

THE AMERICAN ASSOCIATION
FOR THE SURGERY OF TRAUMA
75TH ANNIVERSARY
1938–2013



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EDITED BY

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PREFACE

In 1938 a group of like-minded surgeons founded an organization whose primary focus would be on the management of the major trauma patient. Now, 75 years later, the American Association for the Surgery of Trauma has become the premier surgical association and the professional community for surgeons dedicated to scholarship and improving the care of the critically ill and injured patient. This commemorative book was created to help celebrate the accomplishments and expansion of the AAST over the past 75 years. Each of the sections is designed to focus on a key element of our organization and to convey a sense of shared accomplishment and of a legacy that will hopefully inspire the next generation of surgeons who choose to dedicate themselves to scholarly work related to trauma, surgical critical care, and emergency general surgery.

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Robert C. Mackersie, M.D.
President, American Association for the Surgery of Trauma
San Francisco, California
June 25, 2013

HISTORY OF THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA

STEVEN R. SHACKFORD, MD

PREFACE

The history of a medical society or professional organization can only have meaning when there is context—context with events happening in the world, in the United States, and in medicine. Using these frames of reference, I have tried to present the history of the AAST from its founding to the present day.

“NEITHER FISH NOR FOWL”

It is the winter of 1937. The American College of Surgeons (ACS) is 24 years old and has already achieved an early goal of establishing the legitimacy of “surgery” as a discipline separate from “medicine.”¹ The ACS is dueling with the American Medical Association (AMA) over issues related to which organization can best represent the interest of surgeons to the public and to the government. Representation of surgeons is not trivial; a national health consortium is gaining momentum and it is important that doctors speak with a single voice.

By 1937 surgeons were parsing this new discipline of surgery and already aligning themselves under a variety of rubrics by establishing “boards.” Boards of Otolaryngology (1924), Orthopedic Surgery (1934) and Urology (1935) were well established. The American Board of Surgery was barely a year old.

By all accounts the groundwork for the American Association for Traumatic Surgery (as it was initially named) was laid at an annual meeting of the Western Surgical Association

in December of 1937. The occasion was a happenstance luncheon meeting of several surgeons who had an interest in trauma and who were concerned that there were very few papers about trauma or injuries on the program. Dr. Eslie Asbury, one of the surgeons at the lunch meeting, recalled, "At the meeting of the Western Surgical Association in Indianapolis ... I had Ralph Carothers as a guest at the meeting. I got Ralph, Kellogg Speed, and one or two others to lunch, told them we were neither fish nor fowl, that general surgeons interested in trauma had no place to go (I had the only paper on fractures at this meeting) and that we should have a society of our own."² Dr. Asbury would later remember, "We were not welcome at orthopedic meetings, and societies such as the Western paid no attention to trauma. Fracture services were shunned by surgical residents." In the words of Dr. Carothers, "...we were very much concerned about the attitude of the surgical profession as a whole toward the treatment of trauma and that many of the better surgeons of the country were showing too little interest in this type of case. So we decided to band together and see what we could do about it."³

The coterie arranged to meet again the following week at the Southern Surgical Association meeting in Birmingham, Alabama. Several surgeons of a persuasion similar to Carothers and Asbury joined that meeting, including Edgar Gilcreest. As described by Dr. Carothers, "We talked for a time in that smoke filled room and all agreed that the whole subject of trauma had to be put on a better basis than it was."³ In retrospect, the "better basis" referred to by Carothers, in all likelihood, had to do with advancement of the scientific underpinnings of the treatment of injuries other than fractures. Their concern appears to have been justified. While advances made in the surgical treatment of other diseases were presented at major surgical meetings, the subject of trauma had no forum and little representation on the program of these meetings. The ACS had established a committee on fractures in 1922, dealing primarily with, as the name implies, fractures. The ACS had also established a board on "Industrial Medicine and Trauma Surgery" in 1922, but this was devoted primarily to establishing needed standards of safety in the workplace. Neither of these ACS groups provided the forum necessary for the presentation of scholarly work on the breadth of injury.

A FEW GOOD MEN

Emerging from that "smoke filled room"³ in Birmingham was a "Committee for the Organization of the American Association of Traumatic Surgery," chaired by Dr. Gilcreest, with Dr. Carothers as secretary. Carothers' first task was to "reality test" the idea of a new organization with surgeons around the U.S. and Canada. Inclusion of Canadian surgeons is appropriate for an "American" association and may have been influenced by the ACS model.³ Given the limits on air travel at the time (commercial air travel only became more widely available in 1930 and was quite expensive), Carothers accomplished a lot, visiting "many parts of this country to interview key men in various cities and, as a result, a goodly number became interested in the formation of a [trauma] society." Upon completion of his cross-country tour, Carothers was convinced that there was substantial interest and support. Chairman Gilcreest then composed a letter (dated May 4, 1938) inviting those interested to become a "Founder" of the association

and to meet in San Francisco during the meeting of the AMA. In the letter he explicitly stated the *raison d'être* of the proposed association, "This association is in no way to conflict with any other organization but is to be purely a scientific society limited in size and with membership by election only."⁴

Gilcreest's letter was favorably received, and 68 surgeons met in San Francisco in June of 1938. George Swift chaired the meeting and the first item of business was the Organizational Committee report read by Edgar Gilcreest.⁵ He noted that he had reviewed the programs from the "American Surgical Association, the Southern, Pacific Coast and the Western" and found that "papers related to trauma" represented "less than 10%." With a bit of hyperbole (since it could not possibly be validated at that time) he stated, "It is interesting to note that half of the patients who are admitted to hospitals in America are cases of trauma and 90% of the doctors who treat these patients are not interested in trauma." He concluded his remarks with a prophetic comment, "It [the association] will, in time of war,ⁱ prove of considerable benefit to the Army and the Navy, and through the coming years will its name become large and luminous among the surgical associations of America."

Lively discussion and debate ensued, as some surgeons believed that formation of another society would lead to further fragmentation of "general surgery" (the term general surgery was in common use, but had not yet been explicitly defined).¹ Others raised concerns about the desirability of limiting the membership. In response, it was reiterated that "the aim of the society was to try to advance the scientific work associated with trauma and that this work could best be carried out by limiting the group to a small number of high grade men." There was also concern about the name, particularly the phrase "traumatic surgery" (because it implied that the surgery itself was traumatic, rather than being a means of treating an injured patient).

By any standard, this meeting was incredibly successful, producing a constitution, a set of bylaws, and the first slate of officers (Kellogg Speed was elected president). The constitution, modeled after those from the Western and American Surgical, articulated the objective of the association: "the cultivation and improvement of the science and art of the surgery of trauma and allied sciences, the elevation of the medical profession and consideration of such other matters as may properly come within its sphere." It provided for four categories of fellowship (founder, active, honorary, and senior), six positions of leadership (president, vice president, president-elect, secretary, treasurer, and recorder), a "council of five," and a board of managers. The bylaws defined the categories of fellowship and the qualifications for each category as well as the duties of the officers. Among the qualifications for active fellowship, the bylaws stipulated the candidate must "have contributed to the medical literature" and be certified by the (fledgling) American Board of Surgery. They also limited the number of active fellows to 200 (85% of which would be "general surgeons;" 15% would be made up of those who work in "other specialties" or allied sciences) and specified that the board of managers "may not nominate more than fifteen for Active Fellowship each year." Attendance at the meetings was emphasized and fellowship terminated if two consecutive unexcused absences occurred. In

i. Hitler annexed Austria in March 1938, two months before the organizational meeting.

addition to multiple housekeeping issues (i.e., terms of the officers, meeting planning, etc.) the bylaws (Article IX) specified the “seal and certificate” (containing images of rural and industrial America, an airplane, a train, an automobile, a warship, and a cannon). The seal symbolized the breadth of the American population at risk for injury; it remains unchanged 75 years later.

Based on available documentation, it appears that the founders intended that the association would be exclusive in its membership and scholarly in its proceedings. The requirement for 85% “general surgeons” might be viewed in the context of the time as a reflection of the concern that orthopedic surgeons might dominate the association.

“CALLING BACK TO THE FOLD”

The first meeting of the American Association of Traumatic Surgery was held at The Homestead in Virginia from May 8–9, 1939, a little less than 18 months after the initial discussions. The minutes of the “Executive Session” included a note that “ladies could be invited to the banquet,” a list of the officers for the following year, the obituaries, and a recording of the selection of Atlantic City for the second meeting. Ernest Avery Codman, the father of the morbidity and mortality conference and progenitor of practice-based learning with his “end results method,” was elected as the first honorary fellow. Codman, a former regent of the ACS, had attended the organizational meeting. His attendance not only supported the need for the association, but also demonstrated that there was no opposition from the ACS to its creation.⁶ At some point, either prior to or after this meeting, an agreement was reached with the *American Journal of Surgery* to publish the proceedings of the annual meetings (scientific papers and the presidential address).

Speed’s inaugural address left no room for doubt about the aim and purpose of this association, “In the rapidly developing field of general surgery several schisms have occurred within the last thirty years, ending in a breaking off of certain specialties and narrowed fields, such as ear, nose and throat surgery, genitourinary surgery, neurologic surgery, thoracic surgery and others—even one body devoted quite entirely to the surgery of goiter. It is not the primary desire or intention of the American Association for the Surgery of Traumaⁱⁱ to cause the formation of an additional and possibly narrowed-vision group of surgeons under a different label, but to attempt an amalgamation and calling back to the fold of the well trained general surgeon of those interested in the maintenance of high surgical skill and scientific development in the phases of surgery which have to do with trauma, its immediate and distant effects and complications.”⁷ He reminded those in attendance that new discoveries in other fields had monopolized the programs of other societies such that, “old fashioned trauma and its connections, forever with us like the poor, have jogged along unheralded, poorly nourished and yet demanding a large share of hospital service, of operative time and skill in all parts of the world.”

True to the intent of the founders, the first program had 20 papers devoted to subjects relevant to trauma—including management of a ruptured urethra, the treatment of chest injuries, methods of skeletal traction and experimental fat embolism.

ii. By the time of publication, the name had officially changed

“THE COLOSSAL MAELSTROM”

The second meeting, in 1940, set the tone for the future of the AAST as collateral events brought into sharp relief the need for this society. In his prescient presidential address Edgar Gilcreest made this clear, “There never was a time when we stood more in need of a ready and sound knowledge of the cardinal principles of the surgery of trauma than at the present. With a great part of the world at war and with our not knowing when an incident may happen which may precipitate our entry into the colossal maelstrom, it is timely for a group of surgeons to gather and discuss the progress of the surgery of trauma.”⁸ The ‘incident’ would occur nine months later when the Japanese attacked Pearl Harbor. At this time the Selective Service and Training Act was passed establishing mandatory military service and active fellows who were in the military were relieved of the obligation to pay annual dues.

By 1942, the number of applications to the association exceeded the anticipated volume. As noted in the minutes, “The number of applications received, together with the many inquiries relative to Membership in the Association, presented a most gratifying acknowledgment of the value and need of our organization.”⁹ This, plus a large number on the deferred (waiting) list, prompted the board to suspend the bylaws limiting the number of candidates to 15 and to move that the number be increased to 25. The rapid growth continued, and by 1943, there were 202 active fellows and 10 honorary fellows. Because so many of the membership were on active military service, the annual meetings in 1943 and 1945 were cancelled.

Surgeons returning from the European and Pacific theaters of operation had their trauma skills honed by their military experience.¹⁰ They were clearly the “well trained general surgeon” described by Speed and were easily “called back to the fold.” As a result, AAST membership grew, and at the annual meeting in 1946, the bylaws were changed to allow expansion of the active fellowship from 200 to 250. The increased size of membership obviously impacted the size of the program, which in the original bylaws was restricted to 15 papers.

At the annual meeting in 1948, the association received a replica of Cotton’s hammer, an instrument that had been used by orthopedic surgeons to impact the head of the femur into the shaft to stabilize fractures of the femoral neck.¹¹

From 1947 to 1960, the association’s annual program grew in size from 18 papers to 61. It is likely that an influx of surgeons from the military following the cessation of hostilities in Korea led to further membership expansion, and in 1961, the association voted to increase the number of active fellows to 300.

“CHANGES IN ATTITUDE, CHANGES IN LATITUDE”

In the post-WWII era, the AAST welcomed into membership its first woman member, Barbara Bartlett Simson, in 1946. As the ’60s approached, the association’s second woman member, Mary Margaret Martin, was elected in 1959. A little over a decade later, in 1973, William E. Matory became the first African-American member.

By the time of its twenty-fifth birthday in 1963, the AAST had undergone a number of significant changes that strengthened its commitment to education and research. With the

increase in the number of papers presented at the annual meeting, it became apparent that there should be consideration of “founding a journal to be devoted entirely to trauma, sponsored by the American Association for the Surgery of Trauma.” This “consideration” had been discussed by the board as early as 1955 and approved by the association at the annual meeting in 1959.ⁱⁱⁱ The “birth” of the *Journal of Trauma* and the gradual growth of the size of the program had a ripple effect on the board. Up to this time, the responsibility for the program had been assigned to the secretary. The recorder was responsible for editing the papers selected for submission to the *American Journal of Surgery*. In 1963, as he was completing his tenure as secretary, Dr. William Fitts suggested to the board that the association should have a “program chairman.” This position was approved and, in 1965, formalized in the bylaws. The duties, formally performed by the secretary, were assigned to the recorder.

The program content also changed and evolved at this time. During the first two decades, the papers presented at the annual meeting were primarily clinical, with very few papers on basic scientific research. The first paper describing the use of animals in basic scientific research appeared on the program in 1947. By 1960, 26% of the papers dealt with basic research on subjects such as burns, shock, and stress metabolism. This emphasis on basic research, which has continued to the present, also catalyzed a broadened scope of association activities.

During this period of change in the content of the program, the board established a relationship with the National Society for Medical Research. As a result of that relationship, the secretary of the association became its official representative and a conduit to the board of the activities of the society. This allowed the association to develop the activity of public advocacy and, at the same time, maintain itself as a relatively parochial scientific organization. One of the first collaborative efforts of the AAST with the National Society for Medical Research concerned the use of animals in research. In the early 1960s, animal activism was getting a start in Great Britain and was gaining traction in the United States. Dr. James Stack, the AAST representative to the society, asked the board to adopt a resolution “directed to Congress to favor legislation to assure not only the continuation of laboratory animal research, but also the care of laboratory animals.”¹² It was the opinion of the board that “our association was eligible to support such action” and approved the resolution. Over the ensuing years, the association provided much support not only for this resolution, but also for other initiatives of the National Society for Medical Research. This move into the public domain might be viewed by some as a corruption of the academic ideals and the aims of the association as set down by its founders in the constitution. On the other hand, public advocacy could very well be exactly what the founders intended in Article 2 (the Objective of the Association) with the phrase, “...the elevation of the medical profession and consideration of such other matters as may properly come within its sphere.” As a scholarly association, it hardly seems necessary to justify that laboratory research should come within the sphere of the AAST. Of note, the continued support of this effort by the AAST (together with other professional organizations) culminated in the Animal Welfare Act of 1970 that satisfied all concerned, including the animal activists.

iii. The history of the *Journal of Trauma* is contained in chapter 3, pp. 23 - 71.

Another move into the public domain had commenced in 1956 when then AAST President Charles Johnson sent a letter to the National Safety Council (NSC) proposing that the NSC, the ACS, and the AAST “band together to form a Joint Action Plan. The objective of this program was a joint approach on a solid front to prevent accidents^{iv} and to minimize the serious effects of trauma.” This collaborative effort produced a document appropriately titled the “Joint Action Program” published in 1958 that called for the development of ordinances at the local and state level mandating the appropriate training of ambulance personnel and the appropriate equipping of ambulances. On the heels of the Joint Action Program came enactment of the Highway Safety Act of 1966. A provision of this law established the requirements for education, certification and registration of emergency medical technicians as well specifications regarding the design and equipping of ambulances. Concurrent with the passage of this legislation, fellows of the AAST worked with members of the ACS Committee on Trauma (ACSCOT) and members of the National Academy of Sciences to produce a sentinel white paper entitled “Accidental^v Death and Disability: The Neglected Disease of Modern Society.”¹³ This was truly a clarion call that identified major problems with emergency medical services and trauma care in general. The white paper galvanized surgeons, legislators, and public policy makers to improve the care of the critically injured. It also helped to change how surgeons viewed trauma care. Previously, the process of care was viewed as beginning in the emergency room and ending with discharge from the acute care hospital. Now it was seen as a process beginning in the field and ending at discharge from rehabilitation services.

Concurrent with these public efforts by the AAST and the ACS Committee on Trauma, the National Safety Council commissioned an annual award recognizing the work of both organizations in improving the care of trauma victims. Nominations for the award were made jointly by the AAST and the ACS-COT. The first award was given in 1960 to Dr. George J. Curry, primarily for his 1951 work as chairman of the Committee on the Investigation of Practices in Hospitals that documented the inadequate number of properly trained physicians caring for trauma victims.

The success of these legislative efforts and the widespread acceptance of the resulting authoritative publications demonstrated the synergistic effect of the collaboration between the AAST and the ACS-COT. In the 50-plus years since that initial effort, the AAST and the ACS-COT have continued to collaborate with similar productive results.

Not every effort during the period from 1950–1963 had a successful outcome. One failure is particularly salient and worth mentioning because it would resurface almost 60 years later. During the “gestational period” of the AAST, as mentioned previously, the founders felt that they were ‘neither fish nor fowl’—they did not have a medical “board” that recognized their particular talents in caring for the injured. They were shunned by the American Board of Orthopedic Surgery and none of the other boards in existence at the time seemed appropriate, with the possible exception of the newly established American Board of Surgery (ABS). In the early ’50s, the AAST Board of Managers officially ratified ABS certification as the “minimum

iv. In those days crashes were called “accidents” and viewed as such. It was not until the 1970s when trauma was viewed as a disease with a distinct etiology, and not as an “accident,” that the terminology changed.

v. There is that word again.

requirement for membership.” At the meeting in 1951, “the Board of Managers passed a resolution to sponsor the establishment of a Board of the Surgery of Trauma as predicated upon the applicants having previously met the requirements of the American Board of Surgery.” The records are not completely clear on the motivation for establishing this specialty board, although Arthur Metz in his 1952 presidential address suggested that it was the creation of other specialty boards: “The trend of modern times is to designate minimum qualifications and standards for a surgeon to have in order to treat different types of surgical conditions as provided by the ten Boards already organized. The logical answer is to organize a Board for the Surgery of Trauma—with this association as the Founder Group...”¹⁴ It was discussed repeatedly at the annual board meetings, but there was no action to bring it forward to the membership. It is not clear why it was not pursued, although it was apparent that the Advisory Board of Medical Specialties was opposed.⁶ Gaston writes, “The reader may make his own judgment whether or not this irresolution of the matter was in the best interests of the surgery of trauma, taking into consideration the present day standards of excellent quality of specialized care rendered the injured patient in all categories of injury...”^{15, vi}

At the board of managers meeting in 1967, Jonathon Rhoads suggested that the AAST Board “approve in principle” the creation of a “non-profit corporation to promote research in the field of trauma and to engage in other appropriate activities related to that field.” The ACS was asked to do the same. At the Executive Session that year, the membership voted that “the American Trauma Society be approved in principle, and it was voted to recommend Doctors William T. Fitts and Rudolf J. Noer to represent the AAST.” By 1968, the American Trauma Society was incorporated. This marked the beginning of a long collaboration between the AAST and the American Trauma Society and was the initial commitment of the AAST to public education.

By 1970, the *Journal of Trauma* had become an integral part of the association, not only because of its intellectual currency with the readership, but also because the association had invested significant assets in its success. For these reasons, the board of managers proposed amending the bylaws to make the editor of the *Journal* a member of the board. The amendment successfully passed at the subsequent Executive Session in 1971. It is not mentioned in the available documents, but there was an additional reason for having the editor on the board. Most professional organizations attempt to provide “institutional memory” by having the president-elect, as well as a specified number of past presidents as members of the leadership. In the case of the AAST, an individual elected to the office of president can have input on board actions for a total of five years (one as president-elect, and then president, and three as a past president). Because the editor’s term exceeds five years, he or she can provide additional a longer span of “institutional memory.”

Continued growth in applications for membership^{vii} by very qualified candidates resulted in another change to the bylaws that increased the number of active fellows to 350. At this time, there was also increased international participation in the annual meeting, so much so

vi. Gaston was describing events in the early '50s, but his “present day” was the '70s. Trauma care in hospitals was improving, but there was still much to be done.

vii. Again stimulated by the return of military surgeons from the conflict in Southeast Asia.

that the board created an ad hoc committee, chaired by Dr. Curtis Artz, to evaluate the need to form a new membership category for surgeons who did not “reside in either Canada or the United States.” The board proposed amending the bylaws to recognize this group and to create a new category of membership, the Corresponding Member. The bylaws change was unanimously passed at the meeting in 1975.

THE “FITTS”

Named lectureships are the mark of a mature professional organization. They are named to recognize the multiple contributions of an individual member and to perpetuate his/her memory and legacy. The lecturer selected is often one who personifies the ideals of the organization. The AAST created the William T. Fitts Lectureship in 1975 to memorialize the many contributions made by Dr. Fitts as president and secretary of the association and as editor of the *Journal of Trauma*. Each year the AAST president is responsible for selecting the William T. Fitts Lecturer. Since its inception, “the Fitts” has become one of the major highlights of the annual meeting.

The continued growth in membership led to repeated discussions at board meetings about the concept of changing the association from an “exclusive” to an “inclusive” society. One argument was articulated by Dr. Alexander Walt in 1975 during the board’s consideration of the possibility of offering an international symposium on trauma: “Now we are saying that we are thinking of getting out into the big world, exerting a role of leadership, trying to get into Washington and have them recognize what we do...trying to get into international relationships...” It seems that, in retrospect, the board was a little self-effacing—the association, through its work on national safety legislation, had already attained gravitas in Washington. Through its *Journal*, AAST was already internationally recognized. However, the board did eventually approve a motion to hold the international symposium, which took place in May of 1978. The meeting may have increased the profile of the association with the NIH and with the international community, but it did not achieve the expected attendance.

Growth in membership resulted in increased attendance at annual meetings and an increase in the assets of the association. At about the same time, the tax laws relating to large professional organizations made it necessary for the association to incorporate. Without such incorporation, members of the association could be liable for any legal judgment against the association that exceeded its assets. The resulting incorporation was approved by the membership at the annual meeting in 1977, and subsequently the association applied for 501(c)(3) status from the Internal Revenue Service. Approval for both objectives occurred in 1978. Other issues considered at this time by the board included: allowing commercial exhibitors at the annual meeting (voted down), creating a registry of available “trauma fellowship” positions (a questionnaire sent to the membership to determine if such existed),^{viii} meeting management (several firms invited),^{ix} and the possibility of members obtaining continuing education credit

viii. The questionnaire was mailed in July, 1976—there were only five replies, dampening, somewhat, the board’s enthusiasm for the registry.

ix. Two firms presented their proposals at the Board meeting in 1977. After what appears to be lengthy discussion, the item of meeting management was tabled until the next meeting at which it was unanimously rejected.

from the American Medical Association for attendance at the AAST annual meeting.^x

DOLLARS AND SENSE

By 1984, the AAST achieved two important benchmarks for successful academic associations. Abstract submissions exceeded 200, and the improved quality of the submitted abstracts was sufficient to justify more acceptances for podium presentations, necessitating concurrent sessions at the annual meeting.

There were now sufficient assets to fund a one-year scholarship,^{xi} and a Scholarship Committee was convened to define qualifications of applicants and expectations of the recipient. The guidelines were subsequently developed, but there were insufficient funds to provide the scholarship in perpetuity. As a result, the board began to explore ways to increase funding for the scholarship, which generated lengthy (and lively) discussion and debate. Eventually, the board proposed an increase in annual dues and future consideration (when the time was right) of the possibility of allowing commercial exhibitors at the annual meeting. Both proposals represented a significant reversal of previous board positions. Yet, both passed unanimously. Debate, discourse and discussion are the attributes of a healthy and vibrant organization. That the board and the membership approved these recommendations unanimously demonstrated their willingness to change in order maintain their commitment to their principles and to the support of scholarship. Though not apparent at the time, the decision to allow proprietary interests to exhibit their wares at the annual meeting would eventually result in significant industry support of research and education. Over the ensuing 25 years, suture manufacturers, pharmaceutical corporations, surgical instrumentation companies and an automobile manufacturer (General Motors) would contribute a total of \$1.1 million to support the AAST's scholarly endeavors. Based on discussion at the board meetings in 1985, the first industry support came at a time when the funds available to the AAST for the support of scholarship were dwindling.^{xii}

At this time several major revisions of the bylaws occurred. One of these recognized the contributions of non-surgical scientists to the care of trauma patients by creating a membership category of "Associate Member;" Susan Baker became the first associate member. Increasing the categories of membership produced some significant introspection by the board regarding the "future direction of the AAST." Based on a review of the minutes of past board meetings, that introspection has continued, almost annually, from 1983 to the present day. Topics of this introspective reflection have included: "specialty certification," "renaming the AAST," "qualifications for membership," "defining trauma and critical fellowship guidelines," "relationships with other trauma organizations," "critical care certification," "inclusive or exclusive membership," and "branding", among others. The discussions were always substantive, and though not often productive of some policy change, they served to move the leadership

x. At this time the *AMA Category I* credit was not obtained. Eventually CME credit would be supplied by the ACS.

xi. In the minutes of the board meeting this is referred to as a "trauma fellowship". In order to avoid confusion in this document, what the minutes describe is now called a scholarship.

xii. It appears from the minutes that, without industry support, the funds giving in support of the scholarship were to be reduced.

and organization ever so gradually toward important decisions that would result in major changes as the new millennium^{xiii} approached. The first “product” of these discussions was the creation of an Ad Hoc Critical Care Committee, which led to a session on “critical care” at the annual meeting. In 1991, the Ad Hoc Critical Care Committee was made a standing committee.

In 1985 the National Research Council (NRC) published “Injury in America: A Continuing Public Health Problem.”^{16, xiv} This report recommended the establishment of an office of trauma research at the Centers for Disease Control (CDC). The publication of this document and the subsequent establishment of the National Center for Injury Control represented a significant achievement in which the AAST played a major role. For many years, members of the AAST had written letters, traveled to Washington, and worked with legislators and policy makers to establish a center, similar to an Institute at the NIH, with a focus on injury treatment and prevention. Their work, along with the work of members of other organizations, ultimately resulted in the publication of the NRC’s report on injury in America, a report which had profound effects on improving trauma care and furthering research on injury.

In 1986, the AAST became a sponsoring organization of the American Board of Surgery, and with that came representation on the board. This strengthened the bond between the two organizations and allowed for a robust and frequent interchange of information. At the time it was a singular achievement, and with the increasing stature of the AAST, this would become a formidable relationship that enhanced the establishment of training programs and certification in critical care.

Growth continued through the 1980s, and by 1987, abstract submissions exceeded 300.^{xv} This growth resurrected the possibility of having professional program management because planning and implementing a larger meeting could be unwieldy without professional help. Furthermore, the meeting venue for 1987 was in Montreal, Quebec, further adding to the complexity of making arrangements. This topic of employing professional management was repeatedly discussed and a small committee (consisting of *only* Dr. David Mulder) was established to investigate the possibilities. The board reviewed the “committee” work, which suggested that the association, despite its relatively phenomenal growth, was still “too small” and that a membership of at least 750 would be required for the venture to be affordable. It was decided that the association would not pursue the matter of professional meeting management further until the membership exceeded 700.

By 1986, because of some seminal work done by members of the AAST, regionalization of trauma care had occurred in several states. Regionalization was controversial because it diverted patients from the closest, i.e. local, hospital to a center that was better equipped to

xiii. The choice of these words ‘new millennium’ was purposeful because it not only represents the chronological benchmark of entering a new century, but it also branded a new generation of medical students and physicians who viewed medicine, in general, and surgery, in particular, in a far different light than did their predecessors. As will be seen, the change in the culture was a consideration as the AAST morphed into its present form.

xiv. The AAST was represented by Drs. John Davis, Donald Gann, and Susan Baker on the editorial board of this monograph. It is probable that their interaction with David Viano, head of the research laboratories at General Motors who was also on the editorial board, was helpful in securing continuing support for the AAST General Motors Scholarship.

xv. It is interesting to note, given the impetus for forming the AAST, that its growth was noted by the American Surgical Association in a letter from Dr. Hiram Polk “concerning the duplicity of subject matters at the various associations’ programs.” The AAST secretary was advised “to commiserate with Dr. Polk and send the American Surgical Association copies of the abstract program once available.”

care for the patient. While regionalization may have inflated the reputations of the centers, it is important to note that the quality of care was indeed better at these centers than at the hospitals being bypassed. In short, trauma centers had to demonstrate that they had better outcomes. Appropriate analysis of outcomes requires risk adjustment, particularly for the severity of injury. Dr. Susan Baker and her co-authors provided anatomic risk adjustment for injury severity (the Injury Severity Score)¹⁷ and Dr. Howard Champion^{xvi} and his co-authors provided physiologic risk adjustment (the Trauma Score).¹⁸ While the Injury Severity Score provided an aggregate index of the severity of anatomic injury, there was no scale to assist in comparing treatment of specific injuries. In 1987, President Donald Trunkey^{xvii} appointed the Ad Hoc Organ Injury Scaling Committee. First chaired by Dr. Ernest E. Moore, the committee's work resulted in multiple, frequently cited publications that advanced the management of specific types of organ injury. The clinical value of the AAST Organ Injury Scales became particularly apparent as imaging technology improved and nonoperative management of lower grade injuries became commonplace. The Ad Hoc Organ Injury Scaling Committee eventually became a standing committee with expanded duties (Injury Assessment and Outcome Committee).

Recognizing the potential for collaborative research within the organization, Dr. Trunkey also appointed an Ad Hoc Multi-Institutional Trials Committee in 1987. This committee, initially chaired by Dr. J. David Richardson, has been prolific since its inception, providing an evidence base for the management of trauma and its complications. A bylaws change in 2000 made the Multi-Institutional Trials Committee a standing committee.

A STEEPER GROWTH CURVE

Interest in trauma grew throughout the 1980s. Stimulated by public awareness that injury was the leading cause of death in the first three decades of life, regionalization of trauma care spurred competition, and hospitals^{xviii} became eager to develop trauma centers and surgeon-led trauma teams. As the membership of the AAST continued to grow, expanding research opportunities for surgical residents and new members was a subject frequently discussed by the board. The leadership had to carefully balance the funds allocated to future development with those needed to operate its growing set of commitments. In 1989, President Donald Gann commissioned board member Dr. Lewis Flint to develop "the concept of a foundation or endowment" to support research and education. Work^{xix} on this continued until 1993 when the AAST had one year's operating expenses in reserve allowing an "irrevocable transfer" of seed money for the endowment. The board approved a motion from Dr. Flint to form a foundation to support research and education.^{xx}

xvi. Drs. Baker and Champion are AAST members.

xvii. Dr. Trunkey and his former resident, John West, wrote one of the seminal papers advocating for the regionalization of trauma care.

xviii. It is possible that 'community service' fueled the interest of hospitals to become trauma centers, but it is likely that financial interests were the driving force. The hospitals perceived that the "halo effect" of being designated a trauma center would bring in more patients. The "halo effect," however, did not materialize and many centers eventually withdrew from regional systems.

xix. Dr. Anthony Meyer had worked with the association's legal representatives in establishing a 501(c) (3) foundation and had assembled incorporation documents (modeled after those of the American Surgical Association).

xx. Not surprisingly called the "AAST Research and Education Foundation" that, at the time of this writing, has amassed a corpus of over \$3.5 million and has provided over \$110,000 for research fellowships to qualified applicants.

In 1989, at the behest of the (then) Ad Hoc Critical Care Committee, the board approved adding a Saturday session devoted to critical care presentations and provided \$15,000 in support of this undertaking. The board also proposed a bylaws change that would remove the attendance requirement to maintain fellowship.^{xxi} The bylaws were also amended to “broaden the definition of an Active Member so that surgeons practicing primarily critical care” could be included in that category. A second part of the amendment would create a standing committee on critical care.

In 1991, the board established the Peter C. Canizaro Award in recognition of his multiple contributions to the care of injured and burned patients. The award, first presented in 1993, is given to a new member who, in the judgment of the scholarship committee, has given the best paper among all new members presenting.^{xxii}

After years of discussion, the board agreed in 1991 to finalize the Trauma Fellowship requirements and to submit them to the *Journal of Trauma* for publication. The fellowship requirements represented the work of both the AAST and the ACS Committee on Trauma.^{xxiii}

The topic of professional meeting management continued to surface at board meetings. As was mentioned previously, the association was thought to be “too small,” and there was concern that employing such a professional manager might put a strain on the financial reserves by increasing the cost of the annual meeting. The board ultimately decided to bring this before the membership, explaining that the cost of professional management could be offset by increasing the meeting registration fee, an idea favored by those present at the business meeting. Subsequently, after evaluating proposals from several professional management groups, the board approved an initial three-year contract with a meeting management firm to manage the 1994, 1995 and 1996 meetings. Meeting management has continued from the initial three-year period to today.

Professional meeting management allowed program expansion and in 1992 the board decided to phase in this expansion by approving a combined meeting with the orthopedic surgeons in 1993,^{xxiv} a poster session in 1994, and breakfast sessions in 1995.^{xxv} The poster session and the breakfast sessions were immediately popular. By 1996, the number of posters grew from 35 to 60,^{xxvi} and the number of surgical residents attending the meeting to present posters increased from 13 to 51. The breakfast sessions were immediately oversubscribed and the number of sessions was increased in the ensuing years.

One intention of the founders that had remained unfulfilled was adding trauma education to the medical school curriculum. An attempt to do so had been made in 1944, but it was not enthusiastically endorsed by medical school deans, and the attempt was laid to fallow. It

xxi. The attendance requirement, set forth in the original bylaws, may have reflected the founders’ desire to make sure that the meeting space was full. By 1990, attendance at the annual meeting was definitely not a problem.

xxii. In 1994, the bylaws were changed to establish a Canizaro Award Committee; eventually this function was undertaken by the Scholarship and Awards Committee.

xxiii. Trauma fellowship guidelines had been a board agenda item for several years and their finalization and publication was a significant step. Significant because there were objections from other specialties, primarily orthopedics, who “felt that this may infringe on their domain.”

xxiv. The meeting with the orthopedic surgeons had already been planned and announced, but it did impact the other planned expansions, which were new.

xxv. The meeting in 1992 had 449 attendees, the largest to date. The new attendance record likely added support and enthusiasm for expanding the program.

xxvi. Eventually the number of posters would be capped at 100.

was resurrected, in a manner, almost 50 years later at the meeting in 1993. Qualified medical students were awarded a stipend to attend the annual meeting. Students were selected by the scholarship committee following an application process that included a letter of support from a fellow. This Student Scholarship Program continues to be fully subscribed and has resulted in an enhanced interest in trauma and critical care among medical students.

One of the first of many accomplishments of the newly incorporated AAST Research and Education Foundation was the establishment of the John H. Davis Research Fellowship in 1994. Dr. Davis was a past president of the association and served as the editor of the *Journal of Trauma* from 1975–1993. The association and the *Journal* flourished under Dr. Davis's capable leadership. The *Journal*, which had been a financial burden on the association, came into its own while Dr. Davis was at the helm. The *Journal* generated excess revenue over expenses, such that the investment in the *Journal* by the association was paid back with interest many times over.

Between 1993 and 1995, a number of new initiatives surfaced and were approved, resulting in some changes to the bylaws. Additional standing committees were established: Prevention, Publications, and Program. Trauma nurse coordinators were now frequent attendees at the annual meeting and the board approved reducing their registration fees.^{xxvii} A Contributing Scientist category was also established. The expansion of the program and the inclusion of a broader group of medical professionals further strengthened the organization.

The 1995 meeting in Halifax, which was a combined meeting with the Trauma Association of Canada, attracted a record-breaking 602 participants.

In January of 1996, a "trauma summit" was held in Houston. Approximately 30 individuals from 20 organizations^{xxviii} with an interest in trauma care met to discuss ways to improve communication and to discuss issues of common interest. President Dr. Kenneth Mattox capably represented the AAST. The meeting was a sentinel event as it indicated that interest in the care of the injured patient had become widespread, no longer perceived as "old fashioned trauma and its connections, forever with us like the poor...unheralded... poorly nourished."^{xxix} On the contrary, as evidenced by the summit, trauma care had entered the mainstream of medicine due in large part to the efforts of the association and its membership.

In 1997, a joint meeting with the Japanese Association of Emergency Medicine was held in Hawaii. The total number of abstracts submitted exceeded 400 for the first time, and the increased number of abstracts provided real fodder for the initial discussion of electronic abstract submission.^{xxx} The meeting was well attended and represented the initial joint venture outside of North America.

BITS AND BYTES, ODDS AND ENDS

The new millennium brought with it a number of changes. The *Journal* adopted electronic

xxvii. This was a long overdue recognition of a group that had been indispensable as hospital trauma programs developed and matured.

xxviii. The organizations included governmental agencies and professional societies. That termed themselves the Federation of Trauma Organizations (FOTO).

xxix. This quote is from Kellogg Speed's inaugural presidential address.⁷

xxx. The board began an investigation of electronic submission in 1998.

publication, abstracts for consideration at the annual meeting were electronically submitted, and all presentations at the annual meeting were digitized (“slides” were a thing of the past). The board approved a bylaws change that added the chairperson of the Critical Care Committee to the board of managers. The format of the poster session at the annual meeting was modified to serve as a platform for Professors’ Rounds. The professors, 10–12 in number, were selected by the recorder to discuss individual posters with the poster presenter. Professors’ Rounds became an immediate success, not only because the professors added to the education of the presenter and those on the rounds, but also because it provided an opportunity for the attendees to have personal interactions with the senior members of the association. A second breakfast session was also added to the program format.

After much deliberation, the appointment of several small committees, and a poll of the membership, it was finally decided to allow commercial exhibitors at the meeting in San Antonio in 2000.^{xxxi} Exhibitors were an immediate “bottom line success;” exhibitor space was sold out six weeks before the meeting and pre-meeting revenue from exhibitors exceed \$220,000. In addition, the meeting drew over 650 attendees for the first time.

THE PERFECT STORM

Despite the expansion that the AAST had enjoyed through the 1990s, there were early warning signs that sustained growth in trauma surgery was in jeopardy, resulting from a number of factors. First, there was declining medical student interest in surgery in general and in trauma in particular, and a career in trauma was not always well regarded by surgical residents. Second, the trauma operative caseload was decreasing as a result of the advent of less invasive therapies^{xxxii} and the proven success of non-operative management for selective blunt visceral injuries. Third, more emphasis was being placed on “education” versus “service”, and the Accreditation Council for Graduate Medical Education was considering limiting resident work hours, thereby decreasing exposure to trauma and emergency surgery. Finally, there were reports appearing in the medical literature and the lay press that a majority of America’s emergency rooms were not being adequately covered by surgical subspecialties. These issues were coalescing simultaneously and needed to be addressed. To address some of these issues, a retreat was convened at the spring meeting of the board in April of 2001 to better define the role of the AAST in this changing environment. The retreat assisted greatly in crystallizing ideas for dealing with these multiple issues. It was decided that the AAST would develop a sub-committee to examine the requirements for a sub-board on surgical critical care,^{xxxiii} and would pursue the notion of being the “lead” organization assuring and assessing competency of those surgeons managing trauma and critical care.

The meeting in September of 2001 was cancelled because of the terrorist attacks on New

xxxi. The board first formally considered exhibitors at its meeting in 1985. It was discussed intermittently at meetings over the ensuing 15 years, often stimulating heated debate. It is interesting to note that one board member vacillated—first strongly opposing the idea and becoming a strong advocate two years later.

xxxii. Interventional radiology had become adept at draining abscesses and embolizing thrombogenic substances into bleeding vessels to arrest hemorrhage.

xxxiii. The consideration of a certifying board for trauma surgeons had been discussed formally in 1951 and a resolution passed to consider it in 1952. The minutes subsequently were silent on this consideration for almost 50 years.

York City and Washington, DC, so it was 2002 before the board and membership were able to address the issues raised at the spring 2001 retreat. It was decided that competency and issues related to the quality of care would be assessed by a program similar to the National Surgical Quality Improvement Program (NSQIP), which had been developed by the ACS in collaboration with the VA hospital system. This would be a responsibility shared with the American Board of Surgery and the ACS-COT.^{xxxiv} A “Future of Trauma Surgery” meeting was convened in August of 2003 with representatives from the ACS-COT, the ABS, the Residency Review Committee, and the Society of Critical Care Medicine. An ad hoc committee on the “Consideration of Trauma Specialization”^{xxxv} was formed. As a result of that meeting and additional correspondence, the executive director of the ABS requested that the AAST develop a template “for combining trauma surgery, surgical critical care and emergency surgery.” With approval of the board, President H. Gill Cryer directed that this mandate be achieved by the Ad Hoc Committee on the Future of Trauma Surgery. This was truly a sentinel event because the ABS had previously discouraged such further specialization. It is also worth noting how quickly this moved from discussion at the retreat to an actionable item.

“CHANGING TO LIGHT SPEED”

By 2004–2006, the association was involved in a number of important initiatives including specialization, competency, careers in trauma care, and research collaborations. The slope of change for the association was no longer linear; it was now exponential. It became increasingly clear to the board that all of these issues could not be managed well under the current administrative structure with leadership changes occurring annually and very little in the way of association “institutional memory” about details. Consensus was reached about the need for an executive director.^{xxxvi} Over the ensuing 18 months, a job description and budget were developed. In order to accommodate the expenses of hiring an executive director, an increase in membership would be necessary. The proposal to hire an executive director, co-locate the office in the ACS building in Chicago,^{xxxvii} and raise the membership dues by \$100 was presented to the membership by President Steven R. Shackford and passed unanimously. A search committee was formed, interviews held, and the association’s first executive director, Ms Sharon Gautschy, was recruited and began work in March 2006. Sharon entered the “fray” of a vigorous surgical organization seamlessly and with great efficiency. She functioned in the role extremely well and easily exceeded the board’s expectations. As the work load of the AAST central office expanded over the following years, two additional staff members were recruited, Tamara Jenkins and Jermica Smith.

Meanwhile, work initiated in 2004 on a research collaboration with the National Institute of General Medical Science (NIGMS) reached fruition in the form of KO8/K23 grant to be awarded to successful applicants. Successful candidates would be selected by the AAST after

xxxiv. This later became known as “TQIP” or the Trauma Quality Improvement Program.

xxxv. This subsequently morphed into Ad Hoc Committee on the Future of Trauma Surgery.

xxxvi. Most professional societies the size of the AAST already had executive directors

xxxvii. Having the executive director’s office in the ACS Building allowed co-location with the ACS-COT office that eventually facilitated collaboration between the two organizations.

review by the NIGMS. This was the association's first such collaboration with the National Institutes of Health.

Work was initiated on obtaining Advisory Council status with the ABS as this would be the first step toward a specialty board. Under the capable leadership of Dr. Gregory J. (Jerry) Jurkovich, the Ad Hoc Committee on the Future of Trauma Surgery^{xxxviii} completed a strategic plan, developed a 40-page curriculum for trauma and acute care fellowship training, and produced a white paper on acute care surgery. Nominations for the initial membership to the Advisory Council were made and approved by the board.^{xxxix}

Following the terrorist attacks of September 11, 2001, President George W. Bush declared a "war on terror." As part of the war on terror, the United States invaded Afghanistan in 2001 and Iraq in 2003. To assist military physicians and surgeons in their deployments to the theaters of operation, the AAST developed a Military Liaison Committee in 2005. Working with this committee, President-elect William C. Schwab, developed the "Senior Visiting Surgeon Program." Senior surgeons in the association rotated through the Landstuhl Regional Medical Center in Germany to provide consultations and assistance to military staff caring for injured soldiers, sailors, and Marines evacuated to the center from "down range." In the years since its establishment, the program has won high praise from the military and from the surgeons who have participated.^{xl}

Multiple changes in the AAST bylaws occurred during this very busy period from 2000 through 2010. Sixty-seven years after its establishment, the Honors Committee was "sun-downed." In light of the adoption of electronic publishing and the establishment of the association's website, the Publications Committee was renamed the Publications and Communications Committee, and an International Relations Committee was formed, in recognition of the fact that the association had established an international reputation and had informal ties with a number of countries.

Beginning in 2005, the association hosted several "trauma summits" focusing on the collaboration of professional organizations involved directly with the care of the critically ill and injured patient. Officers of the American Burn Association, the Eastern Association for the Surgery of Trauma (EAST), the ACS-COT, and the Western Trauma Association (WTA) participated. . The primary purpose was to establish a platform for dialogue and to discuss projects of mutual interest such as research, disaster response, and trauma system management. This collaboration was particularly important in the effort to garner support for the Acute Care Surgery Fellowship program. Eventually, the leadership of these sister organizations were invited to give regular reports to the AAST's board of managers.

By 2006 the Acute Care Surgery Committee had completed a final draft of the curriculum and circulated it to the membership with a specific set of requirements necessary to establish Trauma and Acute Care Fellowships. The curriculum included exposure to vascular and general surgery, orthopedics, surgical critical care, and neurosurgery. Initially, the plan

xxxviii. This would eventually become a standing committee—the Acute Care Surgery Committee.

xxxix. Unanimously approved for the positions were Dr. David B. Hoyt and Dr. Gregory J. Jurkovich.

xl. The Senior Visiting Surgeon program benefited both military and civilian surgeons with educational transfer occurring in both directions.

was to implement the fellowship program in 2007, but it was slowed to allow some refinement and time for beta testing.

THE SECONDARY SURVEY

In 2006, the board discussed the possibility of another retreat. Much had happened in the six years since the previous retreat in 2001 and it was time to reassess where the association stood and, more importantly, where it was going. In an effort to provide the board with greater input and, perhaps a different perspective, younger members of the association were invited to participate in the retreat. When the retreat convened in January of 2007, several working groups were established to address research, branding and identity, communication, and strategic planning. It was clear to the attendees that the association was on the right track and that it needed to hold the current course.

The annual meeting in 2007 drew a record number of attendees, 869, attributed by some to the growing awareness of acute care surgery as a defined discipline. The success of this meeting stimulated interest in creating a separate category for abstract submission to the annual meeting on the subject of acute care surgery/emergency surgery.

In 2007, members of the Acute Care Surgery Committee initiated visits to evaluate possible sites for fellowship programs. These were eventually approved in 2008, and programs were started first at Las Vegas, and later at Denver. By 2009, several fellowship programs were well established, and graduating fellows were being recruited to high-profile trauma centers.

In 2011, under the capable leadership of President L. D. Britt and immediate Past-President Andrew B. Peitzman, the annual meeting was expanded and re-named the Annual Meeting of the American Association of the Surgery of Trauma and the Clinical Congress of Acute Care Surgery. The name of the *Journal* was changed to the *Journal of Trauma and Acute Care Surgery*, thus capping a significant expansion of the role and, some might say, the mission of the American Association for the Surgery of Trauma.

“LARGE AND LUMINOUS”

Dr. Speed and our AAST founders would be gratified to see what has happened in the 75 years since the birth of the association, proud of their own foresight and proud of all of us for achieving their “attempt [at] an amalgamation and calling back to the fold of the well trained general surgeon of those interested in the maintenance of high surgical skill and scientific development in the phases of surgery which have to do with trauma, its immediate and distant effects and complications.”⁷ We honor them with the achievements of the past 75 years, including the expansion of the association’s role in the profession of surgery, all of which validates Edgar Gilcreest’s 1939 prediction about the future of the organization that would come to be known as the American Association for the Surgery of Trauma: “through the coming years will its name become large and luminous among the surgical associations of America.”

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THE AAST GAVELS

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Since 1948, the annual meeting of the American Association for the Surgery of Trauma has been opened by the president using a ceremonial gavel. The number of ceremonial gavels increased to two in 1989 with the addition of the 50th Anniversary gavel and to three in 2008 with the addition of the Wounded Warriors gavel. Each of these gavels has its own special significance and history, as summarized below.

COTTON'S HAMMER



Frederick Jay Cotton was a founder of the American College of Surgeons and served as a regent of the ACS. His work on fractures, published in books and articles was widely recognized at the time. This work included a seminal article published in 1911 on artificial impaction for the treatment of hip fractures.¹ In this article, Cotton described two cases that involved the use of a large heavy wooden mallet to impact the two ends of a femoral neck fracture as a means of stabilization that would promote healing. Cotton went on to publish three more papers describing the use of impaction in the treatment of these types of fractures, and, by the time of his death in 1938, Cotton's technique had been well incorporated in the procedural armamentarium of orthopedic surgeons of the day.

In June of 1948, a replica of the original mallet used by Frederick Jay Cotton was presented to the association by our first president, Dr. Kellogg Speed. This mallet, now referred

to as “Cotton’s Hammer,” has been used to open the annual meeting of the AAST ever since. Cotton’s Hammer resides at the AAST central offices in Chicago.

50TH ANNIVERSARY (MILITARY) GAVEL

The 50th Anniversary gavel began as a suggestion from past President Lewis Flint in 1988 that a commemorative gavel representative of the Vietnam conflict be presented to the AAST during the 1989 meeting. The gavel was subsequently constructed in San Antonio by an Institute of Surgical Research engineer under the supervision of Past President Basil Pruitt using wood and metal parts from an Army stretcher. An engraved metal plaque was attached and the gavel presented to the AAST during the 50th Anniversary meeting. The gavel has been used since that time to open the annual meeting, and resides in Chicago at the AAST central offices.



WOUNDED WARRIORS GAVEL



The Wounded Warriors gavel was presented to the AAST in 2008 and involved a number of AAST members who also served in the armed forces including John Holcomb (U.S. Army), Don Jenkins (U.S. Air Force), Jay Johannigman (U.S. Air Force

Reserve), and Martin Schreiber (U.S. Army Reserve). Constructed of wood taken from two combat support hospitals in Balad, Iraq, and Bagram, Afghanistan, the gavel commemorates the longstanding relationship between the AAST and United States military surgeons and specifically acknowledges the AAST’s support of the Joint Theater Trauma System. The gavel was constructed primarily by Dr. Slate Wilson, a Vietnam veteran Navy surgeon. Along with Cotton’s Hammer and the 50th Anniversary gavel, the Wounded Warriors gavel has been used to open the annual meeting of the AAST since 2008. The gavel resides at the central AAST offices in Chicago.

REFERENCE

1. Cotton FJ. Artificial impaction in hip fracture. *J Bone Joint Surg Am*. 1911 May 01;S2-8(4):680-686.

CONCEPTION, MATURATION, AND TRANSMOGRIFICATION OF THE JOURNAL OF TRAUMA

BASIL A. PRUITT, JR., MD, AND ERNEST E. MOORE, MD

As related by Sawnie Gaston, the thirtieth president (1970) of the American Association for the Surgery of Trauma (AAST), the possibility of founding a journal focused on trauma was first raised by the specialty journals editor of Williams and Wilkins, Dick Hoover, in a letter to James K. Stack, MD, secretary of the AAST, in March 1955.¹ Dr. Stack subsequently met with Mr. Hoover in Chicago to discuss that possibility and brought the topic to the board of managers at the 1955 annual meeting of the association in Chicago. The board considered the suggestion to found a trauma journal to be premature and, contrary to the current unthinking alacrity with which journals are founded, decided that a study would be required to determine the need and viability of a journal devoted to trauma.

CONCEPTION

The matter incubated until mid-1958 when the president of Williams and Wilkins, E. F. Williams, met with Dr. Preston Wade of New York, the recorder of the AAST (later its twenty-second president). Together they developed a proposed publication contract. At the 1958 meeting in Chicago, President W. L. Estes, Jr., and the board of managers appointed an ad hoc committee with Dr. Wade as chairman to consider sponsorship of a journal devoted to trauma. The committee decided that a trauma journal would be of interest to many surgeons and judged the potential readership to be sufficient to justify AAST sponsorship. Working with Dick Hoover, the committee negotiated and drafted a periodical publishing agreement.

FOUNDING EDITOR: CHARLES G. JOHNSTON, MD

At the business meeting during the 1959 annual meeting of the AAST at Bretton Woods, New Hampshire, Dr. Wade reviewed the negotiations leading up to the proposed publication agreement and the board of managers recommended to the membership sponsorship of a trauma journal. The minutes of the executive session of the AAST on September 25, 1959, indicated that the fellows, after “considerable discussion by Drs. Glover, Breidenbach, Artz, Johnston, Cave, Whittaker, Hampton, and Stryker,” voted unanimously to accept that recommendation. In a special meeting of the board of managers in Atlantic City, New Jersey, on September 28, 1959, they unanimously elected Dr. Charles G. Johnston as the editor of the new journal and decided that it should be named the *Journal of the Surgery of Trauma*, which would be launched in early 1961. The editor was given the responsibility of appointing the editorial board.

The initial periodical publication agreement, effective on January 2, 1961, was signed on January 29, 1960 by President Stack and Secretary Fitts for the AAST and by E. F. Williams for the Williams and Wilkins Company. That agreement, for the publication of what was now to be named *The Journal of Trauma*, stipulated six issues per volume with each volume of 600 editorial pages corresponding to a calendar year with an editorial allowance of only \$1,200 to be paid quarterly. The subscription price was set at \$8.50 per volume for dues-paying AAST members (paid by the association) and \$10.00 per volume for other subscribers. The agreement also stated “net profits from the business operation of the periodicals shall be equally divided between the sponsor (the AAST) and the publisher”—a promissory note long in being realized.

The Journal of Trauma sustained an almost immediate setback when, only six months later, Dr. Johnston unexpectedly died of a heart attack. A special meeting of the board of managers was called for September 9, 1960, in Chicago. At this meeting, Dr. Rudolph J. Noer, who had agreed to be an associate editor when invited by Dr. Johnston, was the unanimous choice to fill the position of editor. When Dr. Noer received the call from the board of managers requesting that he become the editor, he initially demurred and requested that he be given time to assess whether the editor’s responsibilities could be reconciled with his existing obligations. His deliberations led him to accept the editorship though he was concerned about meeting the proposed publication date for the first issue in only five months, i.e. February 1961.

MATURATION

1961–1968: RUDOLPH J. NOER, MD

To “get out a respectable first issue,” Dr. Noer, with the cooperation of the board of managers and the program committee, asked for and received advanced manuscripts of papers that were to be given at the annual meeting in Coronado, California, October 5–7, 1960. These manuscripts, combined with material from the 1959 Bretton Woods meeting, comprised the initial issues of *The Journal of Trauma*. In the first issue of volume I, Dr. Isador Ravdin authored a eulogy of Dr. Johnston as the founding editor of the *Journal*, a founding member of the AAST, and an “elite figure in American surgery.” Dr. Ravdin also authored an editorial in which he

lamented the variable quality of trauma care in the United States which he attributed to medico-legal complications and increasing specialization among surgeons. He stated, "We American surgeons have tended to neglect the injured patient during times of peace." That concern has been repeatedly cited by AAST officers and authors over the subsequent 53 years.

The articles in the first issue included papers presented at the 1960 meeting of the AAST in Coronado, California, addressing orthopedic injuries, septicemia in burn patients, reactions to tetanus antitoxin, and the teaching of trauma in a general surgery program. As listed in the Appendix of most-cited articles, the article by Dehne et al² reporting immediate weight-bearing for nonoperative treatment of tibial fractures has been the most frequently cited *Journal* article from 1961. The topic variability of the most-cited papers published in each year since the founding of the *Journal of Trauma* reflects the progressive expansion of our understanding of the pathophysiology of trauma, the continual evolution of research interests, and the multidisciplinary nature of the readership and authorship of the *Journal*. Articles that have changed clinical practice in the management of trauma patients and those that have materially advanced research capabilities and increased our understanding of the pathogenesis of injury include those listed in the Appendix. The inaugural issue also included recommendations for tetanus prophylaxis as proposed by the American College of Surgeons Committee on Trauma and a brief review of the Joint Action Program on Safety in which the AAST, the National Safety Council, and the American College of Surgeons collaborated to develop policies for accident prevention and to minimize the serious effects of trauma. A "Trauma News" section containing newsworthy trauma-related items selected by Dr. Stack, which was inaugurated in 1961, was renamed "Current News and Comment" in volume 2 and last published in December 1974.³⁻⁵

In an editorial posthumously published in the first issue, Dr. Johnston reviewed the involvement of physicians and surgeons in injury prevention and safety activities from 1867 to 1961.⁶ He attributed the recent improvements in the care of the injured patient to the collaborative efforts on the part of the National Safety Council, the Committee on Fractures of the American College of Surgeons, and the AAST. Dr. Johnston lauded the AAST for including not only general surgeons but surgeons with special anatomic interests in its membership. He complimented the association for deciding to sponsor *The Journal of Trauma* which he expected to bring together "selected articles of interest and importance to all segments of surgery." To that end, he noted that the *Journal's* editorial board would consist of "recognized representatives of all branches of surgical interest." Dr. Johnston was recognized as the founding editor on the masthead of the inaugural issue and has been on each issue of *The Journal of Trauma* since then.

An issue was published every other month, so that volume 1 consisted of six issues (622 pages total) containing 57 articles (including 48 clinical papers and six laboratory research papers). The six papers in volume 1 in which laboratory studies were reported dealt with the topics of the effects of shock on the lung in a canine model,⁷ comparison of the wounding characteristics of some "commonly encountered bullets" in a goat model,⁸ vascular replacement in a canine model of grossly contaminated wounds,⁹ the use of microfilter sheaths in

peripheral nerve surgery (repair of a feline sciatic nerve injury),¹⁰ a basket technique for producing a standard thermal injury in mice,¹¹ and the effect of age on the vascular response to fractures in a murine model.¹² In addition to Dr. Stack's "Trauma News" section, which appeared in four issues, there was a foreword in the inaugural issue and an invited editorial in each issue. Among other items in the first volume of "Trauma News," Dr. Stack called attention to the Surgeons' Award for Distinguished Service to Safety,¹³ which was a conjoined activity of the Joint Action Program of the AAST, the American College of Surgeons, and the National Safety Council.

The first AAST presidential address published in the *Journal* was, most appropriately, that given by Dr. Stack at the 1960 twentieth annual meeting in Coronado, California.¹⁴ In the address, entitled "The Journal and Joint Action," Dr. Stack committed himself and the AAST to improving the care of the injured patient by individual action and in collaboration with other organizations. To encourage close collaboration in the realm of trauma prevention and safety, Dr. Noer included a special article in the July 1961 issue by G. C. Stewart,¹⁵ the executive vice president of the National Safety Council.

In subsequent volumes, Dr. Noer orchestrated the physiognomic development and skeletal maturation of the new journal. In volume 2, a section entitled "Abstracts" was instituted in which Colonel Douglas Lindsey presented reviews of selected trauma-related articles published in foreign journals. He prepared a total of 12 reviews that were published in volumes 2–5. In the "Current News and Comments" section, Dr. Stack reported the posthumous award of the 1961 Surgeon's Award for Distinguished Service to Safety to Dr. Johnston,¹⁶ the founding editor of the *Journal*. In the July 1962 issue, a symposium on shock was presented consisting of a foreword by Fraser N. Gurd¹⁷ (twenty-ninth president of the AAST) and five papers authored by Curtis Artz,¹⁸ John Kinney,¹⁹ A. M. Lansing,²⁰ Mark Nickerson,²¹ and Lloyd MacLean²² in which attention was directed to fluid resuscitation, ventilatory support, use of vasoactive agents, and shock due to sepsis. The article describing the seatbelt syndrome by Garrett and Braunstein has been the most-cited article from 1962.²³ In the March 1963 issue, a symposium on electrolyte and nutritional problems in injured patients was published with a foreword by John Howard²⁴ introducing five papers on the metabolic response to trauma authored by George Clowes,²⁵ Bernard Zimmerman,²⁶ John Howard,²⁷ and Paul Teschan whose paper dealt with post-traumatic renal insufficiency.²⁸

In an editorial in the March 1964 issue of volume 4, Dr. Noer reported that in volume 1 a total of 57 papers were published of which 36 (63%) were clinical, 11 (19%) experimental, nine (16%) educational and one (2%) being medico-legal. Dr. Noer noted that of the 11 experimental papers, six (55%) reported laboratory studies, and that ten (17%) of all the papers published in volume 1 were focused on skeletal trauma.²⁹ That distribution confirmed the multidisciplinary authorship and readership of the *Journal* from its very birth. Dr. Noer further noted that a total of 46 papers were published in volume 2 of which he classified 34 (74%) as clinical, 10 (22%) as experimental, 1 (2%) as educational and 1 (2%) as medico-legal. Seven or 15% of those papers were focused on skeletal trauma. Additionally, an editorial was presented in all six issues. Dr. Noer noted that volume 3 had contained a total of 58 papers of which he classified 29 (50%) as

clinical, 17 (29%) as experimental and 12 (21%) as educational. Sixteen (28%) of the 58 papers were focused on skeletal trauma reflecting the proportion of members and readers who were orthopedic surgeons.

In that editorial, Dr. Noer noted that the number of manuscripts submitted to the *Journal* independent of the meetings of the association had steadily increased and, in the preceding year, had equaled the number received from the AAST meetings. He reported that the total number of subscriptions had shown a slow but progressive increase and at that time included 300 foreign subscriptions. Those data were considered to justify 300 additional editorial pages, a 50% increase, which would permit publication of the increased number of acceptable (but previously rejected because of page limitations) manuscripts generated by the reviews of the two-fold increase in submitted manuscripts in 1963 as compared to 1962. Dr. Noer further remarked that case reports had not been accepted because of space limitations and anticipated that the increase in editorial page allowance would permit the publication of case reports as part of a larger number and wider variety of papers “without sacrifice in quality.” Immediately following this editorial in which the increase in the annual allotment of editorial pages was announced, case reports were first published in the May 1964 issue. Of note that same year was the article by Baxter, Zedlitz, and Shires reporting nine trauma patients who developed renal failure “without an observed period of oliguria.”³⁰ In this early description of “high output” renal failure, the authors included correlative studies in a canine model of high output renal failure and cautioned about hyperkalemia.

Dr. Noer recognized the added value that symposia and reviews represented for the reader and the *Journal*. To that end, the March 1965 issue contained a symposium on burns. Dr. Curtis Artz provided a foreword³¹ and Dr. Steve Lewis a summary editorial³² to surround papers by John Burke,³³ Duane Larson,³⁴ B. W. Haynes,³⁵ John Moncrief,³⁶ and Bruce MacMillan³⁷ which presented state-of-the-art information on fluid resuscitation, closure of the burn wound, management of burns in children, burns of specific areas, and infection in burns. In 1967, the bulk (94 pages) of the January issue was devoted to a symposium consisting of brief reports of 25 papers and “Summarizing Remarks” by Curtis Artz delivered at the Sixth National Burns Seminar in November 1965 at the Sumner L. Koch Burn Unit at Cook County Hospital in Chicago.³⁸

In 1968, the September issue was devoted entirely to the proceedings of a conference on the pulmonary effects of non-thoracic trauma conducted by the Committee on Trauma of the Division of Medical Sciences, National Academy of Science-National Research Council in late February and early March 1968. The conference was prompted by the perceived high incidence of the acute respiratory distress syndrome in combat casualties, in whom it had come to be known as “Danang lung,” and its increased occurrence in civilian trauma patients. Authors of papers addressing that problem included Fiorindo Simeone,³⁹ Ben Eiseman,⁴⁰ Richard Simmons,⁴¹ Carl Teplitz,⁴² William Shoemaker,⁴³ Lazar Greenfield,⁴⁴ John Siegel,⁴⁵ William Sealy,⁴⁶ Frank Veith,⁴⁷ Tom Ducker,⁴⁸ Leonard Peltier,⁴⁹ William Neville,⁵⁰ Gerry Moss,^{51, 52} Herbert Proctor,^{51, 52} Ed Salzman,⁵³ Lloyd MacLean,⁵⁴ George Clowes,⁵⁵ Richard Peters,⁵⁶ Henning Pontoppidan,⁵⁷ Francis D. Moore,⁵⁸ and James D. Maloney.⁵⁹ The proceedings of that conference led to

the clinical and laboratory studies that have supported the reduction of resuscitation volume, modification of transfusion practices, and improved techniques of mechanical ventilatory support that have increased survival of combat casualties. The sixth issue of volume 8 contained “A Standard Animal Burn” by Walker and Mason, which has been the most-cited article from 1968 and, with 448 citations to date, for all of the 1960s.⁶⁰

In an editorial marking the completion of Dr. Noer’s tenure as editor-in-chief, he noted that volume 8 totaled 1,136 pages as compared to only 622 pages in volume 1.⁶¹ It was further noted that the number of spontaneously submitted manuscripts had increased from 11 in 1961 to 93 in 1968. Dr. Noer noted that the distribution of the papers was “surprisingly constant” with 60–70% being primarily clinical, 20–30% relating to basic investigation, and the remainder on educational and medico-legal subjects. He reported that the initial fears of some AAST members that the *Journal* would become “another fracture journal” had not been realized and, on the average, only 20% of the papers in each volume were focused on skeletal trauma and 80% on other effects of injury. It was gratifying to Dr. Noer that the 1,957 paid subscribers in 1961 had increased to just under 3,000 in 1968 with the subscription list including 53 foreign countries besides the United States and Canada. Dr. Noer welcomed his successor as editor-in-chief, Dr. William T. Fitts, who had been a signatory on the original publication agreement and an original appointee to the editorial board. Dr. Fitts took office in November 1968. During the eight years of Dr. Noer’s editorship, the *Journal* developed a characteristic format, increased the number of editorial pages to accommodate the greater number of papers accepted from the progressively enlarging harvest of manuscripts from the trauma community at large, and garnered a steadily expanding readership as manifestations of the number of surgeons involved in trauma care and the perceived quality of the *Journal*’s content.

1969–1974: WILLIAM T. FITTS, MD

As the new editor, Dr. Fitts, in an editorial in the first issue of volume 9, announced that the *Journal* would begin monthly publication to address a publication backlog generated by the increase in the number of papers submitted to the *Journal* independent of those presented at the association’s annual meetings.⁶² Dr. Fitts called attention to the publication of *Accidental Death and Disability: The Neglected Disease of Modern Society* by the Committee on Trauma and the Committee on Shock of the Division of Medical Sciences-National Academy of Sciences, National Research Council,⁶³ and the renewed interest in prevention and treatment of accidental injury to address the perceived discrepancy between the care given combat casualties in Vietnam and that given to many civilians injured in the continental United States. Dr. Fitts also noted the founding and incorporation of the American Trauma Society as the trauma community’s organization focused on prevention and public information. At that time, he announced the appointments of Drs. Robert Freeark, Nicholas Gimbel, and G. Tom Shires as editorial consultants.

Early in his editorship, Dr. Fitz was approached by Dr. Artz who persuaded him to publish in the *Journal* the address of the president of the American Burn Association and that organization’s Everett Idris Evans Memorial Lecture. In the October 1969 issue, the *Journal of*

Trauma published “Burns in My Lifetime,” the presidential address of Dr. Curtis P. Artz, the first president of the American Burn Association, in which he described the many improvements in burn care that had occurred since his birth in 1915.⁶⁴ In that same issue, Douglas Jackson, director of the Burns Research Unit at the Accident Hospital in Birmingham, England, described his early experience with tangential excision of the burn wound in his E. I. Evans Memorial Lecture.⁶⁵ Thereafter, the ABA presidential addresses and the E. I. Evans lectures that were submitted were published in the *Journal of Trauma* until 1986, when they moved to the *Journal of Burn Care and Research* which became the official journal of the American Burn Association in that year.

In the August 1969 issue, Dr. Fitts published a symposium on The Role of Intravascular Coagulation in the Immediate and Later Care of the Severely Injured Patient. The manuscripts were authored by Alan Thal,⁶⁶ Donald McKay,⁶⁷ William Fitts,⁶⁸ Don Silver,⁶⁹ Robert Replogle,⁷⁰ Ken Brinkhous,⁷¹ Willis Warner,⁷² and Watts Webb.⁷³ Dr. Webb reviewed the report of the 1968 National Research Council Symposium on the Pulmonary Complications of Non-Thoracic Trauma in the context of intravascular coagulation.

In 1970, the format of the *Journal* was changed to place two columns of printed text on each page to increase the number of papers that could be published. In the March 1970 issue, a symposium was presented on motor vehicle accident research consisting of a foreword provided by John States⁷⁴ and four papers on motor vehicle-related extremity injuries,⁷⁵ soft tissue injuries,⁷⁶ human body simulation,⁷⁷ and vehicle design.⁷⁸ Later in 1970, the November issue was devoted to the proceedings of the International Trauma Symposium sponsored by the National Institute of General Medical Sciences and held in Washington, DC. National and international authorities authored 15 papers, the content of two panel discussions, and 16 Trauma Workshop reports. A summation and critique was presented by J. Englebert Dunphy.⁷⁹ The December issue of volume 10 contained the article, “A New Concept in the Early Excision and Immediate Grafting of Burns”, in which Zora Janžekovic of Maribor, Yugoslavia, reported her early experience with what has come to be called “tangential excision.”⁸⁰ The article has become the most-cited (479 citations to date) article published by the *Journal* in 1970.

In 1972, the *Journal* and AAST provided a publication platform for the inaugural meeting of the University Association for Emergency Medical Services by publishing the papers delivered at the first annual meeting of that organization, which was held in Ann Arbor, Michigan, in May 1971. In the July 1973 issue, an editorial entitled “The American Trauma Society” was published.⁸¹ The author of that editorial, Dr. Tom Morse, president of the American Trauma Society (ATS), reviewed the genesis of the society, its functions, and its goal of being the trauma analogue of the American Cancer and American Heart Associations. The article entitled “Patterns of Injury in the Battered Child Syndrome” by O’Neill et al⁸² published in the April 1973 issue has been the most frequently cited *Journal of Trauma* article from that year. In the March 1974 issue, Dr. Fitts published a seminal paper authored by Susan Baker and her associates describing the Injury Severity Score (ISS),⁸³ which, with 3,686 citations to date, has become the most-cited *Journal of Trauma* article published in that year, in all of the 1970s, and of all time.

In the December 1975 issue, Dr. Fitts, who had become a designated ex-officio member of the AAST Board of Managers in 1971, announced his resignation as editor-in-chief and the selection of Dr. John H. Davis as the new editor of *The Journal of Trauma*. Dr. Fitts noted that the subscription list for *The Journal of Trauma* had shown a solid and steady increase and predicted that circulation would exceed 5,000 in that year. Dr. Fitts recognized Dr. Davis' achievements as clinician and investigator, his recent election to the presidency of the AAST, and his service as vice chairman of the Committee on Trauma of the American College of Surgeons.

1975–1994: JOHN H. DAVIS, MD

In January 1975, Dr. John H. Davis began a twenty-year tenure as editor-in-chief of *The Journal of Trauma*. His first editorial, which appeared in the August 1975 issue, indicated his interest in expanding the scope of material presented in *The Journal of Trauma* to include topics “beyond the direct responsibility of patient care to involve other areas of trauma and trauma of interest to all who care for the injured patient.”⁸⁴ It was also noted that he would request and publish editorials and editorial comments from members of the AAST to address controversial and innovative concepts. He further announced that the Abstract section prepared by Dr. Douglas Lindsey would be expanded to include abstracts of selected papers from American and British journals that were considered to be of interest to the trauma community in general. Dr. David Pilcher was appointed as the editor of the Abstracts Section and charged with preparing the abstracts of papers from US and UK journals. The most-cited article which the *Journal* published in 1975 has been “Diagnostic Peritoneal Lavage in Blunt Abdominal Trauma” by Engrav et al⁸⁵ reporting their experience with DPL which rapidly became a commonly used diagnostic modality.

To honor Dr. Fitts' work on behalf of the association as officer (program chairman, secretary, and president) and editor of the *Journal of Trauma*, the annual William T. Fitts, Jr. lectureship in trauma was established when he terminated his editorship. The lecture is presented at the annual meeting by a distinguished traumatologist selected by the president. In the January 1976 issue, the first William T. Fitts, Jr. oration, “Burns Updated,” given by Dr. Curtis Artz at the 1975 AAST annual meeting was published.⁸⁶ When he gave the lecture, Dr. Artz's showmanship reached an apogee when he began with a short film clip in which an atomic explosion occurred and Dr. Fitts' visage emerged from the mushroom cloud. In the publication, Dr. Artz reviewed the changes in resuscitation, wound care and metabolic support, based on research findings, that had dramatically increased the survival of even extensively burned patients. The lectures given by the Fitts orators listed in Table 1 have added value to each of the association's annual meetings since 1975.

Table 1. Fitts Orators

YEAR	ORATOR	PUBLISHED ORATIONS
1975	Curtis P. Artz, MD	Burns Updated. (<i>J Trauma</i> . 1976; 16:3-15)
1976	Francis D. Moore,MD	

YEAR	ORATOR	PUBLISHED ORATIONS
1977	G. Tom Shires, MD	
1978	Lloyd D. MacLean, MD	
1979	Peter S. London	
1980	Carl T. Brighton, MD	Treatment of Nonunion of the Tibia with Constant Direct Current. (<i>J Trauma</i> . 1981; 21:189-195)
1981	John W. Kinney, MD	
1982	Thomas W. Langfitt, MD	
1983	Col. Robert Scott, L/RAMC	Scott R. Military Science and Military Surgery. (<i>J Trauma</i> . 1984; 24:553-556)
1984	F. William Blaisdell, MD	Trauma Myths and Magic. (<i>J Trauma</i> . 1985; 25:856-863)
1985	Donald P. Becker, MD	
1986	Chih-Yong Sheng, MD	Medical Support in the Tangshan Earthquake: A Review of the Management of Mass Casualties and Certain Major Injuries. (<i>J Trauma</i> . 1987; 27:1130-1135)
1987	Paul Dudley Hart	
1988	Roderick A. Little, MD	Heart Rate Changes after Hemorrhage and Injury - A Reappraisal. (<i>J Trauma</i> . 1989; 903-906)
1989	Martin Allgower, MD	General Surgery in the Era of Specialization and Its Commitment to Trauma. (<i>J Trauma</i> . 1990; 30:521-527)
1990	Philip R. Lee, MD	
1991	Donald D. Trunkey, MD	Reflections on Recent Experiences. (<i>J Trauma</i> . 1992; 32:562-533)
1992	Basil A. Pruitt, Jr., MD	Trauma Care in War and Peace: the Army/AAST Synergism. (<i>J Trauma</i> . 1993; 35:78-87)
1993	John H. Davis, MD	The American Association for the Surgery of Trauma. A Personal Odyssey. (<i>J Trauma</i> . 1994; 37:538-544)
1994	John R. Border, MD	Death from Severe Trauma: Open Fractures to Multiple Organ Dysfunction Syndrome. (<i>J Trauma</i> . 1995; 39:12-22)
1995	Jonathan E. Rhoads, MD	Trauma Care, Trauma Prevention, and the Role of The American Trauma Society. (<i>J Trauma</i> . 1996; 41:375-379)
1996	Susan P. Baker, MPH	Advances and Adventures in Trauma Prevention. (<i>J Trauma</i> . 1997; 42:369-373)
1997	George F. Sheldon, MD	John Hender and the American School of Surgery. (<i>J Trauma</i> . 1998; 44:13-40)
1998	Leonard Evans, PhD	
1999	Barbara Barlow, MD	
2000	Johannes A. Sturm, MD	
2001	Janet Reno (Cancelled)	
2002	C. James Carrico, M.D.	
2003	Ellen J. MacKenzie, Ph.D.	

YEAR	ORATOR	PUBLISHED ORATIONS
2004	Col. John Holcomb, MD	Current Perspective on Combat Casualty Care. (<i>J Trauma</i> . 2005; 59:990-1002)
2005	Sylvia D. Campbell, MD	
2006	Sten E.V. Lennquist, MD, PhD	Management of Major Accidents and Disasters: An Important Responsibility for the Trauma Surgeons. (<i>J Trauma</i> . 2007; 62:1321-1329)
2007	Thomas M. Scalea, MD, FCCM	Optimal Timing of Fracture Fixation: Have We Learned Anything in the Past 20 Years? (<i>J Trauma</i> . 2008; 65:253-260)
2008	Charles E. Lucas, MD	The Parathyroid Response to Acute Hemorrhage, Sepsis, and Multiple Organ Failure. (<i>J Trauma</i> . 2009; 66:92-97)
2009	Frederick P. Rivara, MD, PhD	
2010	Charles N. Mock, MD, PhD, MPH	Strengthening Care for the Injured Globally. (<i>J Trauma</i> . 2011;70:1307-1316)
2011	H. Leon Patcher, MD	Prometheus Bound: Evolution in the Management of Hepatic Trauma - From Myth to Reality. (<i>J Trauma Acute Care Surg</i> . 2012; 72:321-329)
2012	David B. Hoyt, MD	Post Hoc Ergo Propter Hoc: The Story of the Resuscitation Outcomes Consortium. (<i>J Trauma Acute Care Surg</i> . 2013; 74:8-16)

The article entitled “The Injury Severity Score: An Update,” which appeared in the November issue of the *Journal* by Susan P. Baker and Brian O’Neill, has been the most-cited article for 1976.⁸⁷ With the February 1976 issue, Dr. Davis instituted a section entitled “Meetings and Postgraduate Courses of Interests” to facilitate maintenance of competence and promote quality of care long before those concepts became CME mantras. Concise notices of meetings and courses were published without charge to encourage the sponsors of CME activities to post their announcements in the *Journal*. In 1977, Dr. Davis established the requirement that there be an abstract with all research articles. In 1978, the page size of the *Journal* was enlarged from 6¼ x 9¾ inches to 8 x 11 inches to accommodate more of the ever increasing number of accepted papers.

In the early years of Dr. Davis’ tenure as editor-in-chief, two papers were published which were harbingers of later changes in trauma patient management “that have been recently rediscovered”. In 1975, Drs. Sheldon, Lim, and Blaisdell published “The Use of Fresh Blood in the Treatment of Critically Injured Patients.”⁸⁸ The limitations of stored whole blood were cited to place that fluid and “component” therapy in clinical perspective. Fresh whole blood was recommended for those patients requiring an exchange transfusion of five to ten units in less than four hours. Those authors emphasized the role of whole blood in the treatment of critically injured patients three decades before the current enthusiasm for massive transfusion regimens. Six years later, in the April 1981 issue, Drs. Feliciano, Maddox, and Jordan reappraised and described a role for intra-abdominal packing to achieve control of hepatic hemorrhage⁸⁹— an apparent forerunner of the now popular damage control surgery as advocated by Drs. Rotondo and Schwab in the September 1993 issue of the *Journal*.⁹⁰

Dr. Davis strongly believed that the *Journal* should be a publication platform to encourage interdisciplinary collaboration in trauma-related problems, give voice to organizations involved in trauma care, and present the results of clinical and laboratory studies that gave promise of improving trauma patient outcomes. To that end, he agreed to publish the presidential addresses of the Eastern Association for the Surgery of Trauma (EAST), the Western Trauma Association (WTA), and the Trauma Association of Canada (TAC). His ecumenism included publication of the Fraser Gurd Lectures given at the annual meeting of the TAC, the Stone Lectures given annually at the meeting of the American Trauma Society, and even the Sixth Alan Deforest Memorial Lecture in the March 1991 issue.⁹¹

In the third annual Stone Lecture, published in the May 1979 issue, R Adams Cowley asked the question, “Why not a national institute for trauma?” and made a strong case for an answer of “yes” with compelling epidemiologic data for support.⁹² In 1984, the seventh annual Stone Lecture was published in which Fiorindo Simeone recognized the role of Col. William Stone in helping Col. Edward D. Churchill organize the Board for the Study of the Severely Wounded,⁹³ which was established on September 1, 1944, and in the few months of its existence, carried out studies generating data to expand our understanding of the pathophysiologic responses to injury and improve casualty care.

The 1979 AAST presidential address of Dr. Roger Sherman,⁹⁴ in which he presented a detailed history of splenectomy and placed nonoperative management of splenic trauma in historic perspective, has become the most-cited *Journal of Trauma* article published in 1980, the first and only presidential address to achieve that status (Table 2). The most-cited article from the year 1983, authored by Faist et al and entitled “Multiple Organ Failure in Polytrauma Patients,”⁹⁵ had been presented at the AAST annual meeting in 1982. The most-cited article on orthopedic trauma, “Problems in the Management of Type III (Severe) Open Fractures: A New Classification of Type III Open Fractures” by Gustilo et al,⁹⁶ was published in 1984. In 1985, the paper describing the Abbreviated Injury Scale and Injury Severity Score by Greenspan et al⁹⁷ was the most-cited *Journal* article. In 1986, the most-cited article was authored by Ernest E. Moore and Todd N. Jones⁹⁸ reporting the results of a prospective randomized study which were interpreted as demonstrating benefits of immediate jejunostomy feeding after major abdominal trauma. The most-cited article from 1988 was by John W. Baker et al⁹⁹ reporting a study indicating that hemorrhagic shock induced bacterial translocation through the portal vein. The most-cited paper of the decade was “Evaluating Trauma Care: The TRISS Method” by Boyd et al¹⁰⁰ in the April 1987 issue.

Table 2. Source of annual most-cited *Journal of Trauma* articles.

SOURCE	TYPE	NUMBER
AAST Annual Meeting	Plenary Paper	18
	Presidential Address	1
WTA Annual Meeting		3
EAST Annual Meeting	Plenary Paper	1

SOURCE	TYPE	NUMBER
John H. Davis Festschrift		1
Independent Submissions		28

Dr. Davis was an early advocate of evidence-based trauma care and, to that end, he encouraged submission of laboratory as well as clinical research papers. In 1979, he published a paper authored by Drs. John Border, Frank Cerra, John Siegel, and R. R. McMenemy of the Buffalo General Hospital Trauma Research program which showed that data from many systems could be correlated to define the patient's physiologic state and trajectory across time.¹⁰¹ In 1981, seven papers by that same group defined what they termed the "basal state" of multiple systems organ failure (MSOF) and described the effects of infusions of amino acids and glucose on the "basal state" and survival and the effects of exogenous albumin on plasma amino acids and the protein profile in septic trauma patients.¹⁰²⁻¹⁰⁸ Dr. Davis also promoted international readership and authorship as exemplified by the 1981 paper, authored by Chi-Sing Chu from the Hunan Medical College, Hunan, China, in which Dr. Chu described the classification, diagnostic approach and treatment of pulmonary burn injuries used in China.¹⁰⁹ In 1981, the *Journal of Trauma* was first published in Japanese, as further manifestation of Dr. Davis' international outreach.

Dr. Davis also welcomed papers from the trauma and burn research centers funded by the NIH in the 1970s and 1980s. In 1979, he agreed to publish the proceedings of the November 1978 "Consensus Development Conference on Supportive Therapy in Burn Care" which had been sponsored by the National Institute of General Medical Sciences (NIGMS) with the cooperation of the American Burn Association (ABA). The proceedings took the form of an 86-page supplement (the first published by the *Journal*) to the November 1979 issue.

That first supplement contains opening remarks by Emilie A. Black, MD, assistant director for clinical research at the NIGMS in which she identified the components of the "research to application continuum" as knowledge development, technical consensus, interface consensus, and dissemination. She described the role of the NIGMS Trauma Program in Trauma and Burn Research in each of those activities emphasizing the importance of the NIGMS in sponsoring and conducting technical consensus conferences to accelerate the incorporation of research findings into patient care. Forty-four papers were presented dealing with five major aspects of burn care i.e. fluid resuscitation (10), infection (10), metabolism (9), smoke inhalation (6) and excisional therapy (9). The authors of those papers were U.S. investigators representing the leading burn research institutions in the U.S., including those supported by the NIGMS Trauma and Burn Research Program, and Drs. Arturson, Kuzin and Zellweger representing burn centers in Sweden, Russia, and Switzerland, respectively. A consensus summary of the information presented on each of the five major topics was presented in which progress in the clinical translation of that information was recognized and further research needs identified. The conference was chaired by G. Tom Shires, MD, who in his closing remarks noted that the studies funded by the NIGMS Program in Trauma and Burn Research had impressively expanded knowledge and understanding of the pathophysiology of injury which had improved care of the injured and clarified the direction of future research.

In the February 1981 issue, the enthusiastic AAST support of emergency physicians, first manifested in May 1972 by publication of papers from the first meeting of the University Association for Emergency Medical Services, was considerably tempered. The board of managers authored an editorial¹¹⁰ taking strong issue with a September 1980 policy statement of the American College of Emergency Physicians (ACEP). In this statement, ACEP proposed that emergency physicians should assume the medical control and direction of pre-hospital care and the initial treatment of trauma patients and decried any policy to list any establishment of need, design, or manner of implementation of the trauma care plan that any region or community must adopt.¹¹¹ The AAST Board of Managers emphasized that the American College of Surgeons as well as the AAST had historically provided and would maintain the leadership in the upgrade of trauma patient care. The board considered such policy statements as those advanced by the ACEP to detract from efforts to improve the management of trauma patients.

The second supplement of the *Journal of Trauma* appeared with the August 1981 issue and contained the proceedings of the Second Conference on Supportive Therapy in Burn Care sponsored by the NIGMS. Dr. Shires was again the chairman of the conference. The major topics addressed were the five considered in the first supplement with five papers on fluid resuscitation, six on infection, five on metabolism, five on inhalation injury and six on burn wound incision and debridement. Additionally, there were individual papers on clinical, legal, and moral Perspectives; manpower needs in trauma and burn care and research; a review of the NIGMS burn research program; a review of the NIH pharmacological program; a review of research and research training opportunities within the NIH physiology and biomedical engineering program; a summary of NIGMS activities related to trauma and burn research; and a review of the NIGMS 1978 Consensus Development Conference on Supportive Therapy in Burn Care. The participants and authors of the papers from the second conference were in large part the same individuals who had participated in the first conference and authored the papers presented in the first supplement. In his concluding remarks, Chairman Shires emphasized the effectiveness of goal-directed research in improving burn care and identifying fruitful areas for further investigative efforts.¹¹²

The third supplement published in September of 1984 was entitled, "Frontiers in Understanding Burn Injury," and presented the proceedings of a third NIH conference on trauma and burn research sponsored by the NIGMS along with the International Society for Burn Injury (ISBI), and the ABA. Dr. Ruth Kirschstein, director of the National Institute of General Medical Sciences noted it to be the "third major conference on this topic sponsored by the NIGMS in the last five years."¹¹³ She stated that the work reported makes obvious that continued studies at "the cellular and molecular levels are absolutely necessary." Dr. G. Tom Shires was again the general chairman and the topics covered included repair of thermally-injured skin (six papers), promising methodologies in burn research (one paper on high frequency ventilation and one on the use of ultrasound to assess burn depth), immunological alterations following burn injury (six papers), advanced technologies in burn research (one paper on nuclear magnetic resonance authored by Britton Chance and one on the use of stable isotopes and the mass spectrometer), and pain and anxiety in the burn injured (four papers). Many of the authors

had contributed to the earlier burn supplements as had many of the designated discussants for each paper presented. In his summary, Dr. Shires noted that the impressive research productivity generated by NIGMS support had materially improved the clinical care of burn patients and had also revealed areas where future research activities could be most advantageously applied.¹¹⁴

In a 1988 editorial, Dr. Davis announced that the *Journal* would begin publishing selected papers from the newly formed Eastern Association for the Surgery of Trauma, just as it had been doing for the Western Trauma Association since 1985, when one paper from the 1983 WTA meeting and five papers from the 1985 meeting appeared in volume 25. In that same year, the TAC presidential address appeared in the August 1988 issue.¹¹⁵ Dr. Davis also cited the recent publication of “special issues on seatbelts and wound ballistics.”¹¹⁶

The fourth *Journal of Trauma* supplement was published in 1988 and contained papers presented at the Fifth Annual Symposium of Wound Ballistics held in Gothenburg, Sweden, in June 1985. Fifty papers were included, with the United States represented by Norman Rich,¹¹⁷ William Schwab,¹¹⁸ Michael Carey¹¹⁹ and Martin Fackler¹²⁰; the United Kingdom by Robert Scott¹²¹; Sweden by Sten Lennquist¹²²; and China by Zhengguo Wang.¹²³

In an editorial marking the beginning of the fiftieth anniversary of the AAST in 1989, Dr. Davis encouraged the readers to “keep your best papers coming to the *Journal*” and announced that the editorial page allowance for 1991 would rise to 1,975 and that the *Journal* circulation had increased from 1,957 in 1961 to 6,245 in August of 1988.¹²⁴ To accelerate the review process and expedite publication of accepted manuscripts, Dr. Davis announced the policy of assigning three reviewers, rather than only two, to each submitted manuscript.

Later in the fiftieth anniversary year, Drs. Peltier and Davis authored “A History of the American Association for the Surgery of Trauma: The First 50 Years.”¹²⁵ In that history, the authors noted that initial reluctance to found the *Journal of Trauma* had been the requirement that the AAST commit substantial funds to the project and that was certainly true. In the first fourteen years of the *Journal’s* existence, the AAST contributed almost \$46,000 more than it received as royalty from the publisher. In the next 12 years, 1975–1987, the AAST still directed a large portion of the Williams and Wilkins royalties to support the *Journal of Trauma* editorial office. In 1988, Drs. Pruitt and Flint traveled to Burlington, Vermont, and with Editor Davis, met with representatives of Williams and Wilkins. At that time, a significant increase in text pages was negotiated from the annual allotment of 1,200 in 1986 to annual allotments of 1,750 text pages in 1989, 1,850 text pages in 1990, and 1,950 text pages in 1991. A more realistic level of support for the editorial office was agreed upon and the editorial office expenses became a line item expense of the *Journal of Trauma* funded by the publisher. A modest guaranteed royalty to the association supported development of the AAST Trauma Research Fellowship Program. Since that time, the editorial office allotment has kept pace with inflation and the royalty received has permitted expansion of the research fellowship program.

In the fiftieth anniversary year, two papers appeared in the *Journal of Trauma* that increased one’s ability to relate patient response and outcome to injury severity. In the May 1989 issue, Howard R. Champion and colleagues presented¹²⁶ a revision of the trauma score

originally described in 1981.¹²⁷ The authors reported that the revised trauma score significantly improved reliability in outcome predictions compared to the original trauma score and provided more accurate predictions of the outcomes in patients with “serious head injuries”. That article has become the most-cited article published in the *Journal* in 1989.

In 1987, Donald Trunkey, as the AAST president, had appointed Ernest E. Moore to chair an Organ Injury Scaling (OIS) Committee and charged it with devising Injury Severity Scores for individual organs. The scores that the committee produced for the spleen, liver and kidney were published in the *Journal* in 1989.¹²⁸ Subsequent *Journal of Trauma* publications followed with severity scores for the pancreas, duodenum, small bowel, colon and rectum in 1990;¹²⁹ chest wall, abdominal vascular trauma, ureter, bladder, and urethra in 1992;¹³⁰ thoracic vascular trauma, lung, cardiac, and diaphragm in 1994;¹³¹ a revision of the spleen and liver severity scores in 1995;¹³² extra hepatic biliary, esophagus, stomach, vulva, vagina, uterus (non-pregnant), uterus (pregnant), fallopian tube and ovary in 1995;¹³³ and cervical vascular, peripheral vascular, adrenal gland, penis, testis and scrotum in 1996.¹³⁴ In 2013, Thomas J. Esposito was the first author of a review article in which the history of the OIS scale was reviewed and revised with “validated” scores published.¹³⁵ The trauma community was urged to incorporate the OIS scores “into routine trauma data collection practices,” but the uncertain relationship between OIS score and mortality for some of the organs has compromised their acceptance. It is hoped that the validation claimed will promote use of the scores but the validation by retrospective review with the National Trauma Database data may not adequately address those concerns.

The fifth and last supplement to be published during Dr. Davis’ tenure appeared in conjunction with the December 1990 issue. Dr. Ruth Kirschstein, the director of the NIGMS, again provided a preface in which she expressed satisfaction with the productivity of the trauma and burn research centers and the other investigators funded by the Trauma and Burn Research Program.¹³⁶ The authors of the 39 papers contained in the supplement were acknowledged leaders in burn injury, trauma, and wound healing research, many of whom had participated in the earlier “burn” conferences. In his concluding remarks, Dr. Charles Baxter anticipated future perspectives in trauma and burn care as a continuum of research activities reported in the supplement.¹³⁷

The papers published in the *Journal* in the 1990s continued to reflect surges of interest in new clinical treatments, newly developed laboratory technology, and the evolving changes in surgical education and practice. A paper by R. M. Chestnut and colleagues on the role of secondary brain injury in severe head injury has been the most-cited article published by the *Journal* in 1993.¹³⁸ The “Major Trauma Outcomes Study” by H. R. Champion and colleagues, who considered the study to have established national norms for trauma care, has become the most-cited *Journal of Trauma* article from 1990.¹³⁹ The most-cited paper of 1992, entitled “Effect of Increased Intra-Abdominal Pressure on Hepatic Arterial, Portal Venous and Hepatic Microcirculatory Blood Flow” by Diebel et al, was presented at the 1992 meeting of EAST and identified circulatory relationships explaining, at least in part, the metabolic effects of the abdominal compartment syndrome.¹⁴⁰

The *Journal of Trauma* has also given continuous support and a readily available publication platform to committees and spokespersons for trauma-related educational programs. Special reports, summary reports, position papers, and consensus statements pertaining to trauma fellowships, surgical critical care fellowships, and the development of acute care surgery fellowships have been published. In the October 1992 issue, the *Journal* published “Guidelines for Trauma Care Fellowships” which had been developed by the members of a committee composed of American College of Surgeons Committee on Trauma members and representatives of the AAST.¹⁴¹ The guidelines described the objectives, structure, and content of a trauma care fellowship and defined the essential components of such a fellowship. In the January 1998 issue, Sheryl G. A. Gabram et al published a paper entitled “Trauma Care Fellowships: Current Status and Future Survival” based on their presentation at the 1997 annual meeting of the AAST.¹⁴² Those authors, on the basis of a telephone survey of 45 program directors, concluded that one-year trauma fellowships were being replaced by one- or two-year trauma or surgical critical care fellowships, with Accreditation Council for Graduate Medical Education accreditation increasingly seen as essential. In the March 2005 issue, W. C. Chiu and colleagues published a “Summary Report on Current Clinical Trauma Fellowship Training Programs.”¹⁴³ In that report, steady growth and proliferation of trauma care fellowships were documented. The authors noted that a link to an RRC-approved surgical critical care program was important, but not essential and urged leaders in trauma surgery to monitor changes in the surgical residency curriculum to ensure that trauma care was included in the evolving surgical residency experience.

In the April 1993 issue of *J Trauma*, Dr. Grace Rozycki and colleagues published an article entitled “Prospective Evaluation of Surgeons’ Use of Ultrasound in the Evaluation of Trauma Patients.”¹⁴⁴ In that article, the indications for ultrasound in the trauma patient were enumerated and the recommendation was made that surgeons become proficient in using ultrasound and program directors were encouraged to incorporate ultrasound training into the surgical residency curriculum. Later that year, in a follow-on editorial entitled “Focused Ultrasound Examinations by Surgeons: The Time is Now,”¹⁴⁵ Dr. Steven Shackford termed ultrasound “the stethoscope of the future” and strongly advocated prompt incorporation of ultrasound training into the surgical residency curriculum. Since that time, ultrasound experience has become a component of surgical residency and of trauma and critical care fellowships.

In the nineteenth Fitts Lecture entitled “American Association for the Surgery of Trauma – A Personal Odyssey,” Dr. Davis reviewed his AAST activities as a member since 1960, a counselor-at-large (1963–1966), secretary (1968–1972), and *Journal of Trauma* editor (1975–1994).¹⁴⁶ He detailed the accomplishments of the AAST and specifically emphasized its role in trauma education and research particularly that sponsored by the AAST Trauma Research Fellowship Program. As the editor of the *Journal of Trauma*, he proudly noted that it was receiving more and more papers from other countries as testimony to its quality.

Shortly after the 1986 annual AAST meeting in Hawaii, Dr. Davis experienced lower limb neuropathy that rapidly progressed to paraplegia. That affliction compromised Dr. Davis’ mobility and made travel progressively more difficult in the early 1990s. In 1994, he announced

his wish to conclude his tenure as editor, and the board of managers initiated a national search for Dr. Davis' successor. In 1994, the December issue was devoted to a Festschrift honoring Dr. Davis and recognizing his leadership of the *Journal of Trauma* for two decades. As an index of Dr. Davis' editorial success, it was noted in the introduction to the Festschrift issue that the text page allowance for the *Journal* had doubled in size from 1,000 to 2,000 pages a year during his editorship.¹⁴⁷ The Festschrift, as is customary, consisted of papers presented by graduates and faculty of the University of Vermont Surgical Residency Program, which had been chaired by Dr. Davis. Those papers that were related to the care of trauma patients comprised the material published in the Festschrift issue. One of those papers, "Epidemiology of trauma deaths: a reassessment", by Angela Sauaia, Frederick A. Moore, Ernest E. Moore, et al,¹⁴⁸ has been the most-cited article published by the *Journal* in that year and the second most-cited for all the 1990s. At the close of the Festschrift, in his typically generous fashion, Dr. Davis expressed his gratitude for having had the opportunity to be the editor of the *Journal*, thanked the members of the editorial board for their support of the *Journal*, and expressed his profound appreciation for the assistance he had received from the managing editor and the *Journal* staff.

EVOLUTION AND TRANSMOGRIFICATION

1995–2011: BASIL A. PRUITT, JR., MD

The search for Dr. Davis' successor was concluded at the spring 1994 meeting of the AAST Board of Managers when Basil Pruitt, a past president (1982) and an associate editor for many years, was appointed to become editor on January 1, 1995. To facilitate the move of the editorial office, in April 1994, the editorial office in Burlington, Vermont, began sending to San Antonio the submitted manuscripts needing assignment of reviewers and the reviewer's reviews needing editorial review and decision.

As of the January 1995, the name of the *Journal* was expanded to "*Journal of Trauma: Injury, Infection, and Critical Care*" to recognize those members and subscribers whose professional activities and interests were focused on the ICU patient. On the cover of that issue, there was an illustration taken from one of the papers published therein as selected by the editor to highlight an unusual clinical situation, or more commonly, clinically relevant research findings that gave promise of advancing clinical management and improving patient outcomes. Such an illustration appeared on the front cover of every issue of the *Journal* for the next seventeen years. The editorial board was also expanded. The masthead listed four associate editors, 14 section editors, a biostatistical consultant, six editorial consultants, and 53 editorial board members. The associate editors, in addition to their other editorial activities, were utilized to resolve questions of publication misconduct. In similar fashion, the section editors were asked to resolve hotly contested and grossly disparate reviews leading to diametrically opposed publication recommendations. The editorial consultants were former members of the editorial board whose high-quality reviews and expertise were made accessible to the editor by such appointment after their term as a member of the editorial board had ended.

The January 1995 issue began with a brief editorial extolling Dr. Davis' success in

“growing” the *Journal* in size, subscription number and stature, welcoming him as editor emeritus, and announcing that Dr. Davis had agreed to serve as the section editor for the organization and delivery of trauma care and trauma-related legislation.¹⁴⁹ In addition to that editorial, that issue was completed by inclusion of clinical and laboratory studies, case reports, and reviews. Throughout the remainder of 1995 and subsequent years, the categories of manuscripts accepted for consideration of publication expanded to include: Procedures and Techniques, Current Opinions, Brief Reports, Book Reviews, Surgical Histories, Clinical Management Updates, AAST Topical Updates, Consensus Statements, Special Reports, and Images of Trauma. The latter became an extremely popular category and soon generated a backlog of accepted Images awaiting publication. Additionally, from time to time, reviewers volunteered or were invited to provide an editorial comment to place an article in clinical or scientific context.

As the publication platform for papers delivered at the annual AAST meeting, considerable effort was made to publish the presidential address and 8–10 of the podium papers from the preceding autumnal annual meeting in the subsequent January issue of the *Journal*. In similar fashion, publication of the presidential addresses and papers presented at the annual meetings of the EAST, the WTA, and TAC were expedited as much as possible. To encourage submission of manuscripts delivered at the annual meetings of these affiliated societies, the editor made a point of attending the annual meetings of those organizations and making a report to the membership on the status of the *Journal*, including subscription data, the number of manuscripts submitted by each organization, and the acceptance rate of papers from their annual meeting as compared to that of papers from the annual meetings of the other organizations from which manuscripts were harvested on a regular basis. The acceptance rates of papers from the annual meetings of the four trauma organizations were typically greater than that of papers spontaneously submitted.

In addition to publishing manuscripts delivered at the annual meetings of the trauma-focused associations, particular attention was given to publication of special projects sponsored by those organizations. In his 1994 EAST presidential address, Michael Rhodes established that organization’s Practice Management Guidelines (PMG) Ad Hoc Committee to develop evidence-based guidelines for clinical practice in the management of trauma patients.¹⁵⁰ The first three of those guidelines were published in 2000 in the *Journal*, i.e. Luchette et al’s “Practice Management Guidelines for Prophylactic Antibiotic Use in Penetrating Abdominal Trauma”¹⁵¹ and “Practice Management Guidelines for Prophylactic Antibiotic Use in Tube Thoracostomy for Traumatic Hemopneumothorax,”¹⁵² and Nagy et al’s “Practice Management Guidelines for Diagnosis and Management of Blunt Aortic Injury.”¹⁵³ Since that time, practice management guidelines have been published for: the prevention of venous thromboembolism in trauma patients, the management of mild traumatic brain injury, geriatric trauma, the timing of tracheostomy, the evaluation of blunt abdominal trauma, the diagnosis and management of injury in the pregnant patient, optimal timing of long bone fracture stabilization in polytrauma patients, identification of cervical spine injuries following trauma, screening of thoracolumbar spine fracture, selective nonoperative management of penetrating abdominal trauma, blunt cerebrovascular injuries, nutritional support of the trauma patient, and man-

agement of hemothorax and occult pneumothorax. It must be noted that the most-cited article from 2002 published was the PMG for the prevention of venous thromboembolism.¹⁵⁴ In November 2010, Jana B.A. MacLeod and other members of the EAST PMG Committee published what was termed “An Evidence-based Review: Helmet Efficacy to Reduce Head Injury and Mortality in Motorcycle Crashes.”¹⁵⁵ In the summary of that paper, the authors noted that the use of helmets decreased death rate, incidence of lethal head injury, and severity of non-lethal head injury in motorcycle crashes as compared to non-helmeted riders.

The first supplement published during Dr. Pruitt’s tenure as editor appeared in March 1996. That 227-page supplement reported the proceedings of the Seventh International Symposium on Weapons Traumatology and Wound Ballistics. It consisted of 48 papers authored by an international faculty of experts on which Norman Rich, William Drucker, Tom Hunt, and Michael Carey represented the United States; Ari Leppaniemi, Finland; and Zhengguo Wang, China. The studies reported by T. K. Hunt indicated that subcutaneous tissue oxygen pressure was a reliable index of peripheral perfusion in humans after injury.¹⁵⁶ There was one supplement in 1997 reporting the proceedings of the 14th Bodensee Symposium on Microcirculation. The 72-page supplement consisted of eleven papers focused on the circulation to the spinal cord and head and the response of that circulation to injury. The U.S. representatives at that symposium included James Holcroft, Randall Chestnut, and Steven Shackford. The latter two presented work emphasizing the importance of limiting fluid infusion while avoiding hypotension to minimize brain swelling and reduce mortality in patients with head injury.¹⁵⁷

In 1999, a 110-page supplement to the September issue entitled “Academic Symposium to Evaluate Evidence Regarding the Efficacy of Trauma Systems” was published.¹⁵⁸ That symposium, chaired by Richard Mullins and N. C. Mann, consisted of 25 papers describing the organization and development of trauma systems to provide regionalized trauma care and improve the outcomes of trauma patients throughout the system. The symposium served as a stimulus for the development of trauma systems throughout the United States.

In addition to the three supplements, there were other most-cited papers of note in the late 1990s. The most-cited article from 1997 has been the report of a prospective study of blunt aortic injury conducted as a multicenter trial of the AAST.¹⁵⁹ The most-cited paper from 1998, “Abdominal Compartment Syndrome” by Saggi et al, further characterized the abdominal compartment syndrome.¹⁶⁰ Indicative of the awakening interest in the outcomes of trauma patients, the most-cited article from 1999 has been “Outcome After Major Trauma: 12-month and 18-month Follow-up Results from the Trauma Recovery Project.”¹⁶¹

As an 86-page supplement to the August 2001 issue, “Management and Prognosis of Penetrating Brain Injury” was published. Beginning in 1998, the International Brain Injury Association, the Brain Injury Association, U.S.A., and members of the American Association of Neurologic Surgeons and the Congress of Neurologic Surgeons worked to develop treatment recommendations for patients with penetrating head injuries. In this two-part supplement containing 24 papers, the authors first performed an exhaustive review of the literature to develop guidelines consistent with our understanding of the pathophysiology of brain injury and its response to treatment. In the second part, attention was directed to prognostic factors that

influence outcome and how those factors could be modified to improve outcomes and refine the treatment recommendations.

In 2003, two supplements were published. The first was a supplement to the May issue entitled “Tactical Combat Casualty Care: Combining Good Medicine with Good Tactics.”¹⁶² This first of several supplements prepared in successive years by military surgeons and other physicians involved in the conflicts in Southeast Asia consisted of 234 pages with 38 papers focused on fluid resuscitation and the treatment of hemorrhagic shock as practiced in the care of combat casualties. Interestingly, a paper related to combat casualty care in which Brohi et al characterized acute traumatic coagulopathy has been the most frequently cited article published in the *Journal of Trauma* in 2003.¹⁶³ The 76-page supplement to the June issue of volume 54 was entitled “Guidelines for the Acute Medical Management of Severe Traumatic Brain Injury in Infants, Children and Adolescents.”¹⁶⁴ There were 19 papers in this supplement covering diagnosis, monitoring, and treatment of traumatic brain injury for patients in those age groups. The recommended guidelines were provided by a working group first assembled under the auspices of the International Brain Injury Association.

The most-cited article from 2004 has been the published version of a plenary presentation at the 2003 annual meeting of the WTA on the relationship of early hypoglycemia to trauma patient mortality.¹⁶⁵ Later in 2004, there was a 44-page supplement to the July issue that was entitled “Hemostatic Effects of Poly-N-Acetyl Glucosamine” (pNAG), which presented nine papers reporting laboratory studies and clinical experience characterizing pNAG and its effectiveness as a hemostatic agent.¹⁶⁶ In September 2005, a 166-page supplement to the entitled “Controlling Alcohol Problems Among Hospitalized Trauma Patients” was published. Organized in conjunction with the Centers for Disease Control and Prevention, the supplement contained 27 papers delivered at a symposium focused on screening for alcohol and drug use and abuse as a means of reducing recidivism and decreasing trauma risk as well as the morbidities and mortality associated with alcohol and drug use.

In June 2006, a 96-page supplement entitled “Early Massive Trauma Transfusion: State of the Art” was published. Edited by John B. Holcomb and John R. Hess, the supplement included 13 papers focused on the effect of hemorrhage on trauma patient outcome, the coagulopathy of trauma, predictors of mortality, and indications for whole blood and blood components. Massive transfusion practices around the globe were summarized by Debra L. Malone, John R. Hess, and Abe Fingerhut in a paper¹⁶⁷ that has been the most-cited *Journal of Trauma* article in 2006.

In 2007, one supplement accompanied volume 62 and two supplements appeared with volume 63. The 112-page supplement of the June issue was entitled “Twelfth Annual San Antonio Trauma Symposium, September 19-21, 2006 and contained 77 “papers” concerning both combat casualty and civilian trauma care. The papers, more properly viewed as expanded abstracts or brief reports, addressed the following topics:

- Physical medicine and rehabilitation – six papers
- Pre-hospital care – five papers
- Current combat care (recent experience in Iraq and Afghanistan) – five papers

- Trauma surgery (military and civilian) – nine papers
- Military surgery – four papers
- Urologic injuries – two papers
- Prevention – five papers
- Critical care – four papers
- Orthopedic surgery – four papers
- Burn management – seven papers
- Trauma nursing – five papers
- Pediatrics – three papers
- Craniofacial injuries – six papers
- Disaster medicine – five papers
- Neurosurgery – three papers
- Anesthesia – four papers

The most frequently cited article of the first decade of the twentieth century has been the paper proposing that “The Ratio of Blood Products Transfused Affected Mortality in Patients Receiving Massive Transfusions at a Combat Support Hospital,” published in 2007 by Borgman and colleagues.¹⁶⁸ The second most frequently cited article in that decade has been the article published in 2005 by Boffard et al reporting the results of the use of recombinant factor VIIA as adjunctive therapy for bleeding control in severely injured trauma patients.¹⁶⁹ It should be noted that both of those studies have been questioned, the first on the basis of time to death variability and the second on the basis of patient selection bias. Another paper reporting on the use of recombinant activated factor VII for hemorrhage control in trauma has become the most-cited paper from 2001.¹⁷⁰

The last two supplements of 2007 were both focused on pediatric injury. The 49-page supplement to the September 2007 issue, “Forging New Frontiers: The Injury Free Coalition for Kids 2006 Conference: Magnifying the Injury and Obesity Prevention Message,” contained 15 papers addressing prevention aspects of scald burns, home safety, a child street safety program, teenage driving offenders, all-terrain vehicle safety, and child safety seats.¹⁷¹ This was the first of an annual succession of Injury Free Coalition for Kids supplements. The December 2007 supplement issue, entitled “Pediatric Trauma Care,” was organized by Drs. Rivara and Oldham with the goal of the defining a research agenda to advance pediatric trauma care.¹⁷² The supplement was 107 pages in length and presented 12 papers and printed discussions of eight of those papers. The papers addressed national costs and outcome for pediatric trauma and a national assessment of trauma in children, and included ten presentations on the organization and delivery of trauma care to pediatric patients. The supplement concluded with a summation of means by which pediatric trauma care could be improved and an enumeration of priority research topics.¹⁷³

In 2008, the WTA began the publication of “Critical Decisions in Trauma” in which they presented annotated algorithms to aid the trauma surgeon at the point of care in the management of commonly encountered injuries. The first two annotated algorithms addressed the

management of adult blunt splenic trauma¹⁷⁴ and pelvic fracture with hemodynamic instability.¹⁷⁵ In 2009, WTA Critical Decisions in Trauma addressed the nonoperative management of adult blunt hepatic trauma¹⁷⁶ and screening for and treatment of blunt cerebrovascular injuries.¹⁷⁷ The Critical Decisions in Trauma algorithms are scheduled for review and, if necessary, updating every three years. In 2011, the WTA published an updated Critical Decisions in Trauma for nonoperative management of blunt hepatic trauma and a second new algorithm for the evaluation and management of peripheral vascular injury.¹⁷⁸ Those were followed in 2012 with Critical Decisions in Trauma for resuscitative thoracotomy,¹⁷⁹ management of the mangled extremity,¹⁸⁰ management of complicated diverticulitis,¹⁸¹ and management of parapneumonic effusion.¹⁸² As noted, each Critical Decision in Trauma article includes an algorithm or flow diagram to illustrate variable patient trajectories and intervention decision nodes.

Additionally, in 2008, there were three supplements to volume 64, all of which were related to military surgery. The supplement published with the February issue was entitled “Advances in Combat Casualty Care: Clinical Outcomes from the War.” Dr. John Holcomb authored the introduction,¹⁸³ which was followed by a commentary by Howard Champion.¹⁸⁴ The 28 papers of the supplement filled 206 pages and included a brief review entitled “The Symbiosis of Combat Casualty Care and Civilian Trauma Care: 1914–2007.”¹⁸⁵ Other papers addressed problems encountered in establishing a human research protection program in a combatant command¹⁸⁶ and the contrast between the combat care policies in Vietnam and those in effect in Iraq and Afghanistan including the use of tourniquets and massive transfusion.¹⁸⁷ Other papers focused on damage control surgery, the use of CT scans for the diagnosis of penetrating torso injury, ventilatory support during transit, and the contrast between combat casualty care and trauma care in U.S. hospitals. Papers on burn care documented that the long distance transport of even extensively burned patients was safe¹⁸⁸ and that the use of burn resuscitation guidelines reduced the rate and volume of fluid infusion and the occurrence of abdominal compartment syndrome, and increased the survival of burn patients.¹⁸⁹ Additional papers described the use of continuous renal replacement therapy for acute renal injury in burn patients¹⁹⁰ and the use of early coagulation indices and cytokine levels to improve the prediction of morbidity in burn and trauma patients.¹⁹¹ Two papers on post-traumatic stress disorder brought the symposium and the supplement to a conclusion.^{192–193}

The most frequently cited *Journal of Trauma* article from 2008 has been the paper describing combat wounds in Operation Iraqi Freedom and Operation Enduring Freedom authored by Owens and colleagues.¹⁹⁴ The second most commonly cited article from that year is mentioned because of the intense interest in the response of the coagulation system to injury. That article authored by Hess and a group of international co-authors reviewed the mechanisms of “The Coagulopathy of Trauma.” Interestingly, the most commonly cited article from 2009 has been the paper authored by C. W. Snyder et al,¹⁹⁵ which brought into question whether the relationship of blood product ratio to mortality, as proposed by the most frequently cited article in 2007,¹⁶⁸ actually demonstrated survival benefit or more likely, when the data were analyzed in terms of time to death, a survival bias.

The second 2008 supplement, “Prevention and Management of Combat-related Infec-

tions: Clinical Practice Guidelines Consensus Conference: Overview,” consisted largely of guidelines for antibiotic use in patients injured in combat and included nine articles filling 80 pages that discussed the history and epidemiology of combat-related infections and provided recommendations for the treatment of infection in limb injuries, CNS injuries, thoracic and abdominal injuries, head and neck injuries, and burns.¹⁹⁶ The third supplement of 2008 was entitled “Autonomous Care for the Austere Environment” and was organized by Dr. Jay A. Johannigman. The 50-page supplement consisted of articles describing closed loop strategies for circulatory support systems and techniques of autonomous control of oxygen administration, ventilatory support, and resuscitation in burn patients, the treatment of hypovolemia, and the enroute monitoring of combat casualties with mention of potential application to future space missions.¹⁹⁷

In 2009, a clinical management update was published, which was entitled “Clinical Practice Guidelines: Red Blood Cell Transfusion and Adult Trauma and Critical Care.”¹⁹⁸ The paper was authored by Lena M. Napolitano et al and represented the collective effort of the EAST Practice Management Guideline Committee and the American College of Critical Care Medicine Task Force. The representatives of those two organizations reviewed the published evidence regarding use and efficacy of red blood cell transfusion in trauma and critical care and developed guideline recommendations regarding indications for the infusion of red blood cells in injured and critically ill patients.

In 2009, four supplements were published, two in volume 66 and two in volume 67. The supplement to the March 2009 issue was entitled “Forging New Frontiers: Proceedings of the Annual Meeting of the Injury Free Coalition: 2008” and began with an introduction by Dr. Barbara Barlow followed by four papers directed toward the prevention of sledding accidents, prevention of dog bites, the Walk-Safe Program, and the use of GIS mapping to track the epidemiology of pediatric pedestrian injury.¹⁹⁹

The second supplement was published in April 2009 and consisted of 169 pages containing 23 papers entitled “The Next Generation of Combat Casualty Care,” which was the sixth supplement of the decade reporting on the surgical treatment of combat incurred trauma.²⁰⁰ Three papers were presented on post-traumatic stress disorder, two papers on ventilatory support during aeromedical transfer, three papers on transfusion practices, three papers on infections occurring in combat casualties, and two papers on amputation. Other papers focused on vascular injury complications, traumatic brain and spinal cord injury, and ocular injury. Somewhat surprisingly, one paper presented information indicating that the results achieved by two-man forward surgical teams were equal to those achieved at the casualty staging hospitals.²⁰¹ In a concluding comment, pre-hospital and in-hospital hemorrhage control were cited as key targets for prevention.

A 69-page supplement of the July 2009 issue contained 12 articles and was entitled “Forging New Frontiers: Securing the Future of Injury Prevention – the 2008 13th Annual Conference of the Injury Free Coalition for Kids.”²⁰² The introductory comment, provided by Michael P. Hirsh,²⁰³ was followed by papers focused on ethnicity and home safety programs, falls and pediatric traumatic brain injury, and the positive effect of community built play-

grounds on injury occurrence. A study of the influence of booster seats on motor vehicle crash injuries and costs in 3–8-year-old children reported that state booster seat legislation was not associated significantly with abdominal injury, and another study, not surprisingly, reported that alcohol use in the caregivers of pediatric patients was associated with childhood injury. The supplement contained five articles on teenage driving and reported that graduated licensing laws decreased the occurrence of motor vehicle crash injuries and the expenditures related to such injuries. The supplement to the August 2009 issue, which also concerned pediatric trauma, reported the proceedings of the Pediatric Disaster and Emergency Services National Summit.²⁰⁴ The guest editor for this 108-page supplement presenting 24 articles on pediatric disaster preparedness was Dr. Jeffrey S. Upperman. The papers presented began with a description of the use of the Disaster Research Center Program in Los Angeles, California, which emphasized maintaining unity or achieving reunification of the family, and the importance of leadership and hospital commitment. Other critical aspects of preparedness were enumerated such as planning for critical care surge capacity, training, and the establishment and use of trauma systems as the backbone of disaster preparedness. The topics of other papers included pediatric traumatic brain injuries, intra-abdominal solid organ injury, and burn injury. Individual papers addressed pre-hospital care transport and the integration of disaster planning within the trauma system. In a closing commentary, Dr. Mary Fallat judged the information provided during the conference to have provided direction for future pediatric trauma and critical care research.²⁰⁵

In 2010, a supplement was published in association with both the July and October issues of volume 69. The 187-page July supplement, “Tactical Combat Casualty Care: Update 2009,” contained 27 papers on fluid resuscitation for hypovolemic shock, drowning, urologic trauma, maintenance of normothermia, the use of the Department of Defense trauma system, non-invasive monitoring, fixation of fractures, development of a porcine model of ischemia/reperfusion to assess neuromuscular outcomes, use of negative pressure wound dressings during aeromedical transfer, field repair of popliteal artery injuries, and infection control.²⁰⁶ Of particular interest was the paper indicating an independent relationship between the amount of fresh frozen plasma infused and the incidence of early acute lung injury²⁰⁷ and the paper suggesting that heterotopic ossification in amputation wounds could be related to negative pressure wound care.²⁰⁸ Data were also presented indicating that there had been a decrease in “killed in action” and “died of wounds” among combat casualties in the Southeast Asia conflicts.

The most-cited paper published in 2010 has been that reporting the results of the CONTROL trial studying the efficacy and safety of recombinant activated factor VII in the management of refractory traumatic hemorrhage authored by Hauser et al.²⁰⁹ In that paper, the authors reported a study of 573 patients with blunt and penetrating trauma (predominantly blunt) in which the use of recombinant factor VII reduced blood product use but did not affect mortality as compared to placebo. The lack of effect on mortality was attributed to evidence-based trauma care resulting in unprecedently good survival in both groups of patients.

The 56-page supplement to the October 2010 issue was entitled “Forging New Fron-

tiers: Proceedings of the Annual Meeting of the Injury Free Coalition: 2009.”²¹⁰ The 11 papers in this supplement dealt with the use of helmets to reduce sledding injuries, pediatric forearm fractures, injury in the homeless population, injury prevention using trauma registry data, fall injuries in children, distracted driving as a cause of injury, dating violence, and home safety. The recommendation was made to incorporate injury prevention in the pediatric residency curriculum.

The *Journal* has enthusiastically supported surgical critical care in the context of trauma care. In the December 2010 issue, the *Journal* published a special report from the Critical Care Committee of the AAST in which they discussed shortage of manpower issues and the current status of surgical critical care, trauma, and acute care surgery fellowships.²¹¹ The authors advocated standardization of critical care services and regionalization of intensive care services. In the August 2010 issue, Hasan B. Alam and colleagues representing the Surgical Critical Care Program Director’s Society had published a position paper on training and certification in surgical critical care.²¹² The authors discussed the challenges of surgical critical care fellowship education, supported use of the National Resident Matching Program to fill surgical critical care fellowship positions and called attention to the comprehensive curriculum for surgical critical care developed by their society.

In 2011, one supplement accompanied volume 70 and six supplements accompanied volume 71. The May issue’s 66-page supplement was entitled “Pre-hospital Fluid Resuscitation” and included 22 papers plus a summary commentary in which the conclusions largely ratified the opinions of the participants in the workshop at which the papers were presented.²¹³ Unfortunately, some of the recommendations appeared to be supported only by studies that had been seriously questioned by others.

The 60-page supplement to the July 2011 issue was entitled “Papers from the 2010 Advance Technology Applications for Combat Casualty Care (ATACCC) Symposium” and consisted of 25 papers providing a snapshot of current combat casualty care.²¹⁴ A number of papers addressed the epidemiology, pathophysiology, treatment, and outcomes of combat injuries. Laboratory studies focused on hemorrhage control and infection control were also presented. A review of the use of tranexamic acid (TXA) was included in which the authors stated, “TXA should be incorporated into trauma clinical practice guidelines and should be adopted for use in bleeding trauma patients.”²¹⁵

The first supplement to the August 2011 issue, entitled “Clinical Activity and Mode of Action of Poly-N-Acetyl Glucosamine Fiber Materials: Hemostasis and Wound Healing,”²¹⁶ occupied 36 pages and began with a foreword by Dr. Herbert Hechtman who had organized the symposium.²¹⁷ That was followed by seven papers describing the characteristics and effectiveness of a modified form of the Rapid Deployment Hemostat containing fully acetylated diatom-derived poly-N-acetyl glucosamine fibers for hemostasis and acceleration of wound healing. The second of the supplements to the August 2011 issue was entitled “Prevention of Infections Associated with Combat-related Injuries: Clinical Practice Guidelines Update 2.”²¹⁸ This 117-page supplement included eleven papers describing updated guidelines to prevent and treat infection in combat casualties. New recommendations included the use of high-dose

cefazolin with or without metronidazole for most post-injury indications and “guidelines” for redosing of antimicrobial agents. The authors also favored the use of negative pressure wound therapy and the use of supplemental oxygen during aeromedical transfer of combat casualties.

The third supplement to the August 2011 issue was 79 pages in length and was entitled “Topics in the Management of Substantial Hemorrhage 2.”²¹⁹ This supplement consisted of 13 papers authored by members of the Trauma Outcomes Group and included description of the authors’ experiences with blood component transfusion practices in trauma patients and the effect of blood component ratios on outcomes in various groups of trauma patients. Interestingly, a paper presented by Schreiber and associates reported improved survival with crystalloid infusions in trauma patients who received a low fresh frozen plasma to packed red blood cell ratio resuscitation²²⁰—a finding ostensibly at odds with current recommendations to minimize crystalloid infusion.

The 108-page supplement to the November 2011 issue was entitled “Canadian Forces Operational Medicine.”²²¹ The 17 papers comprising that supplement described the diagnostic techniques and treatment used and the outcomes achieved in the management of combat casualties by surgeons in the Canadian Armed Forces. The supplement also contained reports of clinical studies and laboratory studies conducted at Canadian civilian trauma centers. The supplement included a review of the use of tranexamic acid, which was endorsed for clinical use by the authors.²²²

The second supplement of the November 2011 issue contained 52 pages and was entitled “Proceedings of Forging New Frontiers: The 15th Annual Conference of the Injury Free Coalition for Kids.”²²³ This supplement, as has been true for all six of the Injury Free Coalition for Kids supplements, contained a foreword by Dr. Joseph J. Tepas, III, who edited those supplements. The ten papers of the supplement addressed emergency management, fracture treatment and prevention, microwave injuries, the effectiveness of gun buy-back programs, motor vehicle injuries, and non-bite dog injuries.

In addition to its support of trauma fellowships and surgical critical care education, in recent years, the *Journal* has served as a friendly platform for advocates and leaders in the development of acute care surgery as a means of expanding the operative workload and scope of practice of trauma surgeons. In the March 2005, the AAST Committee to Develop the Reorganized Specialty of Trauma, Surgical Critical Care, and Emergency Surgery announced plans to develop a new acute care surgery specialty in the context of the evolution of the surgical specialty of trauma surgery.²²⁴ The announcement included a table outlining the curricular components of an acute care surgery fellowship. Two years later, in the March issue of volume 62, the Committee on Acute Care Surgery of the AAST published a Special Report in which they described the proposed acute care surgery curriculum and displayed an extensive list of the operative management principles and technical procedure requirements of an acute care surgery fellowship.²²⁵ More recently, a consensus statement authored by Dr. Heidi L. Frankel and the Critical Care Committee and board of managers of the AAST was published in the July 2012 issue.²²⁶ In that consensus statement, the authors make a strong case for the essentiality of surgical critical care as a component of acute care surgery. The integration of surgical criti-

cal care intensivists in clinical practice with trauma and acute care surgeons was discussed in the context of the Affordable Care Act. A regionalized critical care system was advocated as a means of providing multidisciplinary acute care and post-acute care to trauma patients.

Under Dr. Moore's direction, the publication of supplements to the *Journal* has continued apace as recognized by the five supplements to issues in the latter half of 2012. The supplement to the August issue was entitled "ATACCC 2011: Advances in Combat Casualty Care 2" and consisted of 172 pages presenting papers given at the 2011 ATACCC conference.²²⁷ That supplement and the supplement to the December 2012 issue represent the twelfth and thirteenth supplements published in the past decade reporting advances in the care of the severely injured and critically ill combat casualties as provided by U.S. and Canadian military surgeons and physicians. The 172-page supplement of the December 2012 issue, entitled "Ten Years of Combat Casualty Care, 2001–2011," contained both review and original articles in which the advances in combat casualty care training during a decade of conflict are described and the onerous bureaucratic regulations that impede the needed clinical studies are decried.²²⁸

The supplement to the September 2012 issue is entitled "Shriners Hospitals for Children and the American Burn Association: Burn Outcomes Program."²²⁹ This 61-page supplement contains papers describing the age-specific health-related outcomes questionnaires that have been developed to assess the psychosocial and functional convalescence and rehabilitation of severely burned children. Serial completion of the questionnaires permits a trajectory of rehabilitation to be determined for each of the several domains included in the questionnaires. Identified departures from the anticipated recovery trajectory enable therapeutic interventions to be made to accelerate recovery and improve outcomes. Each burn center, every hospital in which burns are treated, and all personnel involved in burn patient rehabilitation will need a copy of this supplement. A 46-page supplement to the October 2012 issue entitled, "Forging New Frontiers: The 16th Annual Conference of the Injury Free Coalition for Kids," consists of papers delivered at that meeting focused on prevention of pediatric injury.²³⁰

In a supplement to the November 2012 issue, the Eastern Association for the Surgery of Trauma Practice Management Guidelines Ad Hoc Committee published new and updated Practice Management Guidelines with the stated goal of standardizing and improving patient care.²³¹ In that supplement, the committee provided guidelines for seven trauma, four critical care, and one acute care surgery condition, i.e. management of pulmonary contusion and flail chest, evaluation and management of mild traumatic brain injury, evaluation and management of penetrating lower extremity arterial trauma, evaluation and management of geriatric trauma, emergency tracheal intubation immediately following traumatic injury, selective nonoperative management of blunt splenic injury, nonoperative management of blunt hepatic injury, screening for thoracolumbar spinal injuries in blunt trauma, screening for blunt cardiac injury, prophylactic antibiotic use in penetrating abdominal trauma, presumptive antibiotic use in tube thoracostomy for traumatic hemopneumothorax, and evaluation and management of small bowel obstruction. In the supplement, the authors provide a description of the method that the EAST committee used in developing the guidelines which consisted of grading of recommendations, assessment, development, and evaluation to which the Grading of Recom-

mentations Assessment Development and Evaluation (GRADE) Working Group methodology has been applied.²³²

EDITORIAL OFFICE PROBLEMS, SOLUTIONS AND SUCCESSES

As documented above, in the 1995–2011 period, the *Journal* underwent several changes necessitated by its ever-increasing harvest of manuscripts and expanding readership. To expedite publication, the processing of manuscripts transitioned from hard copy to electronic-only over the course of a few years. The user-friendly, rapid submission and processing system had the anticipated effect of increasing the number of submissions and the unanticipated effect of increasing the inventory of accepted manuscripts and extending the acceptance-to-publication interval. The initial effort to reduce the inventory of accepted manuscripts was to increase the number of available text pages by eliminating the pre-meeting publication of the abstracts of the papers that were to be given at the annual meetings of AAST, EAST, WTA, and TAC. That was helpful, but did not solve the problem. The size of the inventory finally necessitated the purchase of additional text pages but financial considerations limited the number of pages to be purchased and only a modest effect on the accepted case report inventory was realized. The editorial board further addressed that problem and, in 2007, offered the authors of accepted case reports the option of an expedited electronic-only publication route. In the June 2007, six online-only case reports were noted in the table of contents. Later in 2007, the editorial board declared a temporary moratorium on submission of case reports which was extended in 2008, 2009, and 2010. In the October 2010 issue, six online-only Images of Trauma appeared for the first time as a means to accelerate reduction in the inventory of accepted Images of Trauma. In 2009, the pre-publication posting of proof-corrected accepted manuscripts was initiated, which makes the work citable as a reference for grant application and promotion purposes and relieves, in part, the pressure for print publication. Pre-print publication posting is now common practice. In 2010, to increase further the content per text page, the type font was decreased as was the size of both tables and figures. In 2011, the *Journal's* editorial board recommended that the moratorium on case reports, first declared in 2007, be made permanent. With the approval of the AAST Board of Managers, it was announced that the moratorium was permanent and case reports would no longer be accepted for consideration of publication.

In the interest of increasing the acceptance rate of EAST and WTA papers, the program committees of those organizations had reviewed the manuscripts of papers presented at their annual meetings before submitting those manuscripts for a final review by a senior *Journal of Trauma* reviewer. In the early years of the new century, incomplete processing, prolonged processing and, conversely, premature submission of manuscripts deemed to be unacceptable to program committee members evoked concern and prompted extensive discussion with the officers of both EAST and WTA. In those discussions, it was agreed that procedural changes were needed and that the success and timeliness of any manuscript processing system was highly dependent on the enthusiasm and direct involvement of the chair and other members of the program committees. The appointment of “activist” chairs of the EAST and WTA program committees, dedication of an electronic mailbox for the manuscripts being reviewed by each

committee, and the institution of a policy to ensure that the manuscripts were submitted to the *Journal of Trauma* Editorial Office only after receiving approval for submission from the program committee, addressed the problem. Those changes reduced the processing time, and as anticipated, increased the acceptance rate of manuscripts harvested from the annual meetings of those organizations.

In the last decade of the twentieth century, identified instances of publication misconduct rose to unprecedented levels, presumably as the consequence of the ready availability of computer programs capable of rapidly comparing and identifying duplicated and plagiarized material. In response, the Surgical Journal Editors Group (SJEG) published in each member's journal a "Consensus Statement on Submission and Publication of Manuscripts" in which duplicate publication was defined and proscribed.²³³ Concern over variability and appropriateness of sanctions for publication misconduct was addressed by the SJEG, the members of which again simultaneously published a "Consensus Statement on the Adoption of the COPE Guidelines."²³⁴ In that statement, potential authors were informed that the signatory journals would follow the Committee on Publication Ethics guidelines in evaluating publication misconduct and applying sanctions when misconduct had occurred. Even after those statements were published, the *Journal* was processing four allegations of misconduct (two for alleged duplicate publications, one for alleged duplication submission, and one for alleged plagiarism) in September 2011.

Review of the *Journal's* publishing agreements between the AAST and the publisher from 1960 to the present confirms the growth of the *Journal* and reveals changes that, after a rather penurious start, have benefited both parties by promoting growth of the *Journal* and ensuring an appropriate financial return for both. The stipulations in the original periodical publishing agreement, the increase in text pages in 1960 and issue number twelve (12) in 1969, and the change in text format and increase in text pages to 1,182 in 1970, have all been noted above. In 1977, in a letter from the *Journal* publisher, Mrs. Vivian B. Rhodes, to John Boswick, secretary of the AAST, the AAST was guaranteed \$36,000 as the editorial allowance, paid on a quarterly basis. The AAST was to receive two-thirds of the net profit, but there appeared to be no net income to share. In fact, no AAST royalty guarantee was listed until 1989. In 1978, the page size was increased from 6¼ x 9¾ inches to 8 x 11 inches to increase further the number of articles which could be published in each volume. In 1985, the publishing agreement was renegotiated to be effective January 1, 1986, with an increase in text pages to 1,200 and an increase in the editorial allowance to \$66,000.

As noted earlier, renegotiation of the publishing agreement in August 1988 increased the editorial office allowance to \$103,000 annually, while the text page allowance increased from 1,750 pages in 1989 to 1,950 pages in 1991. Six color pages per year were also to be provided by the publisher. For the first time, the agreement included provision for the AAST to receive a guaranteed annual royalty of \$90,000. An amendment to the publishing agreement effective January 1, 1992, increased the editorial allowance to \$123,000 per year. Further amendment to the agreement effective January 1, 1996, increased the text page allowance to 2,200, the color page allowance to 12 per year, and the editorial office allowance. Yet another

amendment effective January 1,1999 increased the text page allowance to 2,300 per year, the color page allotment from 13 per year in 1999 to 15 in 2001, and the editorial office allowance.

A further online journal publishing addendum, effective September 1, 2000, provided for the publication of a web-accessible version of the *Journal* beginning in 2001 and was concluded in December 2002. A new periodical publishing agreement was concluded on December 10, 2002 providing for a further increase in text pages to 2,650 annually in 2006 and a color page allowance increasing to 21 per year in 2007. *The Journal's* publishing agreement was renegotiated in August 2006 to take effect January 1, 2007. By the terms of the agreement, the text page allowance increased from 3,000 in 2007 to 3,400 in 2011 with 150 online-only pages each year and 72 pages of four-color illustrations provided by the publisher each year through 2012. In 2013, the *Journal* is entitled to 3,450 print pages and 240 pages of free color. As an offshoot of the contract negotiations, the publisher, at the behest of Dr. Schwab, agreed to undertake electronic archiving of all issues of the *Journal of Trauma* and that was accomplished in 2008 and 2009.

Finally, the amendment to the journal publishing agreement effective January 1, 2012 increased the page allowance to 3,400 in 2012 and 3,450 in 2013 with a 100-text-page decrease in both 2014 and 2015 as electronic publication reduces hard copy page usage. For this reason, the publisher increased the online-only page allowance from 200 to 550 pages annually throughout the term of the amendment. A 240 color page allowance provided by the publisher is included for each year of the agreement.

Temporal changes in subscription data reveal the apparent paradox of a decrease in hard copy subscriptions associated with an increase in the “reach” of the *Journal of Trauma*. Hard copy subscriptions to the *Journal of Trauma* peaked in 1993 at 6,420 which included 3,600 U.S. non-members, 1,647 international non-members, and 1,171 international and U.S. members. The total print page circulation has steadily decreased since that time to a level of 2,238 total print page subscribers in 2012. However, to that number for print circulation must be added, 2,698 electronic access sites which extend the reach of the *Journal* considerably beyond the 1993 peak of paid circulation. Since its founding in 1961, the increase in text pages and number of articles published, online-only postings, and supplements printed (Table 3), testify to the success of the *Journal*.

Table 3. Editorial pages used and articles published in 1961, the final year of successive editorships, and 2012.

PAGES				ARTICLES PUBLISHED				SUPPLEMENTS		
Year	Volume	Year Total	Total by Volume	Year Total	Scientific Papers	Case Reports	Online Only	Number	Articles	Pages
1961	1	622	622	57	57	-	-	-	-	-
1968	8	1142	1142	102	102	-	-	-	-	-
1974	14	1084	1084	135	110	25	-			
1994	36	1961	925	351	115	74	-	-	-	-

PAGES				ARTICLES PUBLISHED				SUPPLEMENTS		
Year	Volume	Year Total	Total by Volume	Year Total	Scientific Papers	Case Reports	Online Only	Number	Articles	Pages
	37		1036		137	25	-	-	-	-
2011	70	4960	1604	679	232	-	23	1	23	67
	71		2745		290	-	22	6	89	544
2012	72	3385	1747	637	291	-	18	-	-	-
	73		1638		346	-	-	5	91	542

In 2010, the fiftieth birthday of the *Journal* was recognized by an editorial board dinner at which recognition was made of the national and international members of the board for their work on behalf of the *Journal* which provided essential support of the educational mission of the AAST. The intensity of editorial board activities reached new levels in 2010 when the submission of manuscripts increased to over 1,500. In that same year, the rejection rate of independent submissions, which rose to 62% as a consequence of the perceptive reviews provided by the board members, was associated with an increase in the quality of *Journal* content as manifested by the *Journal's* impact factor. As always, the acceptance rates were lower for independent submissions and AAST poster papers than for manuscripts representing podium papers at the AAST, EAST, WTA, and TAC annual meetings (Table 4).

Table 4. History of manuscripts submissions and decisions

Table 4a. Annual rejection rates of independent submissions.

YEAR SUBMITTED	NUMBER	REJECTION RATE
1961	11	-
1968	93	-
1987	>400	<37%
2010	1551	62%
2012	1597	68%

Table 4b. Rejection rates of society submissions

Source of Manuscripts	2010		2012	
	Number	Rejection Rate	Number	Rejection Rate
AAST Podium Papers	71	13%	82	13%
AAST Poster Papers	35	45%	53	53%
WTA	23	9%	23	21%
EAST Podium Papers	34	5%	33	10%
EAST Poster Papers	11	17%	24	40%
TAC	18	25%	15	85%

The maturation of the *Journal of Trauma – Injury, Infection and Critical Care* is further indexed by the size of the editorial board listed on the masthead of the December 2011 issue, i.e. three associate editors (William G. Cioffi, Frederick A. Luchette, and Ernest E. Moore), 18 section editors (section titles: Clinical Trauma; Critical Care; Burns; Pre-Hospital Care; Basic Science; Vascular Trauma; Orthopedic Trauma; Pediatric Trauma; Plastic Surgery; Neurologic Trauma; Urologic Trauma; Military Trauma; Radiology; Trauma Care Organization, Economics, and Legislation; Outcome Studies; Anesthesia; Rural Trauma; and Cardiothoracic Trauma), a biostatistical consultant, 42 editorial consultants, 58 editorial board members, and ten corresponding editors representing Africa, Asia, China, Australia, Europe, Scandinavia, South America, and Turkey, as compared to the masthead of 1994 which listed three associate editors and 63 editorial board members.

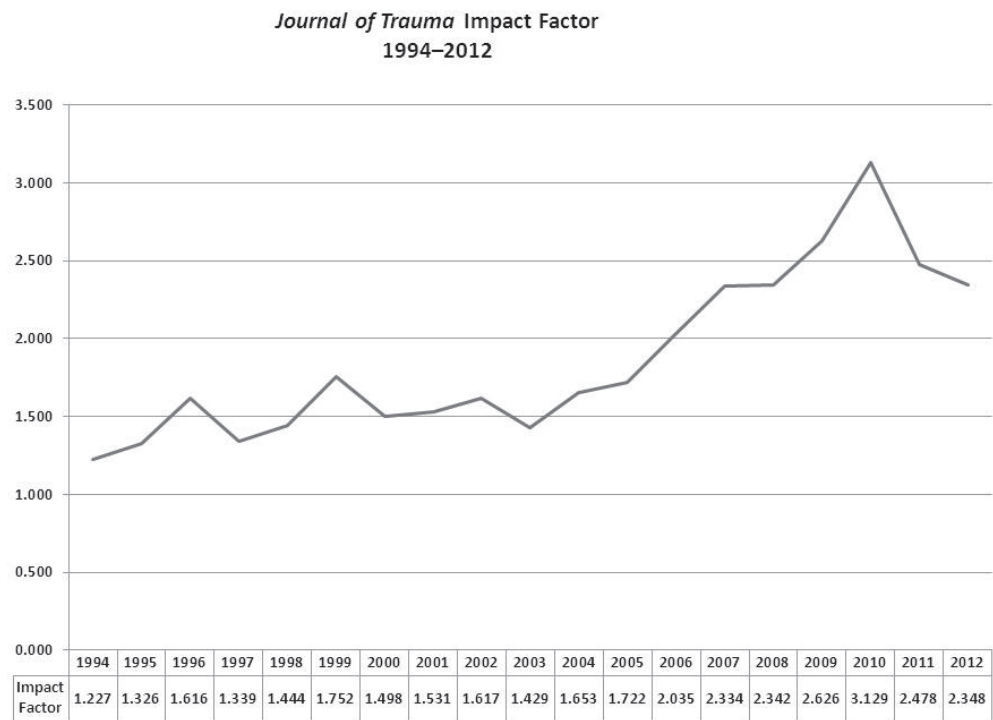


Figure 1. Journal of Trauma impact factor, 1994–2012.

Another index of the maturation and current stature of the *Journal of Trauma and Acute Care Surgery*, is the progressive increase in the quality of the articles published as assessed and then cited in published works by others. One commonly used index of publication quality and importance is the impact factor, which is calculated on the basis of three years of publication data. The numerical value of the factor for 2012 was calculated by dividing the number of times articles published in the *Journal of Trauma* in 2010 and 2011 were cited in indexed journals during 2012 by the number of articles, reviews, proceedings, or notes published in *The Journal of Trauma* in 2010 and 2011. As can be seen in Figure 1 (above), the *Journal’s* impact

factor experienced a progressive but modest increase from 1994 until 2003. Beginning in 2004, the rate of increase in the impact factor increased significantly and rose to a high of 3.129 in 2010. Since then, the impact factor has receded to a level similar to that of 2008. The cause for that reversal and decrease in the impact factor is considered to be in large part the publication of a marked increase in the number of case reports and other articles of lesser priority to reduce inventory of accepted manuscripts prior to the transfer of editorship of the *Journal*. Consistent with that notion is the fact that in 2010 the number of articles published increased from 703 to 776 with a further increase to 951 in 2011 with a corresponding decrease in number of citations from 4,769 in 2009 to only 2,751 in 2010 and 1,604 in 2011.

THE FUTURE

2012–PRESENT: ERNEST E. MOORE, MD

In 2009, Dr. Pruitt's third five-year term as editor was extended by two years to terminate on December 31, 2011. A national search for a new editor began and, in the spring of 2011, Dr. Ernest E. "Gene" Moore, who had been president of the American Association for the Surgery of Trauma in 1994 and an associate editor of the *Journal of Trauma* for 21 years, was unanimously selected and appointed to become the new editor on January 1, 2012. In an editorial in the December 2011 issue,²³⁵ Dr. Pruitt expressed his thanks and gratitude to the members of the editorial board whose reviews and other editorial activities made possible the progressive increase in readership and content quality that had brought the *Journal* to its present state of leadership in the field of trauma publications. Thanks were also given to Mr. John Ewers and the Lippincott, Williams and Wilkins staff who had been major contributors to the success of the *Journal*. In that editorial, Dr. Pruitt recognized the many accomplishments of Dr. Moore and complimented the AAST upon their selection of Dr. Moore as the next editor of the *Journal of Trauma*.

The AAST had resolved to embrace the concept of acute care surgery (trauma, critical care, and emergency surgery), and initiated a formal two-year fellowship. Dr. Moore, a strong advocate of acute care surgery, had maintained this practice paradigm at the Denver General Hospital for the prior 35 years. Thus, he proposed a modification of the *Journal* name to the *Journal of Trauma and Acute Care Surgery*. The AAST board approved, and this change was implemented in January 2012.

The *Journal* editorial office transitioned from San Antonio to Denver, where Jennifer Crebs was selected as the new managing editor, Jo Fields as the assistant editor, and Angela Sauaia, MD, PhD, as the *Journal* biostatistician. Drs. David B. Hoyt, Ronald V. Maier, and Steven R. Shackford were appointed as the associate editors. This team initiated a number of policies including objective criteria for editorial board members, structured manuscript review formats, CME for qualified manuscript critiques, image manipulation and duplicate publication screening, and adherence to reporting guidelines from the EQUATOR Network for biomedical studies^{236, 237} and ARRIVE for animal-based research.²³⁸ Sharon Gautschy, the AAST's executive director, facilitated CME accreditation of *Journal* content with the American College of Sur-

geons. The editorial team also implemented levels of evidence grading for all clinical studies.²³⁹

The Australian and New Zealand Association for the Surgery of Trauma was added as an affiliate in January 2012. For all affiliated society submissions, peer review work flows were customized to ensure rapid publication committee level review, *Journal*-level re-review, and expeditious publication. At publication, all AAST and affiliated society-papers are identified, and dedicated issues are created for papers from EAST and WTA annual meetings.

Under the guidance of the *Journal*'s publisher, John Ewers, and with the expertise of production editor Dinah Elashvili, extensive changes were made to the cover and interior page designs upon the *Journal*'s editorial transition. Online features including podcasts, links to CME activities, and free access to editorially curated articles were launched. The publishing company, Lippincott Williams and Wilkins, launched an iPad edition of the *Journal* in March 2012 and plans to add a hybrid open access option for *Journal* authors in late 2013.

Although the *Journal* has undergone manifold changes since its debut in 1961, its identity as both resource and product of the trauma community remains. The objectives of the *Journal*, first detailed by Rudolph Noer, resonate today: "...to assemble in one publication material of help to all who deal with trauma, whatever their field of primary or special interest; to provide a ready medium for publication of research relating to injury; and through these and other means, to stimulate interest and elevate the quality of care of the injured patient, whoever and wherever he may be..."²⁹ With the recent expansion of editorial scope to include acute care surgery, the editors hope to maintain accord with Dr. Johnston's initial vision of establishing a publication "of interest and importance to all segments of surgery."⁶ As the *Journal* continues to grow and reflect new opportunities, vicissitudes and discoveries in the discipline, it strives to remain the international voice of trauma surgery.

Appendix. Most-cited articles by year, 1961–2012.

YEAR	AUTHORS	TITLE	DETAILS	CITATION
1961	Dehne E, Metz CW, Deffer PA, Hall RM.	Nonoperative Treatment of the Fractured Tibia by Immediate Weight Bearing.	AAST 1960 Plenary Paper	<i>J Trauma.</i> 1961 Sep;1:514-35.
1962	Garrett JW, Braunstein PW.	The seat belt syndrome.	AAST 1961 Plenary Paper	<i>J Trauma.</i> 1962 May;2:220-38.
1963	Neer CS.	Fracture of the distal clavicle with detachment of the coracoclavicular ligaments in adults.	AAST 1962 Plenary Paper	<i>J Trauma.</i> 1963 Mar;3:99-110.
1964	Clawson DK.	Trochanteric fractures treated by the sliding screw plate fixation method.		<i>J Trauma.</i> 1964 Nov;4:737-52.
1965	Lindberg RB, Moncrief JA, Switzer WE, Order SE, Mills W Jr.	The successful control of burn wound sepsis.	AAST 1964 Plenary Paper	<i>J Trauma.</i> 1965 Sep;5(5):601-16.

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1966	DeMuth WE Jr.	Bullet velocity and design as determinants of wounding capability: an experimental study.	AAST 1965 Plenary Paper	<i>J Trauma.</i> 1966 Mar;6(2):222-32.
1967	Yamada S, Kindt GW, Youmans JR.	Carotid artery occlusion due to nonpenetrating injury.		<i>J Trauma.</i> 1967 May;7(3):333-42.
1968	Walker HL, Mason AD Jr.	A standard animal burn.		<i>J Trauma.</i> 1968 Nov;8(6):1049-51.
1969	Cassebaum WH.	Open reduction of T & Y fractures of the lower end of the humerus.		<i>J Trauma.</i> 1969 Nov;9(11):915-25.
1970	Janzekovic Z.	A new concept in the early excision and immediate grafting of burns.		<i>J Trauma.</i> 1970 Dec;10(12): 1103-8.
1971	Larson DL, Abston S, Evans EB, Dobrkovsky M, Linares HA.	Techniques for decreasing scar formation and contractures in the burned patient.	AAST 1970 Plenary Paper	<i>J Trauma.</i> 1971 Oct;11(10):807- 23.
1972	Peterson CA, Peterson HA.	Analysis of the incidence of injuries to the epiphyseal growth plate.		<i>J Trauma.</i> 1972 Apr;12(4):275-81.
1973	O'Neill JA Jr, Meacham WF, Griffin JP, Sawyers JL.	Patterns of injury in the battered child syndrome.	AAST 1972 Plenary Paper	<i>J Trauma.</i> 1973 Apr;13(4):332-9.
1974	Baker SP, O'Neill B, Haddon W Jr, Long WB.	The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care.		<i>J Trauma.</i> 1974 Mar;14(3):187-96.
1975	Engrav LH, Benjamin CI, Strate RG, Perry JF Jr.	Diagnostic peritoneal lavage in blunt abdominal trauma.	AAST 1974 Plenary Paper	<i>J Trauma.</i> 1975 Oct;15(10):854-9.
1976	Baker SP, O'Neill B.	The injury severity score: an update.		<i>J Trauma.</i> 1976 Nov;16(11):882-5.
1977	Novick M, Gard DA, Hardy SB, Spira M.	Burn scar carcinoma: a review and analysis of 46 cases.		<i>J Trauma.</i> 1977 Oct;17(10): 809-17.
1978	Hardaway RM.	Vietnam wound analysis.		<i>J Trauma.</i> 1978 Sep;18(9):635-43.
1979	Carpentier YA, Askanazi J, Elwyn DH, Jeevanandam M, Gump FE, Hyman AI, Burr R, Kinney JM.	Effects of hypercaloric glucose infusion on lipid metabolism in injury and sepsis.	AAST 1978 Plenary Paper	<i>J Trauma.</i> 1979 Sep;19(9):649-54.

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1980	Sherman R.	Perspectives in management of trauma to the spleen.	AAST 1979 Presidential Address	<i>J Trauma.</i> 1980 Jan;20(1):1-13.
1981	Moore EE, Dunn EL, Moore JB, Thompson JS.	Penetrating abdominal trauma index.		<i>J Trauma.</i> 1981 Jun;21(6):439-45.
1982	Goris RJ, Gimbrère JS, van Niekerk JL, Schoots FJ, Booy LH.	Early osteosynthesis and prophylactic mechanical ventilation in the multitrauma patient.	AAST 1982 Plenary Paper	<i>J Trauma.</i> 1982 Nov;22(11):895-903.
1983	Faist E, Baue AE, Dittmer H, Heberer G.	Multiple organ failure in polytrauma patients.		<i>J Trauma.</i> 1983 Sep;23(9):775-87.
1984	Gustilo RB, Mendoza RM, Williams DN.	Problems in the management of type III (severe) open fractures: a new classification of type III open fractures.		<i>J Trauma.</i> 1984 Aug;24(8):742-6.
1985	Greenspan L, McLellan BA, Greig H.	Abbreviated Injury Scale and Injury Severity Score: a scoring chart.	AAST 1985 Plenary Paper	<i>J Trauma.</i> 1985 Jan;25(1):60-4.
1986	Moore EE, Jones TN.	Benefits of immediate jejunostomy feeding after major abdominal trauma—a prospective, randomized study.		<i>J Trauma.</i> 1986 Oct;26(10):874-81.
1987	Boyd CR, Tolson MA, Copes WS.	Evaluating trauma care: the TRISS method. Trauma Score and the Injury Severity Score.	AAST 1987 Plenary Paper	<i>J Trauma.</i> 1987 Apr;27(4):370-8.
1988	Baker JW, Deitch EA, Li M, Berg RD, Specian RD.	Hemorrhagic shock induces bacterial translocation from the gut.		<i>J Trauma.</i> 1988 Jul;28(7):896-906.
1989	Champion HR, Sacco WJ, Copes WS, Gann DS, Gennarelli TA, Flanagan ME.	A revision of the Trauma Score.		<i>J Trauma.</i> 1989 May;29(5):623-9
1990	Champion HR, Sacco WJ, Copes WS, Gann DS, Gennarelli TA, Flanagan ME.	A revision of the Trauma Score.		<i>J Trauma.</i> 1990 Nov;30(11):1356-65.
1991	Champion HR, Copes WS, Sacco WJ, Lawnick MM, Keast SL, Bain LW Jr, Flanagan ME, Frey CF.	The Major Trauma Outcome Study: establishing national norms for trauma care.	AAST 1990 Plenary Paper	<i>J Trauma.</i> 1990 Nov;30(11):1356-65.

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1992	Diebel LN, Wilson RF, Dulchavsky SA, Saxe J.	Effect of increased intra-abdominal pressure on hepatic arterial, portal venous, and hepatic micro-circulatory blood flow.	EAST 1992 Plenary Paper	<i>J Trauma.</i> 1992 Aug;33(2):279-82.
1993	Chesnut RM, Marshall LF, Klauber MR, Blunt BA, Baldwin N, Eisenberg HM, Jane JA, Marmarou A, Foulkes MA.	The role of secondary brain injury in determining outcome from severe head injury.		<i>J Trauma.</i> 1993 Feb;34(2):216-22.
1994	Moore EE, Moore FA, Franciose RJ, Kim FJ, Biffi WL, Banerjee A.	The postischemic gut serves as a priming bed for circulating neutrophils that provoke multiple organ failure.		<i>J Trauma.</i> 1994 Dec;37(6):881-7.
1995	Sauaia A, Moore FA, Moore EE, Moser KS, Brennan R, Read RA, Pons PT.	Epidemiology of trauma deaths: a reassessment.	John Davis Festschrift paper	<i>J Trauma.</i> 1995 Feb;38(2):185-93.
1996	Moore FA, Sauaia A, Moore EE, Haenel JB, Burch JM, Lezotte DC.	Postinjury multiple organ failure: a bimodal phenomenon.		<i>J Trauma.</i> 1996 Apr;40(4):501-10.
1997	Fabian TC, Richardson JD, Croce MA, Smith JS Jr, Rodman G Jr, Kearney PA, Flynn W, Ney AL, Cone JB, Luchette FA, Wisner DH, Scholten DJ, Beaver BL, Conn AK, Coscia R, Hoyt DB, Morris JA Jr, Harviel JD, Peitzman AB, Bynoe RP, Diamond DL, Wall M, Gates JD, Asensio JA, Enderson BL, et al.	Prospective study of blunt aortic injury: Multicenter Trial of the American Association for the Surgery of Trauma.	AAST 1996 Plenary Paper	<i>J Trauma.</i> 1997 Mar;42(3):374-80.
1998	Saggi BH, Sugerman HJ, Ivatury RR, Bloomfield GL.	Abdominal compartment syndrome.		<i>J Trauma.</i> 1998 Sep;45(3):597-609.
1999	Holbrook TL, Anderson JP, Sieber WJ, Browner D, Hoyt DB.	Outcome after major trauma: 12-month and 18-month follow-up results from the Trauma Recovery Project.	AAST 1998 Plenary Paper	<i>J Trauma.</i> 1999 May;46(5):765-71.

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2000	Mabry RL, Holcomb JB, Baker AM, Cloonan CC, Uhorchak JM, Perkins DE, Canfield AJ, Hagmann JH.	United States Army Rangers in Somalia: an analysis of combat casualties on an urban battlefield.		<i>J Trauma.</i> 2000 Sep;49(3):515-28.
2001	Martinowitz U, Kenet G, Segal E, Luboshitz J, Lubetsky A, Ingerslev J, Lynn M.	Recombinant activated factor VII for adjunctive hemorrhage control in trauma.	AAST 2000 Plenary Paper	<i>J Trauma.</i> 2001 Sep;51(3):431-9.
2002	Rogers FB, Cipolle MD, Velmahos G, Rozycki G, Luchette FA.	Practice management guidelines for the prevention of venous thromboembolism in trauma patients: The EAST practice management guidelines work group.		<i>J Trauma.</i> 2002 Jul;53(1):142-64.
2003	Brohi K, Singh J, Heron M, Coats T.	Acute traumatic coagulopathy.		<i>J Trauma.</i> 2003 Jun;54(6):1127-30.
2004	Laird AM, Miller PR, Kilgo PD, Meredith JW, Chang MC.	Relationship of early hyperglycemia to mortality in trauma patients.	WTA 2003 Plenary Paper	<i>J Trauma.</i> 2004 May;56(5):1058-62.
2005	Boffard KD, Riou B, Warren B, Choong PI, Rizoli S, Rossaint R, Axelsen M, Kluger Y; NovoSeven Trauma Study Group.	Recombinant factor VIIa as adjunctive therapy for bleeding control in severely injured trauma patients: Two parallel randomized, placebo-controlled, double-blind clinical trials.	AAST 2004 Plenary Paper	<i>J Trauma.</i> 2005 Jul;59(1):8-15.
2006	Malone DL, Hess JR, Fingerhut A.	Massive transfusion practices around the globe and a suggestion for a common massive transfusion protocol.		<i>J Trauma.</i> 2006 Jun;60(6 Suppl):S91-6.
2007	Borgman MA, Spinella PC, Perkins JG, Grathwohl KW, Repine T, Beekley AC, Sebesta J, Jenkins D, Wade CE, Holcomb JB.	The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital.		<i>J Trauma.</i> 2007 Oct;63(4):805-13.
2008	Owens BD, Kragh JF Jr, Wenke JC, Macaitis J, Wade CE, Holcomb JB.	Combat wounds in Operation Iraqi Freedom and Operation Enduring Freedom.		<i>J Trauma.</i> 2008 Feb;64(2):295-9.
2009	Snyder CW, Weinberg JA, McGwin G Jr, Melton SM, George RL, Reiff DA, Cross JM, Hubbard-Brown J, Rue LW, Kerby JD.	The relationship of blood product ratio to mortality: Survival benefit or survival bias.	AAST 2008 Plenary Paper	<i>J Trauma.</i> 2009 Feb;66(2):358-62.

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2010	"Hauser CJ, Boffard K, Dutton R, Bernard GR, Croce MA, Holcomb JB, Leppaniemi A, Parr M, Vincent JL, Tortella BJ, Dimsits J, Bouillon B; CONTROL Study Group."	Results of the CONTROL trial: Efficacy and safety of recombinant activated Factor VII in the management of refractory traumatic hemorrhage.	WTA 2010 Plenary Paper	<i>J Trauma</i> . 2010 Sep;69(3):489-500.
2011	Morrison CA, Carrick MM, Norman MA, Scott BG, Welsh FJ, Tsai P, Liscum KR, Wall MJ Jr, Mattox KL.	Hypotensive resuscitation strategy reduces transfusion requirements and severe postoperative coagulopathy in trauma patients with hemorrhagic shock: Preliminary results of a randomized controlled trial.	WTA 2010 Plenary Paper	<i>J Trauma</i> . 2011 Mar;70(3):652-63.
2012	Kautza BC, Cohen MJ, Cuschieri J, Minei JP, Brackenridge SC, Maier RV, Harbrecht BG, Moore EE, Billiar TR, Peitzman AB, Sperry JL.	Inflammation and the Host Response to Injury Investigators. Changes in massive transfusion over time: An early shift in the right direction?		<i>J Trauma Acute Care Surg</i> . 2012 Jan;72(1):106-11.

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15. Stewart GC. Surgeons help prevent traffic trauma: the Joint Action Program. *J Trauma*. 1961 July; 1(4):337–340.
16. Stack JK. 1961 Surgeons' Award for Distinguished Service to Safety. *J Trauma*. 1962 Mar; 2(2):202–203.
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18. Artz CP, Fitts CT. Replacement therapy in shock. *J Trauma*. 1962 July; 2(4):358–369.
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ACUTE CARE SURGERY: THE EVOLUTION AND IMPACT OF A NEW SPECIALTY

L.D. BRITT, MD, MPH, GREGORY J. JURKOVICH, MD, AND DAVID HOYT, MD

Acute care surgery (ACS), a new and evolving surgical specialty, addresses the concern highlighted by Dr. William Steward Halsted when he stated that “...every important hospital should have on its resident staff of surgeons at least one who is well trained and able to deal with any emergency.” Dr. Halsted essentially defined a healthcare professional who could provide expert management in the acute surgical and critical care settings.¹ He underscored the importance of the surgical specialist who is now called the acute care surgeon. The evolution of ACS did not occur *de novo*. On the contrary, several forces created an optimal environment for its birth and development, including a precipitous decline in the surgical workforce that was willing to care for emergencies and the well documented short supply of surgical subspecialty support in the acute care setting. The acute care surgery career model was a more appealing specialty than traumatology alone and an impetus for many to embrace remodeling of trauma as a specialty. However, the paramount rationale for support of such a discipline was the fulfilling of a need—the need for ready patient access to quality trauma care, emergency general surgical care, and critical care. The development of this evolving specialty was the expectation that these practitioners would help fill a quality void that exists throughout many emergency medical systems throughout the nation. A survey conducted by the American College of Emergency Physicians in 2005 showed that nearly three-quarters of emergency department medical directors believed that their medical facilities had inadequate on-call surgical specialist coverage.² In that same survey, orthopedic surgeons, plastic surgeons, and neurological surgeons, as well as otolaryngologists and hand surgeons, were reported as being in short supply for on-call emergencies. A fact sheet on “The Future of

Emergency Care,” produced by the Institute of Medicine of the National Academies in 2006, corroborated these findings.³ Considering the importance of branding and specialty identification, the name “Acute Care Surgery” best represents the discipline’s three essential areas: trauma, emergency general surgery, and surgical critical care (Figure 1). The term “emergency surgery,” which was advocated by some, was felt to be too limited in scope and would have likely been mistaken for emergency medicine. In addition, the name “emergency surgery” did not adequately reflect the vital critical care management component. The name or label “Acute Care Surgery” was proposed by Dr. L.D. Britt and ultimately adopted nationally and internationally. The term is meant to be synonymous with “trauma, emergency general surgery, and surgical critical care”.

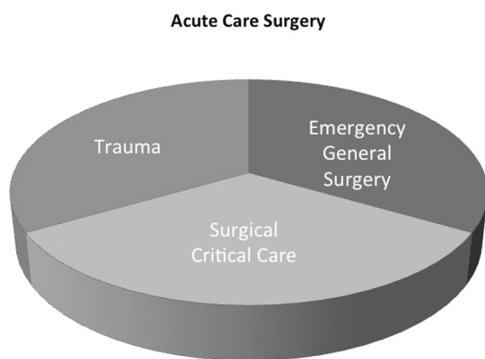


Figure 1. Acute care surgery: a tri-disciplinary specialty

The birth of acute care surgery happened under the auspices of the American Association for the Surgery of Trauma and the Committee on Trauma of the American College of Surgeons. An August 2003 summit meeting was held involving the leadership of the AAST (David Hoyt, MD, president) the American College of Surgeons Committee on Trauma (J. Wayne Meredith, MD, chairman of the ACS Committee on Trauma; Gregory J. Jurkovich, vice chairman), along with the Western Trauma Association (WTA) and the Eastern Association for the Surgery of Trauma (EAST). Membership from the American Surgical Association Blue Ribbon panel, the American Board of Surgery, the ACS Division of Education, Surgery Residency Review Committee, the American Association of Program Directors in Surgery, the Society of Critical Care Medicine, and the American Trauma Society were also invited.

The stated goal of the meeting was to create a vision for the future of emergency general surgery, trauma, and surgical critical care. A variety of models were examined and, after a day and a half of discussion, a vision was created. The vision was of a surgical specialist who cared for trauma, critical care, and emergency general surgery of all types. It was also envisioned that a well-structured training program would be developed in order to achieve this as the primary goal, under the auspices of the AAST.

In September 2003, Dr. Gregory J. Jurkovich was appointed by the next president of the AAST, Ronald V. Maier to be chairman of an initial ad hoc committee to develop the reorganized specialty of trauma, surgical critical care, and emergency surgery, and remained as such until 2008 (Table 1). The initial deliberations of the problems facing the specialty of trauma surgery were published in the *Journal of Trauma* in 2005.⁴ This ad hoc committee was subsequently renamed in 2005 as the Acute Care Surgery Committee, and remains a standing committee of the AAST, chaired by Drs. Jurkovich (2003–2008), Grace Rozycki (2008–2010) and John Fildes (2010–2013).

Table 1. Initial membership of the Committee to Develop the Reorganized Specialty of Trauma, Surgical Critical Care, and Emergency Surgery (2003).

GREGORY J. JURKOVICH, MD, CHAIRMAN	
L.D. Britt, MD MPH	J. Wayne Meredith, MD
Christopher T. Born, MD	Ernest E. Moore, MD
William G. Cioffi, MD	Lena M. Napolitano, MD
David B. Hoyt, MD	Michael F. Rotondo, MD, Vice Chairman
Robert C. Mackersie, MD	Grace S. Rozycki, MD
Mark A. Malangoni, MD	David A. Spain, MD
Ronald V. Maier, MD	Alex B. Valadka, MD

The continued efforts of this committee have included membership surveys of practice patterns and job satisfaction, involvement of other surgical specialties in the discussions of emergency surgical care in the world, and a large number of related peer review publications and editorials. The sentinel work product of this committee, however, was the development of a training curriculum for the acute care surgeon.⁵ The next phase of the growth and maturation of this new specialty was promoting its identity and branding and organizational alignment of the AAST. In an effort to address this requirement, the following two options were proposed by Dr. Andrew Peitzman, the 2010 AAST president and vetted by the AAST leadership (Table 2):

Table 2. Options for developing acute care surgery.

OPTION I	OPTION II
Acute care surgery incorporated within the AAST. Such incorporation would mandate rewriting of the existing bylaws and criteria for membership.	Acute Care Surgery would become a sister organization (e.g. Society of Acute Care Surgery), with shared boards of managers. The AAST would remain the premier trauma organization.
The publication organ would likely be one journal, with the possibility of a name change (e.g. Journal of Trauma and Acute Care Surgery).	Such an organizational structure would allow the Society of Acute Care Surgery to mature as acute care surgery continues to define its academic presence. A second journal would likely be needed (e.g. Journal of Acute Care Surgery?).

OPTION I implied that organization would stay the same but gradually develop into an organization for “acute care surgeons.” Membership requirements would likely require some modification.

OPTION II would have provided a *de novo* specialty society (e.g. Society of Acute Care Surgery). Such a society would provide an organizational home for fellowship-trained acute care surgeons and others who primarily practiced acute care surgery. Such an organization would, ultimately, need a separate publication organ that would likely start off as a semi-annual or quarterly periodical.

The American Association for the Surgery of Trauma embraced Option I. In 2011, the annual meeting of the American Association for the Surgery of Trauma (AAST) was renamed the Annual Meeting of the AAST and Clinical Congress of Acute Care Surgery. In 2011, the membership criteria were also altered to include “substantial and sustained commitment to the field of acute care surgery (trauma, surgical critical care and emergency general surgery),” and that same year the mission statement of the AAST was rewritten to state:

The mission of the American Association for the Surgery of Trauma (AAST) is to serve as the premier scholarly organization for surgeons dedicated to the field of trauma and the care of critically ill surgical patients. The AAST is dedicated to discovery, dissemination, implementation, and evaluation of knowledge related to acute care surgery (trauma, surgical critical care, and emergency general surgery) by fostering research, education, and professional development in an environment of fellowship and collegiality.

The clinical program of that and subsequent meetings have included dedicated time for trauma topics, surgical critical care topics, and topics in emergency general surgery. In 2012, the publishing arm of the AAST was rebranded as the *Journal of Trauma and Acute Care Surgery*.

As highlighted above, “acute care surgery” embodies three specialty components—trauma surgery, emergency general surgery, and surgical critical care. As a result, the general principles of acute care surgery are derived from these three areas of practice. The overarching principle, which transcends each of these three components, is early and expedient medical/surgical intervention. Whether managing a patient with perforated duodenal ulcer or enterotomies secondary to a gunshot wound to the abdomen, early diagnosis and expedient intervention make up the cornerstone of optimum management. Many of the general principles of trauma management are applicable in the non-trauma setting. However, each specific disease entity has its own unique diagnostic/management paradigm. Within the structure of the early years of the AAST Acute Care Surgery Committee, Drs. L.D. Britt and Michael Rotondo developed the first drafts of a curriculum to train the new acute care surgeons. There were two curricular formats (or templates) originally proposed and outlined in Table 3.

Table 3. The initially proposed two acute care surgery training curricula (subsequently settled on Format A).

FORMAT A (2 YEARS)		FORMAT B (3 YEARS)	
Year 1		Year 1	
12 months: Surgical Critical Care		12 months: Trauma/emergency surgery	
Year 2		Year 2	
3 months: Thoracic		9 months: Critical Care (SICU/NICU/CCU/Burns/PICU)	
3 months: Transplant/Hepatobiliary		3 months: Vascular/Interventional radiology	

FORMAT A (2 YEARS)	FORMAT B (3 YEARS)
3 months: Vascular/Interventional radiology	
3 months: Elective (Orthopedics, Neurosurgery, Plastics)	
Year 3	
	5 months: Orthopedics and Neurosurgery
	3 months: Thoracic
	2 months: Transplant/Hepatobiliary
	2 months: Elective (Plastics/Pediatric Surgery/Endo-surgery)

The following recommended subject requirements representing what was thought to be most commonly encountered problems to be faced by future acute care surgeons (Table 4) .

Table 4. Broad scope of knowledge for future acute care surgeons.

SUBJECT REQUIREMENTS			
General	Prehospital/system management Initial assessment and early resuscitation Diagnostic imaging Anesthesia in the emergency setting Fundamental operative approaches Nutrition Critical care (a 9-month curriculum)		
	Pharyngeal/laryngeal/tracheobronchial Pancreatic Esophageal Splenic Thoracic Vascular	Abdominal wall Urogenital/gynecologic Gastroduodenal Orthopedics Intestinal Neurosurgical Hepatic	
Organ Systems	Acute care surgery in the rural setting Prevention: principles and methodology The elderly and acute care surgery Advanced directives Disaster and mass casualties management The nonviable patient and organ procurement Education: surgical simulation		
	Management of perforations/injuries	Esophagus Stomach Duodenum Small bowel	Colon/rectum Bladder Lung Cardiac
Areas for Special Emphasis	Management of solid organ injuries	Trachea/bronchus Spleen (splenectomy/splenorrhaphy) Liver (hepatic resection/hepatorrhaphy) Pancreas (major resection/debridements) Kidney (primary repair, nephrectomy/partial repair)	
	Operative Management Principles		

Operative Management Principles	Gynecological emergencies	Ectopic pregnancy Ovarian cyst Tubo-ovarian abscess
	Thoracic	Mediasternotomy Left/right thoracotomy Wedge and partial lung resection Cardiac injury repair Decortication (open and VATS) Pleurodesis
	Orthopedic	Intraoperative washouts Placement of external fixators Fasciotomies (upper and lower extremities) Open reduction and internal fixation
	Neurosurgery	ICP monitoring placement (including ventriculostomy) Burr hole placement Limited craniotomy Halo traction
	Plastics	Soft tissues, flap construction Management of hand injury Management of facial soft tissue injuries
	Necrotic tissue – debridements principles Abscess – drainage principles Appendectomy Adhesiolysis Cholecystectomy/choleostomy Common bile duct exploration Gastrointestinal resections Colostomy Colostomy reversal Hemorrhoidectomy/rectal prolapse management	

However, due to strong opposition for surgical specialty areas from within the general surgery community, as well as acknowledgment of the difficulty in training and maintaining this broad a scope of practice, modifications were subsequently made, particularly in the surgical subspecialty areas. The current ACS curriculum is listed in Table 5. The curriculum for acute care surgery was ultimately designed to be competency-based as required by the Accreditation Council for Graduate Medical Education (ACGME), with emphasis on the following six competencies:

1. *Patient Care* that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health;
2. *Medical knowledge* about established and evolving biomedical, clinical, and cognate sciences, as well as the application of this knowledge to patient care;
3. *Practice-based learning and improvement* that involves the investigation and evaluation of care for their patients, the appraisal and assimilation of scientific evidence, and improvements in patient care;
4. *Interpersonal and communication skills* that result in the effective exchange of information and collaboration with patients, their families, and other health professionals;

5. *Professionalism* as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to patients of diverse backgrounds; and
6. *Systems-based practice*, as manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.

Table 5. Recommended curricular template for acute care surgery clinical rotations.

Table 5a. Required rotations.

REQUIRED CLINICAL ROTATION	LENGTH
Surgical critical care* including: Trauma/surgical critical care, including other relevant critical care rotations	12 months
Emergency and elective surgery including: Trauma/emergency surgery	12 months 2-3 months
Total	24 months

* This portion of the fellowship must comply with ACGME requirements for a surgical critical care residency

Table 5b. Suggested rotations during emergency and elective surgical experience.

SUGGESTED CLINICAL ROTATIONS	LENGTH
Thoracic	2-3 months
Transplant/Hepatobiliary/Pancreatic	2-3 months
Vascular/Interventional Radiology	2-3 months
Orthopedic Surgery	1 month
Neurological Surgery	1 month
Electives**	1-3 months
Total	12 months

** Burn surgery and pediatric surgery is recommended. Electives may also include endoscopy, imaging, plastic surgery, etc.

Under the category of didactic components, it was underscored that (i) a fellow in acute care should be given the opportunity to obtain a sufficient fund of knowledge in those aspects of trauma, emergency general surgery, and critical care in order to develop competence as a specialist in such areas and (ii) teaching should be essential to the overall educational process of the fellow. He/she should participate when possible in the instruction of both the general surgical residents and medical students, in addition to other allied health professionals and nurses. The emphasis should be on trauma system design, disaster management, surgical critical care, and recognition /management of surgical emergencies. The essential clinical components include a program that has adequate volume and variety of trauma, emergency general surgery, and critical care – allowing each fellow an ample opportunity and responsibility for the care of patients with specific acute surgical problems, along with the operative experience

necessary to develop competency in the technical skills and procedures required to provide acute surgical care. This curriculum was built with the inherent understanding that only training programs that had an established Surgical Critical Care ACGME—approved residency program would be considered, and that in essence, the majority or all of the first year of the two-year fellowship would be in surgical critical care.

The first AAST-approved training program in acute care surgery was established at the University of Nevada-Las Vegas under the direction of Dr. John Fildes in 2008, followed shortly by the Denver Health-University of Colorado program of Drs. Gene Moore and Clay Burlew. As of mid-2013, there are 16 established acute care surgery training programs (Table 6).

Table 6. AAST-verified acute care surgery training programs, 2013.

PROGRAM	PROGRAM DIRECTOR	YEAR APPROVED
University of Nevada - Las Vegas	Tim Browder	2008
University of Colorado - Denver Health	Clay Cothren Burlew	2008
University of Maryland/R Adams Cowley	William Chiu	2009
University of California San Francisco - Fresno	James Davis	2009
University of Pittsburgh Medical Center	Samuel Tischerman	2008
Massachusetts General Hospital	Mark DeMoya	2010
University of Texas Health Science Center	Bryan Cotton	2011
Vanderbilt University	Addison May	2011
UMDNJ- Robert Wood Johnson Medical School	Vicente Gracias	2012
Wake Forest Baptist Medical Center	Michael Chang	2012
East Carolina University/Viadent Medical Center	Eric Toschlog	2012
University of Arizona	Terence O'Keeffe	2012
Baystate Medical Center	Lisa Patterson	2012
Hartford Hospital/University of Connecticut	D'Andrea Joseph	2012
Wright State University, Dayton Ohio	Mbaga Walusimbi	2012
Yale University, New Haven	Linda L. Maerz	2013

Acute Care Surgery: Principles and Practice (edited by L.D. Britt, Donald Trunkey , and David Feliciano), published in 2007, was the specialty’s first comprehensive textbook, followed by a second book, *Acute Care Surgery* (edited by L.D. Britt LD, Andrew Peitzman, Philip Barie, and Gregory J. Jurkovich JG) in 2012.

It was also noted in the requirements that there would be a threshold of 52 night calls in trauma and emergency surgery that must be met. In addition, substantive experience in elective surgery would be an essential component of the ACS fellowship training. While training in an academic environment is specifically mandated for the ACS fellowship, the fellow is also encouraged to conduct research in acute care surgery. The actual type of research was not specified. However, the paramount question that must be answered is the following: “What will be the impact of this new specialty emphasis on patient outcomes?” The goal of the acute

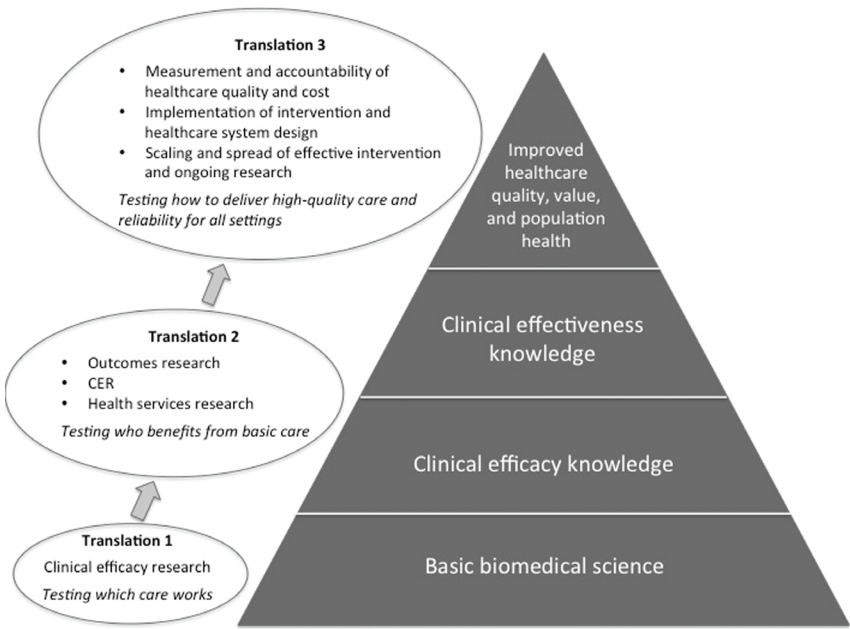
care surgery fellowship is not only to train highly skilled clinicians for a unique practice paradigm, but also to train future leaders and investigators in the field.

With the recent unveiling of the next graduate medical education accreditation an effort to have accreditation based on educational outcome (e.g. “milestones”), instead of the current process-based approach, it is likely that the acute care surgery training paradigm will also shift towards the measurement and reporting of outcomes through designated educational milestones. The establishment of such milestones is a result of the collaboration of the American Board of Medical Specialties, with other stakeholders (e.g. program director associations, resident review committees, resident organizations, etc.) Ultimately, the successful completion of the specifically prescribed milestones for acute care surgery should appropriately set the stage for a smooth transition to maintenance of competency and certification. The need to ensure consistency and quality of the education over service component of this advanced specialty training is of paramount importance to the AAST.

Although acute care surgery is not the complete answer for the workforce shortages in the care of the injured and acutely ill surgical patients, it represents a major advance in addressing this particular health care disparity.

Consistent quality care is the overarching mission for this new specialty. The Donabedian concept of quality emphasizes the important elements: structure, process, and outcomes. As acute care surgeons, our paramount emphasis should now be on this third element of quality – outcomes. In fact, comparative effectiveness research should be the next focus of acute care surgeons (Figure 2).

Figure 2. Comparative effectiveness research pyramid. (Adapted from Dougherty D and Conway PH. *JAMA*. 2008 May 21;299(19):2319–21).



Several investigative teams have documented outcome advantages after implementation of an acute care surgery service. Earley et al from the University of Pennsylvania School of Medicine demonstrated improved outcomes in patients with appendicitis after the establishment of a 24-hour acute care surgery team.⁶ The authors found a significant improvement in time to operation, rupture rate, complication rate, and hospital length of stay for patients with appendicitis after initiating an attending-in-house acute care surgery model. Diaz et al at Vanderbilt also documented improved outcomes in the management of acute appendicitis when there was a designated acute care surgery team assembled.⁷ RC Britt et al underscore a trend toward improvement in the timeline of care for complex inpatient biliary disease with implementation of an acute care surgery service.⁸ The literature is becoming replete with similar findings covering the full spectrum of this evolving specialty.

The overwhelming challenge in acute care surgery is patients with limited access to health care. The greatest health risk in 1955 was acquired heart disease, for which huge resources were devoted to the development of a definitive treatment paradigm. In this century, the greatest health risk is lack of access to care and the remarkable expense of health care in America. The alarming disparities in health care have been well chronicled. Therefore, unless optimal acute care surgical management can be accessed expeditiously for those who need such care, improving the quality of care for only a few will not represent a success story. The role of regionalization of health care for the injured has been well chronicled, and a similar approach to acute care surgery has been suggested, with national regional acute care surgical centers that can also serve as a network of disaster management centers equitably dispersed among the population.⁹ The manpower and financing for such an ambitious undertaking are not overwhelming, particularly with the rapidly expanding interest and training in acute care surgery.

The specialty change from the scope of practice of traumatology to that of acute care surgery, predictably, will continue to draw criticism; foremost is likely to be that such a change is an unnecessary response to consequences of the times, both socio-economic and political. However, a more convincing argument is that the continued evolution of this new specialty and related scope of practice is essential for quality patient care and safety. Irrespective of the debates that will ensue, the launching of acute care surgery has been the best antidote to address the documented deterioration of timely management of the injured and acutely ill surgical patients, and to stimulate a resurgence of interest in a career of acute surgical care. While the existing trends towards sub-specialization and a heavy emphasis on elective practice continues, the overarching focus of acute care surgery is to ensure expert surgical management in the acute care setting and that there is optimal patient care for the injured and critically ill surgical patients.

Questions that will continue to linger and issues that remain to be addressed are the following:

- How do practice models address the problems of urgent neurosurgical and orthopedic care?

- What should be the role of the non-trauma, non-critically care trained general surgeon who wants to provide only non-traumatic emergency coverage in this particular model?
- What is the proposed critical mass (FTE) that is required to provide optimal coverage?
- Should the training programs in acute care surgery seek ACGME (Accreditation Council for Graduate Medical Education) status and eventual board certification or remain a non-ACGME fellowship?
- What should be the proposed business plan that makes this specialty financially viable?

It has been reported that the product of Coca-Cola is the most valued brand in the world. While the name is instantaneously recognizable, it is the quality that keeps it on top. Although acute care surgery is the name for this new specialty, consistently favorable outcomes will establish its legacy as a specialty.

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AAST RESEARCH AND EDUCATION FOUNDATION

ERWIN R. THAL, MD, AND MICHAEL J. SISE, MD

The AAST Research Education Foundation (AASTREF) was established as a separate and independent trust in April 1994. The original purpose of the foundation was to develop a program to provide sustained support for research and education in the field of trauma. The first \$35,000 one-year scholarship was awarded in 1995. The AAST initially designated \$300,000 to establish the foundation and later that year contributed an additional \$500,000 to form the original corpus of \$800,000. The AAST, largely through funds derived from the *Journal of Trauma* royalties, was able to help the foundation grow its corpus, making annual contributions of up to \$300,000. Beginning in 2008, the AAST began to shift financial support to its own programs, reducing its annual contribution to the foundation, but increasing the level of AAST central office staff support for foundation activities.

The initial foundation bylaws created a seven-member board of trustees consisting of the past three presidents, the current president, and the president-elect of AAST. Two additional trustees were to be appointed by the AAST Board of Managers to serve five-year terms. The immediate past president served as the foundation board chairman and the secretary-treasurer of the AAST served as an ex officio member.

The original members of the foundation board were Drs. C. James Carrico, Ernest E. Moore, Cleon W. Goodwin, Arthur Trask, Henry Cleveland, F. William Blaisdell, and Louis M. Flint. As AAST secretary-treasurer, Dr. Anthony A. Meyer served as an ex-officio member.

In 1998, the trustees of the foundation recommended a restructuring of the board to provide more stability and continuity in leadership. The approved changes consisted of increasing the number of trustees from seven to nine voting members. This included the past five

presidents of AAST and four other members appointed by that AAST Board of Managers. The chairman and the secretary-treasurer of the foundation would be selected by the foundation board. The president and secretary-treasurer of AAST would continue to service as ex-officio members. Each appointed trustee would serve a five-year term with the limitation of only one additional five-year term.

Following adoption of the new bylaws, the membership consisted of Past Presidents Cleon Goodwin, Kenneth Mattox, Anthony Meyer, Anna Ledgerwood, and J. David Richardson. The appointed members were G. Tom Shires, C. James Carrico, Erwin T. Thal, and Frank Mitchell. Dr. Mitchell was chosen to be chairman. He was succeeded as chairman by Drs. Don Trunkey and Michael Sise.

The primary mission of the AAST Foundation was to raise money to support research scholarships for young surgeon investigators. The original goal was to build the corpus of \$4–\$6 million. An investment strategy was developed with a long-range goal of an average return of 8–10%. The investment portfolio was to be diversified with regard to fixed income and equity holdings. The fixed income portion of the portfolio was to be compromised of no less than 50% and no more than 90% of the current market value. The equity portion was not to be less than 10% or more or more than 50% of the market value. The portfolio was reviewed on a semiannual basis and changes made according to the economic climate and past performance.

The initial money transferred from that AAST was invested in the same account as other AAST investments. Dr. Ron Maier became secretary-treasurer in 1996 and placed the funds in a Merrill Lynch account in Seattle. Those funds were transferred to the Merrill Lynch office in Dallas in 2001 when Dr. Erwin Thal became secretary-treasurer. In February 2012, the foundation developed a RFP for changing investment firms and interviews were conducted in Chicago; the foundation trustees went with People's Bank in Vermont. The day-to-day operations of the foundation were subsequently moved to Chicago.

Various avenues of fundraising were considered, however the major source of revenue has come from the AAST contributions and generous donations of the membership over the over the years. Since its formation and until recently, the foundation received considerable support from healthcare industry partners. Although supporting scholarships for young investigators remained the primary fund raising goal of the foundation, other goals were identified. These included supporting multi-institutional trials and developing international fellowship programs, among others.

Toward the end of 2008 there was a noticeable lack of activity and a need for a reassessment the role of the foundation was identified by the AAST Board of Managers. A strategic retreat was held in March 2010 during which two options for the future of the foundation were considered. The first was for the foundation to continue as a separate entity with modifications in the declaration of trust. The other option was to dissolve the foundation and create a restricted fund for its activities within the AAST itself. The board of managers reaffirmed their support for a separate and dedicated fund raising entity and elected to maintain the AAST Research and Education to Foundation for this purpose. More recent changes in the foundation included the development of a mission statement and adopting a more pro-active fund raising

strategy. Numerous goals were identified including developing the AAST membership’s rate and level of contributions to the foundation. The need for a goal of a 100% rate of contribution by AAST Board of Managers and foundation board members was identified. The ability to donate online was also identified. The retreat called for regular meetings of the foundation board, the development of a fundraising plan, and reassessment of the investment strategy of the foundation.

A retreat of the foundation’s board of directors was held in May, 2011 during which the following mission statement was adopted:

The mission of the AAST Research and Education Foundation is to promote and advance the optimal care of injured in critically ill surgical patients by obtaining philanthropic support to expand knowledge, advance the art and science, and develop professionals in the field of trauma and acute care surgery.

The foundation’s board also identified the need for a professional consultant to assist in creating a fund raising strategy with appropriate program elements. Interviews were held and CCS was chosen to begin the process in early 2013. This effort included fundraising training for the foundation Board members and a range of program elements that includes all aspects of a mature fundraising effort.

At the time of the AAST’s 75th anniversary, research and education is thriving, with a corpus that exceeds \$3.5 million, unwavering support from the AAST Board, a re-energized fund raising program, and a legacy that includes the award of dozens of scholarships providing career support for the next generation of academic acute care surgeons pursuing research in trauma, surgical critical care, and emergency general surgery. While extramural fund raising will be a vital component of the AASTREF’s activity, the future of the foundation and the scholarships and career support it provides, will continue to depend on demonstrable support in the form of donations from the AAST membership itself. These donations provide a measure of commitment to our academic enterprise and the mentorship we provide.

AAST GRANTS, AWARDS, AND SCHOLARSHIP RECIPIENTS

AAST/SHERWOOD DAVIS & GECK AWARD

1995 – 1996	Robert N. Cooney, M.D.
1995 – 1996	Charles N. Mock, M.D., M.P.H., Ph.D.
1996 – 1997	J. Perren Cobb, M.D.
1996 – 1997	Chong-Jeh Lo, M.D.
1997 – 1998	Kimberly A. Davis, M.D.
1997 – 1998	Joseph T. Murphy, M.D.
1998 – 1999	Kenneth H. Sartorelli, M.D.
1998 – 1999	Joseph T. Murphy, M.D.

AAST/WYETH-AYERST SCHOLARSHIP AWARD

1999 – 2000	Grant O’Keefe, M.D., M.P.H.
2000 – 2001	James C. Jeng, M.D.
2001 – 2002	Eileen M. Bulger, M.D.

AAST/RESEARCH & EDUCATION SCHOLARSHIP AWARD

2002 – 2003	Gregory P. Victorino, M.D.
2003 – 2004	Saman Arbabi, M.D., M.P.H.
2004 – 2005	Saman Arbabi, M.D., M.P.H.
2006 – 2007	Mark A. Hemmila, M.D.
2007 – 2008	Suresh Agarwal, M.D.

AAST/RESEARCH & EDUCATION FOUNDATION SCHOLARSHIP AWARD

1999 – 2000	Kenneth H. Sartorelli, M.D.
2000 – 2001	Andrew J. Michaels, M.D., M.P.H.
2001 – 2002	Kimberly A. Davis, M.D.
2001 – 2002	James A. Murray, M.D.
2002 – 2003	Susan I. Brundage, M.D., M.P.H.
2002 – 2003	Colleen E. Jaffray, M.D.
2003 – 2004	Raminder Nirula, M.D., M.P.H.
2003 – 2004	Kathryn M. Tchorz, M.S., M.D.
2004 – 2005	Jason J. Hoth, M.D.
2004 – 2005	Obeid Ilahi, M.D.
2005 – 2006	Carlos V.R. Brown, M.D.
2005 – 2006	Rochelle A. Dicker, M.D.
2005 – 2006	Ajai K. Malhotra, M.D.
2006 – 2007	Michel Aboutanos, M.D., M.P.H.
2007 – 2008	Barbara A. Gaines, M.D.
2008 – 2009	Timothy Browder, M.D.
2008 – 2009	Tam Pham, M.D.
2009 – 2010	Eric Ley, M.D.
2009 – 2010	Tam Pham, M.D.

2010 – 2011	Jared M. Huston, M.D.
2010 – 2011	Eric Ley, M.D.
2011 – 2012	David A. Machado-Aranda, M.D.
2011 – 2012	Susan Rowell, M.D.
2012 – 2013	Todd Costantini, M.D.
2012 – 2013	Steven Schwulst, M.D.
2013 – 2014	Susan Evans, MD
2013 – 2014	Robert David Winfield, MD

AAST/NOVO NORDISK RESEARCH AWARD IN HEMOSTASIS AND RESUSCITATION

2006 – 2007	Mitchell Jay Cohen, M.D.
2008 – 2009	Mitchell Jay Cohen, M.D.
2009 – 2011	Matthew Rosengart, M.D., M.P.H

AAST/ETHICON RESEARCH GRANT IN LOCAL WOUND HEMOSTATICS AND HEMORRHAGE CONTROL

2007– 2008	Kenji Inaba, M.D.
2008 –2009	Jose Pascual, M.D.
2009 – 2010	Jennifer Watters, M.D.
2010 – 2011	Jeffrey S. Ustin, M.D.

AAST/KCI RESEARCH GRANT IN WOUND CARE

2007 – 2008	Therese M. Duane, M.D.
2008 – 2009	Michael Corneille, M.D.
2009 – 2010	Ziad C. Sifri, M.D.
2010 – 2011	Lydia Lam, M.D.
2011 – 2012	Laurie Punch, M.D.

AAST/CIMIT RESEARCH FELLOWSHIP IN THE FIELD OF TECHNOLOGY IN TRAUMA AND CRITICAL CARE

2009 – 2010	Jeffrey Ustin, M.D.
2010 – 2011	David King, M.D.
2011 – 2012	Suresh Agarwal, Jr., M.D.

1938 to 1949

TIMOTHY C. FABIAN, MD

OVERVIEW OF THE DECADE

The focus of this chapter is on tracing the early roots of the American Association for the Surgery of Trauma (AAST) through the scientific meetings. The first decade of our 75-year history was an interesting and turbulent time in the history of the United States. The culture of the time was dictated by the two major international events of the twentieth century. The dual calamities of the Great Depression and World War II stood as both a backdrop and starting point for the AAST. In reviewing the yearly transactions including the executive, business and annual scientific meetings of our first decade, the influences of those two events are palpable. Therefore, this section of the AAST's 75th anniversary commemorative book will interlace American history and culture with the progression of AAST meetings during the seminal decade of the organization. As reference material for this historical and cultural background, I have relied heavily on the superb website established by the Lone Star College Kingwood Library (<http://kclibrary.lonestar.edu/decades.html>).

The Great Depression of the United States is generally regarded as starting with the Stock Market Crash of 1929. The decade of the '30s was one of the bleakest times in the history of America as well as the world. Money was scarce and people gathered around radios to listen to fireside chats of Franklin Roosevelt and baseball games of the Yankees. They also enjoyed Jack Benny, George Burns and Gracie Allen, Amos and Andy, Fibber McGee and Molly, and The Lone Ranger. On May 6, 1937, as thought was being given for the development of the organization by the founders of AAST, one of the most dramatic events in radio history occurred

when the German airship Hindenburg burst into flames as it was about to land in Lake Hurst, New Jersey. The catastrophe was reported live by Herbert Morrison, a Chicago newsman. That live broadcast can be accessed on the internet, and it is chilling (www.chicagoradio.com/multimedia/audio/571-w.s-broadcast-of-the-hindenberg-disaster-1937). Then on October 30, 1938, as the AAST organizational meeting in San Francisco was beginning, Orson Welles broadcast on his radio series, *Mercury Theatre of the Air*, the H.G. Wells story *War of the Worlds*. This was a tale of a Martian invasion of Earth, which resulted in panicking millions of listeners who mistook the play for a newscast. Radio was tremendously influential in those years preceding television.

The population in that decade was approximately 123,000,000 in the 48 states and life expectancy was 58 years for men and 62 for women. Average salary was \$1,368.00 and the unemployment rate rose to 25% in the mid-thirties. Milk was 14 cents a quart and bread 9 cents a loaf. There were 21 lynchings documented in that decade. Over the course of the decade, the United States had gone from a *laissez faire* economy that regulated its own conduct to an economy regulated by the Federal Government. Debate continues today over which is the best approach.

A few of the famous people of the time included Mildred “Babe” Didrikson, considered by many to be the finest female athlete of all time. Jesse Owens, an African-American athlete who won four gold metals at the 1936 Berlin Olympics, embarrassed Adolph Hitler’s Aryan superiority propaganda. Will Rogers, the blue-collar Oklahoma cowboy and philosopher, was one of the most respected and popular Americans of the time. Supported by the government program, the Federal Art Project (FAP), Gutzon Borglum completed Mount Rushmore. The famous abstract expressionist artists Jackson Pollack and Willem de Kooning were also government supported at the time. Though the Depression lagged on, architecture progressed and the Empire State Building and Rockefeller Center were completed. In 1937, Frank Lloyd Wright completed his masterpiece, Fallingwater.

Hobbies and games were introduced to help distract the people from the difficult financial milieu. *Monopoly* was introduced by Parker Brothers in 1935 and 20,000 sets were sold in one week. Horse racing became legal in 21 states over the decade as gambling was thought by many as a means to add to their incomes. Nearly all found it to be a pipe dream sinking them further. American clothing designers developed as Paris fashion became out of reach for most. Interestingly, the zipper became widespread for the first time, as it was cheaper than button closures that had been previously used. Fiction dominated the literature of the day and some of the great American writers gained their greatest popularity in those years. John Steinbeck, Ernest Hemingway, F. Scott Fitzgerald, and Thornton Wilder developed during the Great Depression.

The Cook County Hospital opened the first blood bank in 1937. Combined with improvements in anesthesia, major surgical procedures advanced with improved mortality outcomes. During the decade of the 1930s, huge advances were made in the field of physics that ultimately led to nuclear technology and the development of the atomic bomb. The first scientific meeting of the AAST was held in 1939. At the New York World’s Fair in that same year,

fair-goers were astonished by the images of a television set at the RCA building as well as the General Motors exhibit of a seven-lane cross-country highway system. At that time, industrial advances led to improved refrigeration, the development of a variety of products made from synthetic materials including nylon and cellophane, and improved manufacturing procedures such as polymerization. The dawning of the AAST was interlaced with this dynamic American cultural background.

The 1940s were defined by World War II. The war production pulled the country out of the Great Depression. A minimum wage of 40 cents per hour was established. During the war, women had replaced men in much of the workplace. That was an important part of the beginning of the ascent of women in American society. Intellectuals and artists from Europe immigrated to the United States to escape the horrors of Hitler and the Holocaust. They infused our culture with new ideas.

World War II produced a tremendous impact on health care throughout the world. The British scientist Brian J. Ford commented, “If any good can be said to become of war, then the Second World War must go on record as assisting and accelerating one of the greatest blessings of the twentieth century as conferred on man—the huge advances of medical knowledge and surgical techniques. War, by producing so many and such appalling casualties, and by creating such widespread conditions in which disease can flourish, confronted the medical profession with an enormous challenge and the doctors of the world rose to the challenge of the last war magnificently.”¹

In 1936, M&B 693, produced by the British May and Baker chemical company, were the first effective sulphonamides that were used for a variety of infections. With the development of war, industrial production on mass scales of the antibiotics was initiated. Penicillin had been discovered prior to the war by Sir Alexander Fleming, but once again, it took the war to force industrial scale production of that highly effective antibiotic. It had a huge impact on the improvement in combating gas gangrene and other infections in contaminated wounds. Howard Florey and Ernest Chain led in the development of the techniques allowing for large-scale production. The Nobel Prize for Physiology or Medicine in 1945 was shared by Florey, Chain, and Fleming. Penicillin was extensively used following D-Day for the many massive wounds encountered. Great advances in burn care were likewise developed in World War II. Blood transfusion services became sophisticated during the war, allowing for blood storage and rapid distribution. The AAST milestone papers and presidential addresses chosen from the era will subsequently testify to these important medical advances.

AAST TRANSACTIONS AND SCIENTIFIC MEETINGS 1938–1949

A standard outline for presentation of the remainder of this chapter was adopted. Yearly significant meeting transactions will first be delineated. Those transactions include executive council and annual business meetings. Important portions of the annual presidential address will follow. Finally, a milestone paper from each meeting will be chosen.

I have decided to employ extensive use of direct quotes from those AAST meeting

sources, as I believe the language of the participants is much more interesting and eloquent than any feeble attempts I might make to interpret them. Their expressions also put one in the context and feel of the times. I can imagine the scenes when reading their words. A commentary to the various source materials will be made in an attempt to trace evolution of the early concepts for various aspects of trauma care to the current time. It will become clear from the transactions and presidential addresses that while many problems have been solved, some of the controversial areas from our early history remain with us. I will freely admit that my “milestone” choices are subjective, and suspect some more important work may have been inadvertently omitted. I apologize.

As the Great Depression was unfolding, American medicine was just beginning to get organized relative to lines of specialization. The financial collapse resulted in great poverty and despair for many Americans, and, injuries formed a significant portion of health care needs. Safety standards were undeveloped and risk-taking behavior was prevalent due to the economic demands placed on families. Consequently, many injuries occurred on the farm and in the developing industrial programs of the time. Skeletal fractures were very common, forming the highest percentage of injuries associated with life in that era. It was in this context of societal challenges and health care necessities that trauma surgery and the AAST developed.

Eighty-five percent of the initial membership in AAST was composed of general surgeons who at that time were indeed “general” in the broadest sense of the term; a heavy percentage of their clinical activity was related to fracture care. Sawnie R. Gaston, our 30th president, published “A History of the American Association for the Surgery of Trauma” in *Surgical Clinics of North America* in December 1973.² The following table is from that important historical document.

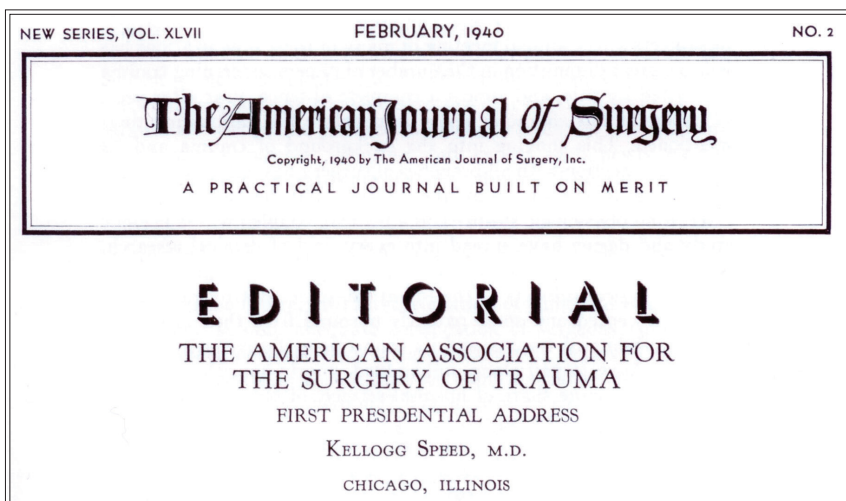
Program Papers in the Decade 1939 to 1948										
FIELD	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Skeletal	8	9	8	11	N	9	N	6	10	7
Plastic and infections	3	4	4	1	O	0	O	3	4	2
Burns	1	1	0	2		0		1	0	3
Shock	0	1	1	0	M	0	M	0	0	0
Vascular	1	0	0	2	E	1	E	0	2	2
Chest	1	0	0	0	E	1	E	2	0	0
Abdominal	2	0	2	2	T	0	T	2	0	4
Neurosurgery	2	2	2	3	I	3	I	2	5	3
Miscellaneous	0	1	1	3	N	2	N	2	2	3
Total	18	18	18	24	G	16	G	18	23	24

It demonstrates the topics of papers in our first decade that will be covered in this section. Nearly half of the papers presented over our first decade were on orthopedic topics. That material clearly demonstrates the broad practice of general surgeons at the birth of the organization.

The meetings of the AAST during our first decade will now be considered.

1939

While the organizational meeting for foundation of AAST was held some 75 years ago in San Francisco, the first scientific meeting was held the following year at The Homestead in Hot Springs, Virginia on May 8–9, 1939.



Our first president, Kellogg Speed, delivered a marvelous presidential address.³ He began by speaking to the relatively recent development of subspecialization of general surgery and suggested how general surgeons might respond to this relative to the management of injured patients. Those comments are certainly germane to many of the issues the AAST has addressed in recent years:

...In the rapidly expanding field of general surgery several schisms have occurred within the last thirty years, ending in a breaking off of certain specialties and narrowed fields, such as ear, nose and throat surgery, genitourinary surgery, neurologic surgery, thoracic surgery, with others— and even one body devoted quite entirely to the surgery of goiter

... It is not the primary desire or intention of the American Association for the Surgery of Trauma to cause the formation of an additional and possibly narrowed-vision group of surgeons under a different label, but to attempt an amalgamation and calling back to the fold of the well trained general surgeon of those interested in the maintenance of high surgical skill and scientific development in the phases of surgery which have to do with trauma, its immediate and distant effects and complications.

...To correlate the newer advances and adjustments of surgical study and technique, the surgery of trauma now steps forth and demands recognition. The Association for the Surgery of Trauma has already attracted, and will continue to attract, the brightest surgically inclined minds. Its forum is opened to the problems of all phases of trauma and its consequences without developing any feeling of inferiority complex among essayists and discussers.

...Consider for a moment the scope of this subject— its relation to shock and the mortality of accident, whether acquired by the impact from an automobile or

the staggering blow from a surgical operation, possibly elective in character, and not primarily caused by injury. Consider the advance in study of the infections and gross lesions subsequent to trauma, the anatomic and physiologic studies of trauma of the human hand or skull or craniocerebral tissues. The magnitude of the field spreading out before this association becomes apparent and lends dignity to its birth.

Dr. Speed’s inaugural presidential address must have been an excellent oration. He had the vision to concisely map the direction the AAST would take, and has continued to follow over the ensuing 75 years.

During the first decade, there were no abstracts published as we know the abstract process of today. It appears that the manuscripts were read from the podium and there was apparently minimal use of audiovisual aids such as slides that became the major foundation for scientific presentations in subsequent times. While the majority of papers presented in the first decade were orthopedic topics, I have chosen to primarily highlight more typical topics addressed today as our Association has evolved.

RUPTURE OF THE SPLEEN: AN ANALYSIS OF 20 CASES

John M. Foster, Jr., MD and Duval Prey, MD

Blunt splenic injury has occupied a central focus of attention over the past 30 years related to the tremendous advances in imaging and non-operative management. This important topic from the first scientific meeting illustrates how far we have come.⁴

Computed tomography, which provides the current heavy diagnostic lifting, was not introduced for evaluation of solid organ injury until the late 1970s. At the time of the first scientific meeting, physical signs and symptoms were the only tools for diagnosis. Table I demonstrates the findings from their report of 20 cases over an extended period from four hospitals. The therapeutic management approaches were demonstrated in Table II:

TABLE I SYMPTOMS AND SIGNS IN ORDER OF FREQUENCY		
	No. of Cases	Percentage
Pain.....	20	100
Pain localized.....	6	30
Tenderness.....	19	95
Rigidity.....	17	85
Localized to L.U.Q.....	3	15
Shock.....	13	65
Dullness.....	10	50
Vomiting.....	7	35
Distention.....	3	15

TABLE II OPERATIVE PROCEDURES			
Type of Operation	Lived	Died	Per Cent Mortality
Splenectomy.....	8	4	33.3
Suture.....	2	1	33.3
Tamponade.....	3	1	25.0
Suture and tamponade.....	1	0	0
• Total.....	14	6	30.0

Twenty cases seems a very small experience by today's standards—certainly would not pass muster with the program committee. While non-operative management is used for management in 80% of cases today, that management is reflective of the extensive use of CT. They, likewise, non-operatively managed most cases; they just didn't know that the injury existed. Splenectomy was performed in 60% of the cases with the remainder managed by either splenic suture or packing. The reported mortality of 30% seems high, but they were reporting the most severely injured patients with destructive splenic injuries—actually pretty good results given the rudimentary state of surgery at that time. The following is the authors' summary:

SUMMARY

1. A detailed analysis is made of twenty operated cases of splenic rupture observed in four Denver hospitals during the years from 1927 to 1938, inclusive.
2. It is felt that the correct diagnosis is not made frequently enough and, more particularly, not early enough. The two especially diagnostic signs of rupture of the spleen are localized abdominal rigidity and shifting dullness.
3. Associated injuries in this review played only a small part, and in our opinion there was but a single fatality attributable to injury other than that to the spleen.
4. The importance of delayed hemorrhage following splenic traumatism is recognized in spite of the infrequency of its occurrence. The etiology, pathology, symptomatology and treatment of secondary hemorrhage is discussed and a single case observed by one of the authors is reported in detail.
5. Preoperative transfusion and autotransfusion are life saving procedures which have not received proper recognition in our own series of cases or in those of others.
6. The treatment of choice in the vast majority of cases is splenectomy. Suture alone is indicated only in rare, selected cases with small lacerations, such as occur following gunshot or stab wounds. Tamponade, we feel, should be resorted to only in the desperate risk case in whom any other type of surgery would undoubtedly cause an operating room death.
7. Because evisceration is one of the most common postoperative complications, it is suggested that the usual wound repair be replaced with the use of interrupted heavy silk sutures through all layers.

Of interest, the authors noted the occasional occurrence of delayed rupture, which we continue to see in a small percentage of cases. In the discussion, Herbert H. Davis from Omaha commented on one of his cases of delayed rupture of the spleen. It is presented in language

and description that makes one sense the difficult circumstances of those early days:

This latter case may be reported in a little more detail. A woman, age 38, received in an automobile accident a blow over the left chest which was followed by pain in the left upper quadrant of the abdomen and left shoulder. She vomited once. She did not see a doctor until the next day. He strapped her chest, thinking she had a thoracic lesion. The following day she went back to her work in a laundry and worked right along until the fourth day after the accident when at ten in the morning she had sudden severe pain in her left upper quadrant and epigastrium which soon became generalized. Nausea and collapse ensued. That evening she was taken to the University Hospital, where the chief findings were her pallor, air hunger, marked generalized abdominal pain and tenderness, inaudible peristalsis, and dullness in both flanks. The pulse was 132, blood pressure 118/78, hemoglobin 25, and white count 12,600. She was given a blood transfusion and operated on. At operation the spleen was found to be literally blown to pieces. Part of it was clear down in the pelvis. That which was left was just mushy, and no real splenic tissue could be made out. The hemorrhage was so severe that the surgeon packed the wound, and stopped the hemorrhage in that way, but the patient died ten hours later.

In this report prior to World War II, it is also remarkable to note the recommendations for preoperative transfusion and the impact of autotransfusion. I think most of us would be surprised at those techniques being available 80 years ago. An interesting comment was made by one of the prominent surgeons of the twentieth century, Warren H. Cole (a president of the American College of Surgeons and chairman of the department of surgery at the University of Illinois for 30 years), regarding autotransfusion:

I wish also to emphasize the use of autotransfusions. I know it is not used enough. True enough, one may be able to find a donor rapidly, but all of us will admit that the blood of patients when spilled in the peritoneal cavity should not be wasted; if a few hundred c.c. can be salvaged, it should be put into sodium citrate solution and used as a transfusion. I have resorted to this procedure in two instances. In one of these patients there were a lot of clots in the peritoneal cavity. It has been said that autotransfusion of blood salvaged from partially clotted blood is associated with a danger of severe reactions. However, I have heard of the use of such blood on several other cases, but in no instance, including my own, did a reaction occur. If an intestine has been perforated in addition to the splenic hemorrhage, the blood may obviously be contaminated, and should then be used only in dire emergencies.

President Kellogg Speed also discussed this paper and it is fascinating to see how we take exploratory laparotomy for granted today compared to what it was like in these early days of abdominal exploration:

I merely wish to touch upon a few practical points. Where the patient is in shock and there is undoubtedly a hemoperitonium, one may be in doubt what organ is involved ... In one case I opened the abdomen, and finding some of the blood clotted, I did a Heller's test with nitric acid, believing that if there were free bile from the

ruptured liver, I would have a key to the exact location of the principal rupture ... When the spleen is ruptured, being the graveyard of red cells, it possibly furnishes all the materials for an early and complete clotting. When hemoperitoneum and shock appear late it is evidence of a bursting of the clot or the wall of the clot, whereas blood from the liver containing the taurocholic or glycocholic acids and their salts is inhibited from coagulating, and one is very liable to find a mass of dark, thick blood without any coagulating at all.

This paper and the discussions demonstrate the relatively embryonic stage of abdominal exploration as our organization was founded, and illustrate how far diagnostics and surgical techniques have taken us over time.

1940

The second annual meeting was held on June 7–8, 1940 in Atlantic City, New Jersey. This meeting was especially poignant relative to what was happening around the world. The world was on the brink of war every corner. Canada had declared war on Germany, on September 10, 1939, as an ally to Britain and France. At the time of the second AAST meeting, the United States had not yet entered the calamity.

The second presidential address by Edgar L. Gilcreest clearly anticipated our involvement as shown by the initial words of his address:⁵

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NUMBER THREE

Editorial

THE PROGRESS OF THE SURGERY OF TRAUMA*

PRESIDENTIAL ADDRESS

EDGAR LORRINGTON GILCREEST, M.D.
SAN FRANCISCO, CALIFORNIA

There never was a time when we stood more in need of a ready and sound knowledge of the cardinal principles of the surgery of trauma than at present. With a great part of the world at war and with our not knowing when an incident may happen which may precipitate our entry into the colossal maelstrom, it is timely for a group of outstanding surgeons to gather and discuss the progress of the surgery of trauma. The far-reaching effects of the good that this association may accomplish can not be estimated at this time....

With the exception that antibiotics have been a milestone for mankind in the cure of most infectious diseases (note *pneumonia* below), the epidemiologic statistics of trauma have not changed substantially over the past 75 years:

... Today accidents rank fourth — behind only heart disease, cancer and pneumonia — as causes of death among mankind. Never since the world began has there been such a need for surgeons profoundly interested in the broad subject of trauma. In the United States alone, in a year 9,000 people are injured, 8,300 are temporarily disabled, 330,000 are permanently disabled, and 93,000 die from accidents. The indications are that these figures will increase this year.

President Gilcreest went on to list statistics relative to American soldiers killed in action or dying of wounds in the 15 years of U.S. warfare up to that time, and compared that number to casualties from highway accidents:

... Our nation, since its birth in 1775, has engaged in six major wars. In total, these wars extended over a period of fifteen years. The number of American soldiers killed in action or who died of wounds during those fifteen years of war was 244,357 as compared with 456,281 who were killed on the highways during the past fifteen years of peace. Therefore, this national traffic death toll is almost double that of war. Indeed, our American highways have become more dangerous to the nation as a whole than is a battlefield.

Little did he know at the time that over the course of the next four years from the oncoming war there would be approximately 416,800 American troop casualties. In his address he then went on to comment on several interesting issues related to clinical management. Many of those principles have not changed:

WOUNDS: ...Undoubtedly, two of the greatest lessons in wound healing learned during the first World War was the execution of proper débridement and the carrying out of the Carrel-Dakin technic. What I should like to emphasize today is that much of this knowledge is being lost and that many of our interns now leave the services of their hospitals without having been thoroughly trained in this technic. While antiseptics come and antiseptics go, I am of the opinion that Dakin's solution — (0.5 sodium hypochlorite in hypertonic saline solution)— still remains the most reliable one yet discovered. But like so many other good things in life, it is often discarded as having been unsatisfactory when the poor result was actually due to failure on the part of the person using it to familiarize himself thoroughly with the technic ...

CHEMOTHERAPY: From all the reports to date, the surgeon undoubtedly has, in sulfanilamide, a most potent aid in the treatment of contaminated wounds and compound fractures; this aid has both a systemic and local protective effect. Aside from antitoxic serums, this is the first protective systemic agent we ever have had which assisted the patient to cope with infection from within ... It appears at this time that we have sufficient evidence to assume that this drug is one of the surgeon's most valuable allies, but as Johnson has emphasized: "Chemotherapy complements but does not replace in any way sound and necessary surgical procedure," consisting of

thorough débridement, immediate reduction, complete immobilization and administration of serum ...

AMPUTATIONS: In trauma often a speedy appraisal of the situation and even quicker action is imperative. This is especially true as regards amputations. In the event we are drawn in this second World War many of us will be confronted with the problem of amputation ...

THORAX: The surgery of the chest has always possessed a fascination and charm for the adventurous surgeon, involving as it does that of the heart and lungs, the most obviously vital organs in the body. An operation on these moving structures will never fail to thrill the most indifferent and cold-blooded surgeon.

In anticipation of the need for organized systems of trauma care and damage control techniques:

... ABDOMEN: Abdominal injuries, whether caused by penetrating wounds or a contusion of the abdomen with resulting visceral damage, are accompanied by a mortality rate of 50 per cent. The mortality depends (1) on the type of injury, (2) on the time elapsing before operation, and (3) on the structures involved. In order to reduce this mortality we must emphasize more and more the importance of having these patients transferred immediately to a hospital where they can be thoroughly examined and observed constantly. After they have recovered from their initial shock it is often more prudent, in case of doubt as to visceral perforation, to perform an exploratory laparotomy rather than to delay too long ... Often when the abdomen has been opened the proper surgical therapy tries the ingenuity of the most experienced and versatile surgeon. In a word, the intervention should be brief. That procedure which will close all perforations most quickly and with the least amount of shock, is the one which should be selected. One must decide in a few moments the question of exteriorization, of resection or of enterostomy....

A curious description, relative to what we know today, is his inclusion of a discussion of traumatic appendicitis, which apparently was a not rare diagnosis at the time and presumably he was describing acute appendicitis. He noted that employers were quite interested primarily because of lost productivity!:

...Traumatic Appendicitis - The incidence of this condition is not so important as is the fact that the disease exists as a clinical entity. It is a subject in which employers of labor and accident insurance companies are deeply interested....

Another very curious consideration at the time was that of:

... Peritonism or traumatic peritonitis, called by some "sympathetic or abdominal shock," must be kept in mind as it may be caused by the presence of a fractured vertebra. The clinical picture is one known as a "knock-out," so severe is the shock. There is intense pain, nausea and vomiting, board-like rigidity of abdomen, diffuse tenderness and absence of peristaltic sounds, rapid pulse and low blood pressure. A laparotomy would seem imperative but traumatic peritonitis readily subsides and disappears

under primary treatment for shock (Hertz and Stalker).

That was a rather vivid description of an entity that I am not exactly sure of what was being described. Was this misinformation or something else? He went on to make some interesting comments regarding rehabilitation of the injured:

... PSYCHIC TRAUMA: ... The injured, who is entitled to the best scientific treatment of the day, not infrequently finds that he is not in the most skilled hands and that, as an industrial case, he is regarded in the hospital as a nuisance. Even if he is fortunate enough to fall into skilled hands, and the immediate treatment or operation is performed properly and well, what often follows? For weeks, and not infrequently for months, the patient is left often to his own devices. Lying there in idleness, with worry and melancholy his chief companions, is it any wonder that traumatic neurosis develops? Satisfied with a good surgical end result, very little thought is given to the injured patient's future economic usefulness. We should remember, therefore, that detrimental psychic reactions usually accompany deformities following injuries. The surgeon must not lose himself in the problem of the repair of the physical trauma and overlook or neglect the psychic trauma, with the result that "the most perfect restoration may be utterly unappreciated." The treatment of both should go hand in hand or the surgeon has not measured up to his full obligation. We should always remember that we are not just artisans or technicians but physicians and philosophers in the broadest meaning of the words.

This remains good advice to of us today. Perhaps too often we have a tendency to get taken up with technology and therapy, and lose sight of the aftermath.

As most of our early founders, Gilcreest too made comments regarding specialization:

... TREND TOWARDS SPECIALISM: It is to be expected that the trend today in everything is towards specialism and this is certainly true in the rapidly expanding field of general surgery; but this can be carried too far ... To do this efficiently, our medical schools will have to give more time to the teaching of this important subject. I realize that the curriculum is already over-crowded, but, like many other decisions in life, the less essential must give way to the more essential. Recent graduates will have to treat many more patient with trauma than they will patients suffering from brain tumor, goiter or bronchiogenic carcinoma ... Our association should develop and promulgate fundamental principles in the care and treatment of the injured. This information should be made available to the physicians working in the smaller institutions throughout the country to enable them to treat more efficiently their patients with acute trauma. We should strive to get the co-operation of administrative staffs of hospitals, large and small, to recognize the importance of being equipped at a moment's notice to care adequately for the seriously injured. They should realize that the first hour of injury is the most important one.

THE USE OF VITALLIUM APPLIANCES IN COMPOUND FRACTURES

Charles S. Venable, MD and Walter G. Stuck, MD

I have chosen to highlight an important orthopedic paper.⁶ At that time internal fixation with

metallic implants was in its infancy. The paper dealt with the use of the metal vitallium for use in compound fractures and management of nonunions. The work is remarkable from the viewpoint that the San Antonio authors were in the vanguard of investigation of optimal materials for metallic implants.

... In the past few years two new principles of treatment have been developed which supplement the earlier methods and which offer hope of constantly improved results. These factors are: 1. The proof that sulfanilamide acts as a local bacteriostatic agent when placed in compound wounds. 2. The fact demonstrated by us in 1936 that metals which are electrically passive (inert) in body fluids (electrolyte) can be used with safety in the internal fixation of fractures ... The discovery that sulfanilamide is an effective bacteriostatic agent has produced revolutionary changes in all fields of medicine and its use has become widespread. Shortly after it became available in this country, Bohlman tried giving the drug orally in cases of compound fracture to reduce the likelihood of secondary infection ... experimented with the introduction of pure crystalline sulfanilamide into compound wounds to enhance the bacteriostatic effects. This was found to produce high local concentrations of the drug in the wounds which prevented the development of osteomyelitis or gas gangrene. Sulfanilamide in a wound acts as a chemical deterrent to bacterial growth which thus permits the normal body defenses to overcome invading organisms.

I'm not sure that today we've learned much more about the proper local and systemic antibiotic treatment of compound fractures.

... VITALLIUM FOR INTERNAL FIXATION: In all cases of compound fracture, thorough débridement of damaged tissues is of course essential and this includes changing of gloves, drapes and instruments when necessary during the operation. The wound must be flushed with large quantities of saline solution to remove scraps of foreign material and dead tissues and the fracture must be supported with casts, splints, skeletal traction or some other form of immobilization. Since we had observed in 1937 that ununited fractures often healed following fixation with nonirritating vitallium plates, we began to apply them to fresh compound fractures through débrided wounds. The wounds were then packed open with 5 per cent xeroform gauze after the manner of Orr. Subsequently, the extremities were supported in the usual plaster casts or splints to immobilize the involved bone and the adjacent joints.

... THE IDEAL METAL FOR INTERNAL FIXATION: The "certain requirements" which must be fulfilled in any metal are passivity in body fluids and hence freedom from electrolytic irritative tissue effects. As we have frequently stated, a positive proof of electrolytic action (or "non-passivity") in the body is the ability to recover constituent metal of an alloy from the tissues adjacent to it. Chemical examination of tissues and fluids which have been in contact with the metal will reveal the presence of metallic ions corroded from the alloy. Thus far only vitallium is sufficiently passive in body fluids to cause no disintegration or release of metallic ions into the tissues. We have stated before that the amount of electrolytic disintegration of metals and consequent erosion of bone seems to be related to the current flow recorded in a microammeter when the metals are combined with a third metal as an anode in sodium

chloride. In other words, an alloy which produces many microamperes of current will produce much erosion of bone and the metal itself will disintegrate in the tissues.

Venable and Stuck applied scientific methods to the development and rationale for the use of vitallium at the time. Elegantly simple experiments demonstrated the low reactivity of vitallium:

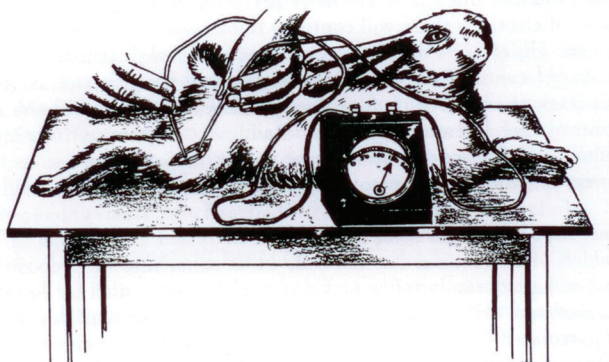


Diagram showing contact being made between stainless steel screws in leg of experimental animal. Micro-ammeter shows relatively large amount of current produced.

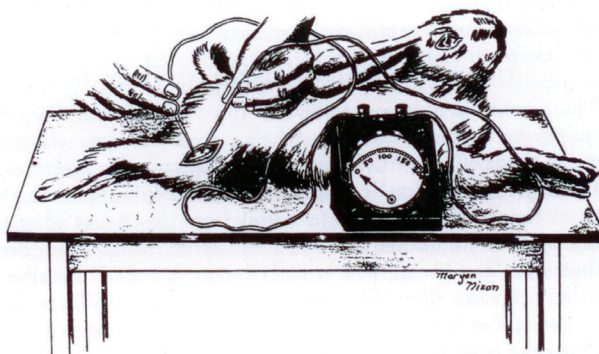


Diagram showing contact being made between vitallium screws in leg of experimental animal. No current flow demonstrable on the micro-ammeter.

In the closing paragraphs they demonstrate their continued pursuit of the ideal metal:

...While vitallium is the most inert alloy now used in bone surgery, we are experimenting with a recently developed alloy which seems to be approaching it in passivity. Our main interest has always been to discover an alloy which is completely nonelectrolytic and hence nonirritating in the body and at the same time malleable enough to be machined. Experiments with "19-15" steel in which the nickel-chromium proportion is altered and molybdenum added seem to point the way toward the ultimate hope of a malleable yet passive alloy. More than a year ago we experimented with plates and screws of this new material and found that they produced only 3 to 5 microamperes of current.

Those investigators were true leaders in the development internal fixation techniques for fracture care. They were "state of the art" at the time as can be seen in their bibliography

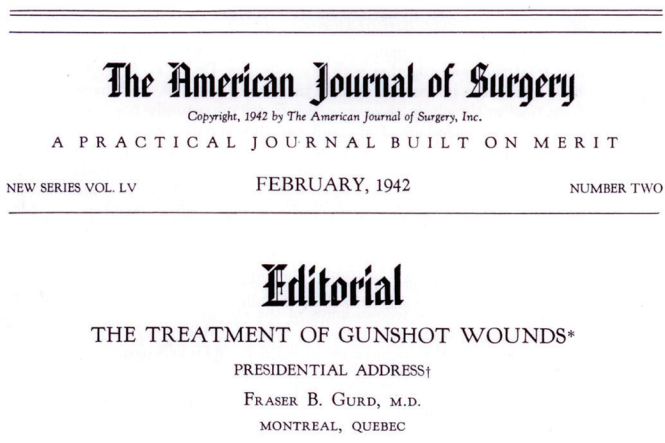
of 21 references. The earliest reference was only 1937 (!) and was from their group. I consider the work by these individuals as a true milestone in trauma care. Orthopedic management of skeletal injuries with internal fixation techniques continues to be one of the most important aspects of care of the multiply injured patient.

1941

The third annual meeting of the AAST was held in Montreal, Canada on May 28–31, 1941. The meeting took place approximately six months before the entry of the United States into World War II when the Japanese attacked Pearl Harbor on December 7, 1941, and Hitler declared war on the U.S. four days later on December 11th. The meeting was held at Montreal’s historic Seigniory Club. There were a couple of interesting comments made at the board of manager’s meeting which deserve mention:

There was considerable discussion over the following gentlemen: Dr. George W. Crile, Dr. Charles L. Scudder, Dr. Frederic W. Bancroft and Dr. Philip D. Wilson. It was decided that Dr. Bancroft be honored with Honorary Fellowship. It was further decided that Dr. Philip D. Wilson was young enough to come in as a regular member if he wished to apply; that in the cases of Doctors Scudder and Crile, in as much as they had never attended a meeting, the matter was deferred.

Crile (Cleveland Clinic founder) and Scudder (American College of Surgeons founder) were two of the leading surgeons of the time and are historic figures in American surgery. But they were not felt to be above the rules. However, it is worth noting that at the meeting in 1942, Dr. Scudder was admitted to AAST membership, presumably because he was attending the meeting. Dr. Crile was once again turned down. Another interesting comment that was made relative to future meetings suggested, “that our meeting be held at Colorado Springs or some place in the West, but not necessarily as far west as San Francisco.”



The third presidential address was delivered by Fraser B. Gurd.⁷ The Gurd family were an iconic family in the history of Canadian surgery. His son, Fraser M. Gurd, went on to become our president in 1968. They are the only father-son duo to preside over AAST. In his address, the elder Gurd spoke of the treatment of gunshot wounds. He had

obtained a very large personal experience with wound management during his service in World War I. This interesting presidential address details care during that time. It is both

poignant and historically captivating.

My justification for attempting to address you on this subject is based upon a prolonged experience during the first stage of the War. Commencing in June, 1915, I cared for wounded soldiers during a ten-year period. Of this time thirty months were spent at a Casualty Clearing Station, four months with Sir Robert Jones at Alder Hey, Liverpool, four months at a Base hospital in France and several years in charge of surgery at Ste. Anne's Military Hospital in Canada ... As compared with what Bernard Shaw has called the Four Years' War, the present conflict has been comparatively trivial in so far as both the number of wounded and the nature of wounds are concerned. Up to May 23, 1941 figures relative to British losses in all fighting services and among civilians have been less than 175,000 persons including killed, wounded and prisoners ... These facts should not, however, lead us to the wishful conclusion that wounds such as we knew them during 1914 to 1918 will not be met with at a later date.

Dr. Gurd had extensive experience with wound management and made several important observations in his address relative to infection and the prevention thereof:

FACTORS WHICH INFLUENCE THE NATURE OF WOUNDS AND TYPE OF TREATMENT INDICATED

Micro-organisms and Gas Gangrene. Although in France and Flanders, particularly during the earlier years of the first stage of the war, practically all wounds were contaminated with the micro-organisms responsible for gas gangrene, this had not been the case in the South African War. During the war in Spain, too, this nightmare of the surgeon in France was largely absent. In so far as the British campaigns were concerned, during the first phase, the Mesopotamian force did not meet with this type of infection and in Gallipoli the incidence was relatively small. Hitherto, fortunately, in this war massive gas gangrene has not been prevalent.

Effect of Season upon Wounds and Wounded. In the summer the soil is relatively dry; the soldiers' clothing is relatively clean; shock accentuation due to chilling is minimal, and the roads are hard permitting rapid evacuation. During the winter the soil has turned to mud or slush; the soldiers' clothing is filthy; the lowering of body temperature deepens shock, and the roads are unfitted for rapid evacuation.

Character of Soil Affects Wounds. Dry sandy soil is free from infection and a delay in operating is not serious. Primary suture is indicated in such instances. Wet, highly fertilized soil teems with bacteria especially anaerobes: *Clostridium* and *welchii* *oedematis maligni*, *Bacillus tetani* and streptococci. A delay in operating is dangerous in the extreme and a primary suture is rarely indicated. A secondary suture is possible if the primary wound treatment has been adequate ... *Clostridium welchii*, the bacillus of malignant edema and both aerobic and anaerobic streptococci, the incidence and gravity of these infections was much lower in the summer time than in the winter. This was due in all probability to the fact that in the winter time the soldiers' clothing was certain to be filthily contaminated with mud from highly fertilized soil.

PERSONNEL AND EQUIPMENT OF SURGICAL TEAM IN BRITISH CASUALTY CLEARING STATIONS — 1916 TO 1918

... Although at our Casualty Clearing station we had received two reinforcing

teams, making four teams in all, the situation created during the first twenty-four hours and longer of the battle of Vimy Ridge made it absolutely impossible to carry out adequate surgery. During the first twenty-four hours of this battle we received over three thousand stretcher cases and a larger number of ambulatory patients ... As a matter of fact, during this battle within an hour after we commenced to receive the wounded we were forced to the decision that no head injuries would receive any attention. Within another hour the same decision was arrived at with regard to chest injuries and before three hours had elapsed it was decided that no patients with abdominal injuries would be operated upon. The soldiers, therefore, suffering from these three types of wounds were placed in marquees under the care of a single orderly whose only armamentarium was water and morphine.

The experience of being overwhelmed by over 3000 casualties is very humbling when we consider ourselves busy on Saturday nights today. World War I was truly a horrific event in the history of mankind. The words of Dr. Gurd's conclusions demonstrate their principles of wound management were not substantially different from the present time. Their reliance on the liquid paraffin gauze packing and BIPP (bismuth-iodoform-paraffin-paste) is of historical interest and provocative, but many of our local wound managements techniques of today likely provide no improved results especially compared to the horrendous conditions faced by soldiers and surgeons in that environment.

THE LOCAL THERAPEUTIC EFFECT OF SULFATHIAZOLE

Grover C. Weil, MD, Darrell W. Whitaker, MD, and Harold W. Rusbridge, MD

In keeping with Dr. Gurd's address, the presentation I have chosen for a milestone of the third annual meeting is one of the early large experiences with the use of a sulfa drug for prevention of infection.⁸

... The advent of the sulfonamide group of chemicals has recreated a widespread interest in one of man's first surgical problems. Today medical science is fulfilling Ehrlich's early prediction of the discovery of chemicals having bactericidal and bacteriostatic properties without deleterious effect upon human tissues.

In this study, the authors reported on the efficacy of local treatment of contaminated compound fractures, contaminated soft tissue wounds, and simple fractures requiring open fixation. They reported 58 cases of contaminated compound fractures with prophylactic local sulfathiazole leading to a 10% infection rate, a rate which was quite good at that time and not too bad today. In the treatment of 31 contaminated soft tissue wounds, there was one infection for a rate of 3.2% and in 22 simple fractures requiring internal fixation, local sulfathiazole resulted in the prevention of infection in all cases. Thus, this paper was a nice study of "end-results research" that has been popularized by Ernest A. Codman in the 1920s. In their concluding paragraph, the authors state:

...In view of the encouraging results which we have obtained to date following

the local use of sulfathiazole to wounds during their period of contamination, we believe that these studies should continue. It is suggested that this method of treatment of wounds may serve as a most valuable factor in the prevention of infection and the saving of human life in military and war injuries.

1942

The fourth annual meeting was convened in Boston, Massachusetts June 4–6, 1942. It was held at the Copley Plaza Hotel, the site of many national surgical meetings to this day. The meeting occurred approximately six months after the official U.S. entry into World War II. The meeting minutes reflected, “We note with pride the activity of our men in the ‘Call to Colors,’ and at this date there is a worthy Honor Roll, with many more awaiting orders.”

The fourth presidential address was especially moving.⁹ The brevity and earnestness in the language chosen emphasize the single-mindedness that the country exhibited in the formal entry into the war. It drove home the clear message that this would be a life and death struggle that would require the mobilization of U.S. industry and the entire population including women and minorities. The surgical profession also entered into wartime production. I have chosen to print the entire address of Henry C. Marble that serves as a tribute to the people and the time.



Editorial

OUR SURGEONS IN THE PRESENT WAR

PRESIDENTIAL ADDRESS
HENRY C. MARBLE, M.D.
BOSTON, MASSACHUSETTS

Twenty-five years ago, when the United States entered the first World War, the surgeons of this country were called upon to wrest themselves from their peace-time practices and join with their countrymen on the surgical staffs of our fighting forces. At that time we had had very little training for the task that was before us. Although the surgery of wounds is the oldest branch of medicine, the surgeons of our era had been so much concerned with abdominal, gynecological and cranial technics that little time had been given to the teaching of this ancient art. It may have been that the optimism of peace and the inability of most of us to imagine a world-wide war in a time of apparent enlightenment was responsible for this neglect.

When we were confronted with the emergency, we hurriedly adopted from the French and the English, who had been deep in this work for over two years, all that

we believed to be good and we applied this borrowed knowledge in the care of our own wounded men. What we lacked in training and experience we tried to overcome by willingness and application of sound fundamentals. The end results of our efforts and the consequences of our failures are medical history.

After the Armistice we returned to our peace-time practices but not to our previous neglect of the study and teaching of the surgery of injuries. Realization came to the war surgeon that the problems of war and peace are not foreign to one another; that the difference is only a change in location; the people and problems are the same.

During the past twenty years industry has expanded, the motor car has become popular, speed has increased and accidents are more numerous. Our hospital clinics are filled with the injured and wards are set aside for their care. The war surgeon continuing his interest in the surgery of trauma, offered his knowledge and experience to the younger staff members, and through research with them developed new medicines, means and methods.

And now another World War is upon us and thousands of young surgeons have again been called upon to care for the war wounded. Surely the surgeon going out today is far better trained, has a deeper knowledge and more mature judgment than his older brother of a quarter century ago. The soldier going into action today knows that he will be cared for by the finest trained and equipped corps of doctors that his country can give him and that, if he is wounded, his chances of recovery are greater than ever before. Knowing this he will do his job better.

The latest step in this educational trend is the organization of the American Association for the Surgery of Trauma, and its duty is clear. We must maintain a thinking membership to administer and direct; we must so plan our councils that we may receive, evaluate and judge all that is new in wound surgery. We must welcome all who are interested and qualified to the end that this knowledge may be spread to the profit of all. In war even more than in peace we have our work to do.

FROSTBITE IN SHIPWRECKED MARINERS

G.M. Brownrigg

In keeping with the gravity of the time, I have chosen a Canadian paper concerning the experiences of G. M. Brownrigg entailing the management of shipwrecked survivors from the Battle of the Atlantic:¹⁰

During the past eighteen months I have been one of a group of St. John's surgeons privileged to share in the surgical care of a large group of shipwrecked mariners, survivors of the Battle of the Atlantic, who have been landed at our port...

The following tables from the paper represent the experience with 94 survivors who were hospitalized. Brownrigg provides a touching description of those unfortunate seamen.

TABLE 1

Survivors Requiring Hospitalization	No. of Cases of Frostbite	Percentage with Frostbite
94	71	75

TABLE II

No. of Cases of Frostbite	First Degree	Second Degree	Third Degree
71	55 77%	7 10%	9 13%

TABLE III

No. of Cases	Lower Extremities Affected	Upper Extremities Affected
71	71 %—100	8 %—11

Nearly all patients, irrespective of the group to which they belonged, gave a similar history. They had noticed no pain until they had been rescued. They had been able to move about, so far as movement was possible, in the life boat, but when rescued or shortly after had lost the use of their legs and experienced pain of varying degrees of severity. Some of them had worn ordinary footwear, some only socks, but the presence or absence of footwear did not appear to have any influence upon the occurrence or severity of the lesions. The history of the onset is similar in all respect to that described by Page in the cases seen by him in the Balkan Wars.

Concluding the manuscript, he implores for the development of improvements of equipment of sailors subjected to these types of insults in the future:

... The problem of prevention of frostbite in shipwrecked mariners is admittedly difficult but it is my opinion that many of these cases can be prevented. I believe that the provision of a form of protection for the lower extremities at least, which would prevent heat loss and at the same time be waterproof, would be a great advancement. Soft sealskin boots might be of considerable value. Sailors operating in submarine zones are now compelled to wear life-jackets at all times. This is fitted with a signal light. The addition of a waterproof compartment containing protective garments for the extremities should not prove impossible....

Over the years, improved safety garments have indeed been developed, as seen in the body armor for the troops in the wars over the past decade. Given the intensity and resolution demanded for pursuit of the war effort it is not surprising the meeting for 1943 was cancelled.

1943

CONCERNING THE ANNUAL MEETING FOR 1943

The Annual Meeting of The American Association for the Surgery of Trauma for 1943 was cancelled on account of war conditions, which resulted in many members being in active military service and those remaining at home were occupied in necessary war work, etc.; so for the good of the service it was decided to cancel the meeting, with the same officers to continue in office until the next meeting.

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*Military Service.

1944

The fifth annual meeting was held June 9–10, 1944 at the Edgewater Beach Hotel in Chicago, three days following D-Day. It is somewhat surprising to note that there are no comments in the Meeting Transactions relative to the Normandy invasion.

It was typical to have a guest speaker deliver an address at the annual association dinner. The guest speaker for the 1944 meeting was Colonel Loyal Davis, M.C. from the faculty of the Northwestern University Medical School. He addressed “Experiences in England, Russia, and Africa.” Loyal Davis was one of the most prominent members of the American College of Surgeons in the twentieth century. He served as ACS president from 1962 to 1963 and he was also a founding member of the American Board of Surgery. The meeting incorporated a military program on the morning of the second day. This was the first military program presented at the AAST. The military program was abandoned in the years following World War II, but the value of such a session was recognized again and it was reestablished in association with the most recent wars in the Middle East.

The presidential address for this fifth annual scientific meeting was delivered by President Charles S. Venable, M.D. from San Antonio, Texas.¹¹ The address dealt with various aspects of operative fixation of upper and lower extremity fractures. Oddly enough, again, there was no mention of the war at all in his address. This is in stark contrast to the prior addresses. It is perplexing that in neither the transactions nor presidential address was the war mentioned, even though the scientific meeting provided the inaugural military program. Undoubtedly the war weighed heavily on the minds of the members, and it must have been a focus of their hallway conversations.

The AAST archives contain the agenda for the first military program:

THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA

SCIENTIFIC SESSIONS SECOND DAY

June 10th, 1944 Edgewater Beach Hotel, Chicago

MORNING SESSION – 9:00 o'clock

MILITARY PROGRAM

COLONEL GROVER C. PENBERTHY, M.C.

Seventh Service Command, Omaha, Nebraska

Chairman

13—Compound Fractures Seen in Training

MAJOR W.G. STANEK, M.C., and CAPTAIN WENDELL PETERSON, M.C.,

Winter General Hospital, Topeka, Kan. (by invitation)

14—Treatment of Fractures in the Combat Area

MAJOR BOARDMAN M. BOSWORTH, M.D.

Fourth Service Command, Atlanta, Georgia

15—The United States Army's Reconditioning of the War Wounded

COLONEL AUGUSTUS THORNDIKE, M.C.

Surgeon General's Office, Washington, D.C.

16—Discussion of the Repair of Cranial Defects with Tantalum, Including the Operative Technique, and the Procedure of Preparation of the Plate, and the Report of 11 Cases

MAJOR FRANK H. MAYFIELD, M.C.

Battle Creek, Michigan, and

CAPTAIN LOUIS LEVITCH, D.C. (by invitation)

17—Thoracic Injuries

JOHN ALEXANDER, Ann Arbor, Mich. (by invitation)

A note was made at the end of the 1944 Council meeting, "Note: - 1945 plans underway, before cancellation is directed by the government, to hold our annual meeting in New York." Thus, due to wartime exigencies, the 1945 meeting was cancelled.

1946

The sixth scientific meeting of the AAST meeting was held June 26–28 in San Antonio, Texas, at the Plaza Hotel. The war in Europe ended with the capture of Berlin and the subsequent German surrender on May 8, 1945. The Pacific Armistice was precipitated only following the two nuclear detonations in Hiroshima and Nagasaki. The Japanese surrendered on August 15, 1945.

The AAST presidential address was delivered by Grover C. Penberthy from Detroit, Michigan.¹² It is interesting to note in this address that once again, attention was directed to the war and the impacts on both medicine and surgery to war, and on war to medicine and surgery.

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Editorial

PRESIDENTIAL ADDRESS

ACTIVITIES OF A SERVICE COMMAND

SURGICAL CONSULTANT

GROVER C. PENBERTHY, M.D.

DETROIT, MICHIGAN

... In a peacetime setting this organization was founded in 1938 for the purpose of maintaining high standards for the care of the injured. In terms of accomplishment we have matured rapidly. Within less than four years after that date, of our membership, fifty-one to be exact, volunteered their services. Medicine in war is largely surgery of trauma and the society was well fitted to make a major contribution.

There is not time to recount all the contributions made by members of this society during the war. In war, no less than peace, this society has, through its membership, taken a place of leadership. I can best speak regarding the place of the Service Command Surgical Consultant because it was from the vantage point supplied by this position, that it was my privilege to view the results of our peacetime efforts in regard to the establishment of sound principles of care of the injured and the effects of the training afforded young surgeons.

Dr. Penberthy spoke about the Consultant service of the Army. He noted that it was set up in World War I and augmented in World War II. It is interesting to reflect on that collaboration of civilian and military medical personnel, and how those activities have been resurrected in our recent conflicts including the AAST involvement with the Visiting Surgeon program in Landstuhl, Germany:

...The War Department has recently authorized the continuance of the Professional Consultants in W.D. Circular 101, dated April 4, 1946, which reads as follows: "In order to insure the maintenance of the highest professional standards and to provide close liaison with leaders in the medical profession at large, a system of utilizing professional consultants developed by the Surgeon General during World War I will be continued and extended in the future. Consultants in internal medicine, surgery, neuropsychiatry, preventive medicine, dentistry, veterinary medicine and other special medical fields, will be designated by the Surgeon General.

At the termination of the address, Dr. Penberthy reminded us of the importance of continuing the military-civilian relationship after the war in order to maintain abilities for optimal care of the injured:

This society has reached the vigor of young maturity. It has been tried in the fire of war and has proven its worth. It is our obligation to continue in the progressive spirit of our youth as a society. The combat activities are over, but there are still challenging problems before us. Medical aspects of preparedness require that we continue to maintain high standards of training in our residency programs, to continue our interest in the service in order to improve the organization of the medical departments of the army and the navy, and to continue to develop and test fundamental concepts relating to the care of the injured.

ABDOMINAL TRAUMA

Pat R. Imes, M.D.

The scientific program was heavily weighted toward wartime experiences and this was the first meeting at which there was somewhat of a shift away from the more traditional orthopedic presentations to a broader variety of injury management. The paper I have chosen as the milestone paper for the 1946 meeting was presented as part of the military program.¹³ It was a report on abdominal injuries based on World War II experience:

This report is based on an experience in an Evacuation hospital during the Italian campaign and, after the end of the war, a comprehensive review of abdominal surgery in the Mediterranean Theatre. The Evacuation hospital series consisted of 412 cases with abdominal wounds of sufficient severity to require laparotomy, 358 of which have been previously reported. The review for the most part consisted of 3,154 cases cared for by the 2nd Auxiliary Surgical Group which was composed of surgical teams working chiefly in Field hospitals.

Dr. Imes made several interesting comments regarding injury management, many of which remain germane today. I have chosen a few areas that he addressed:

... Resuscitation. Since shock is so commonly associated with abdominal injuries and is the greatest single factor in the cause of death, its recognition and treatment before operative procedures are undertaken is imperative. Concealed hemorrhage and extensive peritoneal contamination greatly aggravate shock and render its evaluation difficult. It is a common observation that patients with extensive fecal contamination of the peritoneum exhibit a peculiar lack of response to measures of resuscitation.

Resuscitation consists for the most part of a restoration of the circulating blood volume by giving infusions of whole blood and plasma. It is generally appreciated that whole blood is more efficacious than plasma ... Emptying the stomach by use of a nasogastric tube facilitates resuscitation as well as the operative procedure. It is also an important measure in the prevention of pulmonary complications arising following aspiration of vomitus during anesthesia ... Duodenal injuries require mobilization of the viscus so that repair can be accurately effected without too great tension resulting on the suture lines. Failure to adequately mobilize the duodenum for finding and satisfactory closure of wounds will result in fistula with its disastrous consequences ... most wounds of the colon in War II were exteriorized. It is certainly the procedure of choice for an extensively damaged colonic segment and particularly if its blood supply is questionable. In the cases with less extensive injury, however, primary suture

of the colon may be satisfactorily accomplished with far less morbidity resulting than if exteriorized. The procedure to be employed therefore should largely depend on the extent of the injury.

... Chemotherapy. Since the advent of sulfonamides and penicillin, chemotherapy has been widely used in the treatment of abdominal trauma. Its true efficacy is as yet undetermined, but a decided impression prevails that it is beneficial. Whenever the patient survives for a sufficient period to receive adequate chemotherapy, rarely does death result from spreading infection.

Some thought-provoking discussion comments were made by R. Arnold Griswold of Louisville, Kentucky:

... In most of the large civilian series of gunshot wounds of the belly the mortality runs in the neighborhood of 50 per cent. Dr. Imes has shown us 400 odd cases with a mortality rate of under 30 per cent. Why is that? Some reasons have been given. One is that the man who has a serious wound, dies of hemorrhage before he ever gets to a hospital. In a large city the man gets to a hospital within thirty minutes ... Why are Dr. Imes' statistics better than the ones we see? There are several reasons. First, the large amount of blood used in resuscitation. Too often in civilian practice we give a patient a 500 cc. transfusion of blood and think we have given him a transfusion; 500 cc. of blood is a donor's dose and has nothing whatsoever to do with what the recipient needs.

The one lesson learned in the war is to give the patient the amount of blood needed to restore his physiology.

Anesthesia is another factor. It has enabled surgeons in the army to do transthoracic explorations of the wounds of the upper belly, which is the approach of choice if you have a competent anesthetist.

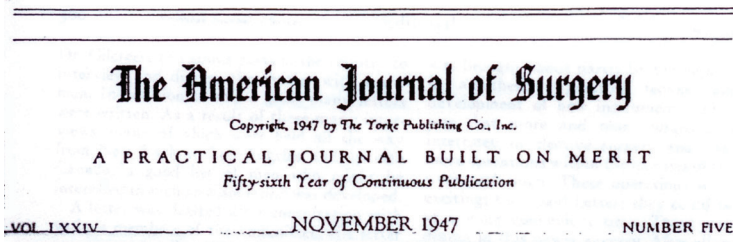
Another factor is better surgery performed up front in this war. That comes back to several factors. First, this war has shown the results of the residency system of training surgery in this country. We had large numbers of competent surgeons who came up through the residency system, who were able to go forward and do the kind of surgery that Dr. Imes has done.

Another factor is the thing that our President brought up in his address this morning, the result of a consultant system which functioned not only in this country but overseas, where men like Howard Snyder, Cutler and Churchill, were correlating the procedures, seeing that they were carried out and were seeing that the right man was in the right place to do surgery."

1947

The seventh annual session of the AAST took place in Atlantic City, New Jersey on June 5–7, 1947 at the Hotel Claridge. President Ralph G. Carothers, M.D., of Cincinnati delivered an exceptionally fine address.¹⁴ He began with a succinct but enjoyable description of the founding of the organization from a decade earlier. He went on to explain the rationale for the development of the AAST and the challenges that were met for adequate delivery of trauma care at the inception of our organization. Dr. Carothers was concise and direct in his observations

and his entire address would be worth reviewing today. The following are some of the more engrossing portions:



Editorial

PRESIDENTIAL ADDRESS

RALPH G. CAROTHERS, M.D.
Cincinnati, Ohio

... It was a very cold rainy day in December 1937, when a small group of us sat together at luncheon at the meeting of the Western Surgical Association in Indianapolis. Among those who are present were: Drs. Edgar L. Gilcreest, Eslie Asbury, William Cubbins, Arthur Metz and I. There may have been some others but I do not remember now who they were, nor do I remember just how the subject of trauma came up. However, it was evident that we who were sitting together were very much interested in that subject and were not getting too great a kick out of some of the other papers which were being read at the meeting we were then attending. The net result of the matter was that suggestions were made for the formation of an association such as we have today. As a matter of fact, we talked about it so much that we decided to hold another meeting the following week in Birmingham, Alabama, where the Southern Surgical Association was convening. At that meeting several more were added to our little gang, as it were, and we talked loud and long of the possibilities of forming the association.

... Now it may be interesting to the younger members here today to know why we were motivated to form such an organization. The reason was a simple one. We were interested in the surgery of trauma and most other surgeons were not. All of us were members of one or more of the older, well organized, surgical organizations and we had attended meetings regularly and enjoyed them very much. But we heard very little on the subject of trauma. In fact, this has been true for sometime ... However, at about the turn of the century before automobiles had become common and before the machine age of today, specialism began to appear in surgery. This was brought about partly by the improvement in anesthesia, operating technic and the development of new instruments. The result was that more and more surgeons became interested in elective surgery and more and more operations within the cavities of the body were performed. These operations were more exciting; they paid better; they could be done at a more convenient time ... the multiplication of instruments became so great that after a while it seemed impossible or at least improbable that anyone would master the technic of more than one or two specialties.

Now the development of the surgical specialties was, in many respects, a good

thing. The field was broadened to a tremendous degree. New surgical approaches to many old diseases which had proved incurable in the past were developed. A great deal of good came out of the movement. But there was one rather unfortunate phase of this trend, and that was as each specialty developed the proponents seemed to drop the trauma part of whatever organ or area they proposed to treat. One could hear the remark made on every hand, "Oh, I don't treat fractures, I turn them over"; "I don't handle those things, I don't want to go into court"; "I don't want to get called out at night"; "the best way to treat a fracture is to send it to your worst enemy."

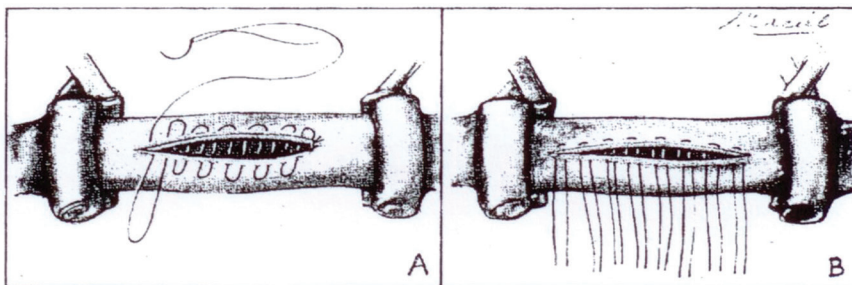
... Someday somebody will find something to do about cancer and it will probably not be a surgical operation. But there is left the repair of injury and that will go on as long as man goes on. An Association like this is settled for a long existence because it deals with the very fundamentals of surgery.

MANAGEMENT OF INJURIES TO LARGE BLOOD VESSELS IN WOUNDS OF VIOLENCE

Louis G. Herrmann, MD

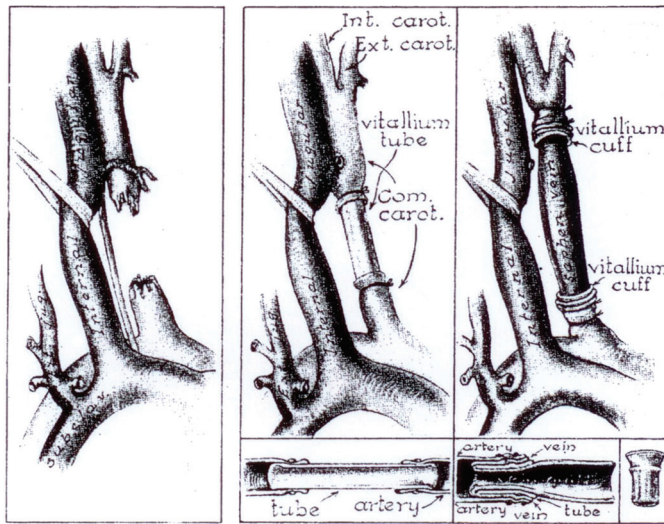
I chose this article because it demonstrated the ushering in of arterial reconstruction for management of vascular injuries.¹⁵ While the work of Alexis Carrel and others had begun nearly a half century earlier, most surgeons managing trauma had little experience with vascular reconstruction. This article clearly demonstrates the influence felt from surgical advances made during World War II. Herrmann was a founding father of vascular surgery and in this paper provides a nice primer for vascular injury management. It traces the evolution of that management over the course of the beginning to the middle of the 20th Century. This milestone article will be highlighted primarily through the illustrations and figures published in Herrmann's article.

The first figure illustrates the importance of eversion of the suture line in arterial repair:



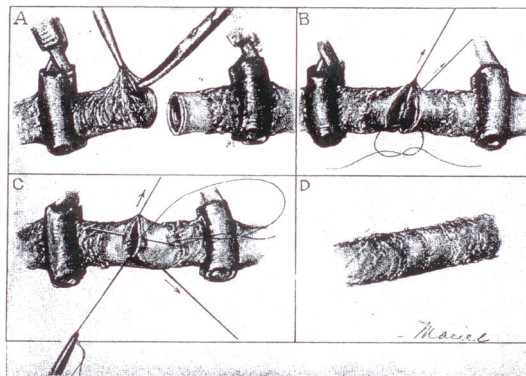
Methods of suturing large blood vessels. A, continuous "in-over-and-out" suture or reversed Connell suture. B, interrupted mattress sutures which cause an eversion of the edges of the vessel with firm approximation of the intimal lining of the vessel.

The second figure is quite fascinating by showing the application of temporary vascular shunts which were abandoned for many years. They have only recently been rediscovered and supported by experiences in the Middle East wars.

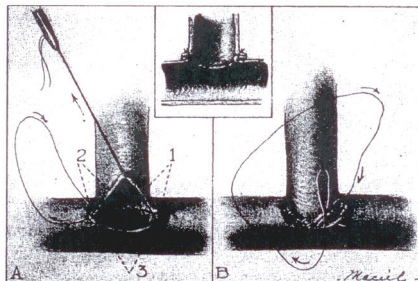


Destruction of part of the right common carotid artery by a bullet. Temporary reestablishment of cerebral circulation by using an unlined Vitallium tube (emergency measure). Final reconstruction of right common carotid artery by the non-suture method of transplanting a segment of saphenous vein to bridge the gap between the ends of the artery.

The following illustrations beautifully demonstrate essential vascular techniques that continue to be applied to this day. These illustrations remain appropriate for current vascular surgical education:



End-to-end anastomosis of blood vessels by sutures according to the method of Carrel. Note the removal of the adventitia of the artery in the vicinity of the suture line.



Method of end-to-side anastomosis of blood vessels by sutures. This is a triangular method using a reversed Connell or "in-over-and-out" type of suture. Note how the intimal surface is approximated without having the suture material extend into the lumen of the blood vessel. Fine silk on atraumatic needle.

1948

The eighth annual meeting was held June 17–19, 1948 at The Drake in Chicago. A noteworthy occurrence at the 1948 meeting was the presentation of Cotton's Hammer to the AAST by the first President, Dr. Kellogg Speed. In review of the transactions, I found this quite interesting because it is always referred to as a "replica" of Cotton's Hammer when used to adjourn the annual meeting. Besides not understanding the replica issue, I also really never knew who Cotton was or what the hammer was designed for. Dr. Speed's words from the presentation during the annual dinner evening of Friday, June 18th, cleared my confusion:

This gavel has a history. In 1929, when the Clinical Congress of the American College met in Chicago, I arranged for and put on at the County Hospital, Chicago, an entire day of practical presentations for the Surgery of Trauma. The men selected for this all-day clinic were my colleagues in a small group which had been meeting once a year in New York for their own edification and the betterment of treatment of fractures and other trauma.

... One of the most important demonstrations was done by our beloved Fred Cotton, chief among master exponents of the surgery of trauma. At that time he had recently brought out his "impaction" treatment of fracture of the neck of the femur -- in which, after manipulative reduction and portable x-ray proof of reduction, he advised and performed his famous "artificial impaction" of head and neck fragments, using the large wooden hammer he had devised for this purpose. He was furnished an unreduced fracture of the neck of the femur, which he skillfully reduced and then impacted by striking three or four blows over the well-padded trochanter of the femur.

For this exhibition he used a replica of his own hammer which I had made and had used in the hospital for some time. This is Cotton's hammer, used by Cotton himself and now to pass into the keeping of the American Association for the Surgery of Trauma.

It seemed fitting that it should carry a lasting, non-corroding metal identifying plate, which would remain neutral in human tissue or in a wave of salty tears from the presiding officer. Consequently, through the friendly cooperation and generous assistance of the Austenal Company, an engraver vitallium plate -- an alloy introduced into surgery by our own member, Charles Venable -- has been firmly embedded in Cotton's hammer to tell its identity and remain intact in spite of the hardest beatings."

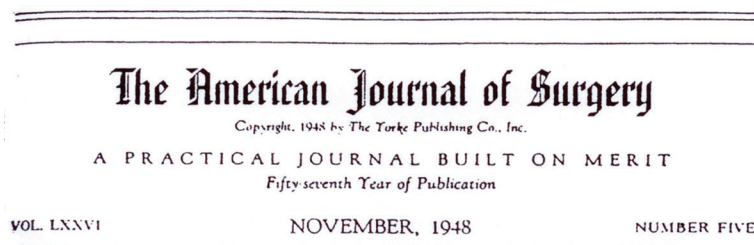
The legend reads, "Replica of Cotton's hammer, presented to the American Association for the Surgery of Trauma by Kellogg Speed, the first President, in June 1948."

So, it turns out that Cotton's hammer was really a practical instrument to impact fractures of the neck of the femur and, in fact, while it's called a "replica," Cotton's hammer was indeed used by Dr. Fred Cotton during the exhibition to illustrate its use for impaction. So, when you see Cotton's hammer used to adjourn the AAST meetings, remember that the hammer was, indeed, used by him in 1929.

The annual dinner address was "Nature of Trauma in Atomic Warfare" by Austin M. Brues (medical director of Argon Medical Laboratories).¹⁶ The post-World War II era ushered in a national obsession with the fear of nuclear war that I can recall from my childhood. It was

time of building bomb shelters by ordinary American families across the country. The consequences of atomic warfare became evident because of the tragedies resulting from the atomic bombing of Japan in World War II. That, combined with the advent of Cold War, occupied a central place in American consciousness for the remainder of the twentieth century.

President Casper F. Hegner's address was the earliest talk concerning the development of emergency medical systems and a harkening to the development of trauma centers and trauma systems.¹⁷



Editorial

PRESIDENTIAL ADDRESS

CASPER F. HEGNER, M.D.
Denver, Colorado

... The efficient care of the wounded is the only humanizing influence of wars. The care of the wounded by the Allies attained the ultimate in the late war.

Wars have taught that the surgery of traumatic conditions is not a specialty per se. It is basic. It is the vital part of every surgical specialty. It encompasses the whole body, covers every tissue, every system, every cavity.

... This compels the organization of an effective overall program of safety first: popularize first aid classes, demand greater consideration and stress in teaching fundamental principles of surgery and medicine in all medical schools, stress competent supervision of the training of students and residents in receiving and accident wards, make county, community and regional hospitals more accessible and provide qualified regional expert consultation service in order to avoid the appalling increase in casualties which are largely preventable, to reduce suffering, loss of time, disability, deformity and death.

We must be alert and become belligerently aggressive if we are to justify the function and purpose of our Organization. Our duty is clear, the task is great and the program formidable. With unity of purpose, we can accomplish great things for surgery and the better service for mankind.

PERFORATION OF THE SMALL INTESTINE FROM NON-PENETRATING ABDOMINAL TRAUMA

Boardman M. Bosworth, MD

This is one of the earliest reports of a significant number of cases of blunt small intestinal injury. Bosworth reports on 81 cases—a large series even by today's standards.¹⁸ Only 30% of these were from automobile accidents with the remaining being a wide variety of blunt mechanisms

from athletics to industry to agricultural accidents. There were two important findings. First, only 41% had free air on x-ray, a revelation at the time. The second major finding was the importance of early operation, noting rising mortality when time from injury to repair increased.

TABLE V
ROENTGEN EXAMINATION FOR AIR BENEATH THE
DIAPHRAGM

Size of Perforation	Air Shown	Air not Shown	Total Cases	Percent- age of Cases in Which Air Was Shown
Large tears..... (more than 1.5 cm.)	5	4	9	44.4
Small tears..... (1.5 cm. or less)	8	15	23	34.8
Size of tear not stated.....	3	4	7	
Total Cases.....	16	23	39	41.0

CONCLUSIONS: Perforation of a hollow viscus must be suspected when there is persistent abdominal pain, spasm and tenderness, with or without nausea and vomiting, subsequent to severe trauma to the abdomen. If these signs persist for six hours, exploratory celiotomy should be performed forthwith, regardless of failure to find free air in the peritoneum by roentgenography. Under such circumstances reasonable suspicion, as in acute appendicitis, not only justifies but demands immediate operation. The dangers of delay are far greater than the hazards of surgery.

1949

The ninth annual meeting was held in Atlantic City, New Jersey June 2–4, 1949 at The Marlborough-Blenheim. The title of the address at the annual banquet on June 3rd provides a sobering remembrance of the delayed impacts of warfare on our young military veterans. Howard A. Rusk, professor of rehabilitation and physical medicine and chairman of the department at New York University delivered the address “Living with What’s Left.”¹⁹

The presidential address delivered by Dr. Paul B. Magnuson is spectacular.²⁰ He was an older surgeon who entered the profession prior to the formalization of Halstedian surgical residency programs. The address reflects on his entry into “trauma surgery” early in the twentieth century. He retraces his practice and the evolution of trauma care over the ensuing years to the point of mid-century and reflects on the advances made. I suspect that I especially enjoyed this because his early career began in Chicago, which was the location of my college and medical school education at Loyola University. Some of the locations and descriptions of the areas for his practice as well as his association with Dr. John B. Murphy, his mentor, and the advice he received strike a chord (Murphy was one of the giants in American surgery and a founder of the American College of Surgeons). Reading the presidential address provides a feeling for the cultural and medical conditions in Chicago in the early twentieth century. It was a hardscrapple time and the life of the working class was especially arduous:

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Editorial

PRESIDENTIAL ADDRESS

PAUL B. MAGNUSON, M.D.

Washington, D. C.

... When I decided to open my own office, I discussed the matter with Dr. Murphy who advised locating in the stockyards district. Those of you who know Chicago know what Halsted Street was and is. He said that for one interested in bone and joint surgery the industrial district was the place to obtain experience and he was right. I had a further incentive for wishing to blossom out on my own. I wanted to marry the girl to whom I had been engaged for some time and I thought there would be more prestige in having my own office than in being an assistant, even to John B. Murphy. She was in complete agreement with this. We therefore combed the stockyards district, riding up and down Halsted Street by trolley car until we came to Root and Halsted. There was plenty of activity at that corner and we thought that this was a good place so we looked for a location and finally selected the two rooms over the saloon on which the rental was \$35 a month, which was a lot of money.

... The first patient who came in was Mike McKenney, bless him, and I shall never forget that name. Mike had a fissure fracture of the patella. I knew enough about the knee joint to decide the ligament was intact and he probably would get well if I kept my hands off. But it was a fractured patella. It happened that two railway employees had had fractured patellas, one two years and one three years before. Both had been operated upon and were still laid up. I did not operate on my patient but applied adhesive strapping and a posterior splint and turned him loose. He walked from one end of that district to the other telling them what a great man I was. When he got well and was able to return to work in eight weeks or so my reputation was made. The grapevine works well in a self-contained district such as the yards. The other two men were still laid up.

... In those days the saloons were open twenty-four hours a day, with a bartender or two always on duty. I decided to ask my landlord, the saloonkeeper, whether I might have an extension telephone run from the bar to my office. This was agreeable to him and I thought this took care of the situation, in part at least. However, business still had to be drummed up so in odd moments it was necessary to contact the timekeepers in the various plants. These were the key men so far as accidents were concerned and most of them were willing to call me when the company doctor could not be reached. I told them there was twenty-four-hour telephone service at my office and there was. The bartender who took the call would say that I had stepped out for a few moments and to send the patient over. Then he would phone me at Mercy Hospi-

tal, about 1 1/2 miles away, and I would dash out in my little two-cylinder automobile (some of the old-timers may remember them) and take care of the patient.

... The type of surgery performed forty years ago was extremely crude by present standards. So far as I can remember we had no anesthetics except chloroform, ether and nitrous oxide. We had no facilities for transfusions, no intravenous salt or glucose solutions nor any of the other adjuncts we take for granted today.

... X-rays were far from adequate. Hollis Potter had not yet designed the Potter-Bucky diaphragm and an x-ray of the spine looked like a snowstorm. At times the outline of the spine could be seen vaguely but in a fat person even that was almost impossible.

.... I had designed a motor-driven saw the year I graduated from medical school; Albee's came out about the same time. The saw required careful handling and was tricky but worked well. One of my good friends who had seen me use it asked if he might borrow it for a bone-grafting operation. I loaned it to him and in the process of getting the graft out the saw whipped around and cut off his interne's finger. So far as I know he has never used a motor-driven bone saw since that day and much prefers to take out the graft with chisels.

... Then, about 1914, the compensation laws were enacted in Illinois and for several years they were in operation without having a medical director. Incidentally, these laws were fought tooth and nail by employers as well as by the medical profession.

... The insurance companies came into the picture because they found that safety measures saved money. There were no safety devices on machines. It was long before workmen were required by law to wear goggles when operating grinding machines. There were no rules against kicking over a draw bar with the foot, with the hazard of catching the foot in the machine. In one week I performed seven amputations for one company, which shows the terrific chances these men took.

... Fractures of all types were treated abominably prior to 1922 when the Fracture Committee of the American College of Surgeons was formed. This Committee has been largely instrumental in the education of the general practitioner throughout the country.

... The mining companies got together and built the hospital and secured a fairly well trained staff. They have decided that it is better to give good medical treatment than to pay what may be assessed against them by the Industrial Commission.

I did not start out with the idea of giving you a learned dissertation and I am sure you will agree that I have not done so. I have merely related some of my own experiences in the evolution of industrial surgery, the surgery of trauma. To some of the younger men in this group the conditions with which we had to deal forty years ago may seem inconceivable. The progress that has been made in the last fifteen years alone has been astonishing.

ANALYSIS OF THE MANAGEMENT AND COMPLICATION OF MULTIPLE (THREE OR MORE) RIB FRACTURES

Duncan A. Cameron, MD, Paul V. O'Rourke, MD, and Charles W. Burt, MD

This paper was chosen because it was one of the earlier analyses of serious rib fracture patterns.²¹ It demonstrates the advancement of rib fracture management. It also shows that the

pathophysiology of pulmonary contusions was just beginning to be understood:

...We have analyzed a series of 109 cases of multiple rib fracture. These are consecutive cases treated by both the orthopedic and the general surgical services ... All were admitted to the hospital for an average stay of ten days The twelfth rib is least likely to be fractured. This is followed by the first, eleventh and then second. The fourth through the tenth are quite exposed and are very frequently injured.

... Immobilization of rib fractures is not feasible. Any method which achieves immobilization will do more harm than good by restriction of respiratory movement. We have abandoned all forms of strapping and our therapy now consists of reduction of pain by intercostal blocks, observation for complications in hope of preventing their full development and supportive therapy.

However, paradoxical respiration due to flail chest demands rib immobilization. Milder instances may not require fixation but severe forms constitute a threat to life. A number of devices have been utilized to lessen paradoxical excursions. We use a single-pointed cervical tenaculum. This instrument has proven most satisfactory in the common type in which the sternum is the mobile fragment. The instrument can be easily introduced into intercostal spaces and a good grip on the sternum obtained. One or more instruments are introduced and with 5 pounds of traction the excursions are materially lessened. We claim no originality for this method. Doubtless others have devices equal to this in every way. We have encountered one case of chondritis.

More will be said later about intercostal block but we use this as frequently as necessary to relieve pain. It affords more comfort to the patient when properly performed than any combination of drugs, and often one block will suffice. We avoid drugs which will depress cough for coughing must be encouraged. Expectorants, steam inhalations and nasal oxygen are useful.

... Wet lung. This inclusive and descriptive term which many authors have employed we have accepted to mean an abnormal accumulation of fluid in the lung. Some synonyms used are traumatic pneumonitis, patchy atelectasis, bronchopneumonia, pulmonary congestion and infarction, but a distinction between these terms is impossible. De Takats has experimentally produced it by chest wall trauma, pulmonary embolism and abdominal trauma and considers that wet lung is due to reflex motor and secretory stimulation of the bronchial tree. Thus intercostal block may not only relieve local pain but also break up a reflex arc. In chest injury such as we are considering, blood aspirated material, upper respiratory infections, cardiac failure and unconscious states are contributory factors.

Thirty-nine or 35 per cent of all our patients had wet lung. In this instance clinical evaluation is fully as important as roentgen findings. Clinically a "wet" respiration, ineffectual cough, rales, dyspnea and cyanosis are apt to put in their appearance singly or combined. Cough is shallow and poor in quality. Due to pain, respirations are rapid and shallow and there is often low-grade fever.

... We regard "wet" lung as a complication which may have serious implications. It interferes with gaseous exchange as evidenced by cyanosis.

... Strapping devices and narcotics which were so widely accepted in the past are out of place in the general treatment of rib fractures. We were interested to find a report of bilateral edema of the legs and ankles following strapping of the chest. This disappeared within twenty-four to forty-eight hours after removal of the tape.

The authors very interestingly pointed out the importance of pain control in the use of intercostal blocks. I was surprised that such therapy was understood and promoted at that point in time. There is also a humorous comment about the management of “difficult patients”:

...Wet lung may be actively and aggressively treated. The patient made comfortable by intercostal blocks must then cough. Patients may have to be cajoled, threatened or assisted, but persistence usually pays dividends. If productive cough cannot be obtained, tracheal aspiration or even bronchoscopy must be employed. Nasal oxygen and penicillin are frequently of value.

... SUMMARY. ... Both the shortcomings of x-rays and the necessity of obtaining serial x-rays are stressed ... These patients presented an imposing array of associated injuries which serves to emphasize that trauma is a general surgical problem and that a thorough, systematic examination is necessary. Ruptured diaphragm is discussed ... Our general program for treatment of fractured ribs is presented, emphasizing the importance of intercostal block and avoidance of restrictive dressings and cough depressants ... The fixation of the “stove in” chest is discussed ... Intrathoracic complications may be anticipated in two-thirds of all cases of multiple rib fracture ... The causes and treatment of wet lung are discussed at some length ... The incidence, treatment and sequelae of hemothorax, pneumothorax and emphysema are discussed. It is important to remove blood completely from the pleural space and to institute prompt measures for the re-expansion of collapsed lung ... This series had a 10 per cent mortality. Delayed hemorrhage is a definite hazard and wet lung is an important contributory cause.

Of course, rib fixation and intercostal blocks have come around again. Trauma is, indeed, a “general surgical problem.”

I thoroughly enjoyed reviewing the first decade of the AAST, and sincerely thank President Robert C. Mackersie for inviting me to do so.

ACKNOWLEDGEMENT

Figures and tables in this chapter originally appeared in *Surgical Clinics of North America*² (table, p. 92) and *The American Journal of Surgery*^{4,6,10, 15, 18} (tables, pp. 94-95, 107-108; figures, pp. 102, 115-116) and are reproduced with permission of Elsevier.

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THE 1950s

DAVID V. FELICIANO, MD, BASIL A. PRUITT, JR., MD,
AND GRACE S. ROZYCKI, MD, MBA

OVERVIEW OF THE DECADE

In 1945, former British Prime Minister Winston Churchill said, “The United States stand at this moment at the summit of the world.”¹ During the 1950s, America was the world’s strongest military power and its economy was growing. A greater variety of consumer goods was available to more Americans than ever before, the gross national product more than doubled, and investments were being made in the country’s infrastructure, transportation, and new technology.

Rates of unemployment and inflation were low, wages were high, and optimism about America abounded leading to the so-called “baby boom.” But the 1950s were also an era of great conflict, as the civil rights movement exposed the underlying divisions in American society. Other defining elements of the 1950s were the Korean War (June 1950 – July 1953) and tension between the United States and the Soviet Union, known as the Cold War. Western leaders began to worry about the spread of communism, and this idea shaped American foreign policy for decades.

The 1950s were also a period of significant medical advancements including, but not limited to, the following: the polio vaccine (Dr. Jonas Salk, 1952); first cardiac pacemaker (Dr. Paul Zoll, 1952); the heart-lung machine (Dr. John Gibbon, Jr., 1953); the development of coronary angiography (Dr. Mason Sones, 1958); the chemical synthesis of penicillin (1957); the

employment of ultrasound for prenatal care; and the “cure-all” vaccine to prevent diphtheria, polio, and whooping cough (1959). The field of trauma surgery was no exception to advancement in the care of the critically injured patient, with the Korean War and increased automobile travel fueling the research.

1950

The meeting in 1950 was held in June at the Hotel Utah in Salt Lake City, Utah. There were 30 presentations, including 15 on orthopedic injuries and surgery, several from other specialties, one on military casualties, and the presidential address by Gordon M. Morrison of Boston, Massachusetts. Among the orthopedic papers was the report of Walter G. Stuck and William S. Dandridge entitled “Uses of Refrigerated Bone on a Large Fracture Service” in which they reported their use of homogenous frozen bone in 60 patients with war injuries treated at Brooke General Hospital beginning in February 1948.² Frozen bone, best used as “barrel stave” grafts placed around the bone of concern, was applied in the repair of 33 un-united fractures, 13 repairs of joints, 12 repairs of fresh fractures, and the filling of bone defects in two patients. Graft failure was noted in only four (6.6%) of treated patients. The second paper of broad clinical interest was authored by John Raaf and Kenneth Swan entitled “Traumatic Carotid-Cavernous Sinus Aneurysm.”³ The investigators reported the treatment of five patients who sustained traumatic brain injury and subsequently developed carotid-cavernous sinus aneurysms. The initial treatment was the ligation of the common carotid artery (under local anesthesia) and ligation of the external carotid artery only if the bruit persisted. In refractory cases, intracranial clipping of the internal carotid artery and the ophthalmic artery with extirpation of ophthalmic veins were employed. Using this treatment algorithm, the authors demonstrated good patient outcomes with only one extracranial ligation needed.

In his presidential address, Dr. Morrison reflected on the purpose of the association, achievement of its goals, and future directives.⁴ He recounted that through its annual meetings, the organization has been successful in its goal to disseminate knowledge that would improve the care of the injured patient. Further, the high quality work presented and subsequently published in surgical journals attracted many non-member guests and members of the armed forces, hence having “a constructive influence on the surgery of trauma.” He emphasized the numerous contributions made by the organization’s members during World War II, especially in the areas of hand, orthopedics, and thoracic surgery, and how this knowledge was translated to improved care for civilian casualties. In the final part of his presidential address, Dr. Morrison called for an expansion of the geographic distribution of membership, encouragement for the young surgeon (the future of the association), support for research, especially to better care for the injured patient’s co-morbidities, and a continued effort to improve the quality of the annual meeting’s scientific program.

1951

The meeting in 1951 was held at the Seignory Club in Montreal, Canada. There were 37 presentations, including 16 on orthopedic injuries and surgery, five during a “Symposium on Vascular Problems,” and the presidential address by R. Arnold Griswold of Louisville, Kentucky. In addition, there was an evening movie session with four films on orthopedic injuries and a round table discussion on “Vascular Injuries and Vascular Surgery.” The list of AAST members included many of the “giants” of American surgery at the time as follows: Sterling Bunnell (hand), Warren Cole (oral cholecystogram), William T. Fitts, Jr. (Fitts Lecture), R. Lee Clark, Jr. (later, M.D. Anderson Hospital and Cancer Center), Oscar P. Hampton, Jr. (orthopedics), Jere Lord (vascular surgery), Carleton Mathewson, Jr. (founder), Frank H. Mayfield (neurosurgery), John E. Raaf (neurosurgery), I.S. Ravdin (University of Pennsylvania; World War II), and Preston A. Wade (orthopedics). Among the honorary fellows were Kellogg Speed, president, 1938-1939, and Rudolph Matas of New Orleans.

The CLASSICAL paper at this meeting was by the legendary Fraser N. Gurd of McGill University and was entitled “Management of Shock and Convalescence in the Elderly and Infant.”⁵ Echoing comments that would be made in a CLASSICAL presentation by Scalea et al⁶ on trauma in the elderly at the meeting in 1989 (see chapter 10, p. 188) nearly 40 years later, Gurd stated: “In the first place, resuscitation from the shock state is more difficult and dangerous, due primarily to the earlier onset of fatigue in the autonomic nervous system, the endocrine system and the myocardium. In the second place, the likelihood of serious visceral damage taking place is very much higher than in the younger individual.” Dr. Gurd went on to emphasize that shock-induced anoxia would lead to “tubular damage in the kidneys and congestive changes in the lungs.” Recognizing the “chronically diminished blood volume in the elderly and malnourished,” and that “blood loss even from closed fractures may be very considerable indeed,” Gurd emphasized that “blood transfusion becomes the most important preventive of circulatory collapse.” In the remainder of this paper, preoperative transfusions in patients with fractures and the recognition that transfusion improves plasma oncotic pressure (thus decreasing the risk of pulmonary edema) are emphasized—two principles that remain true today.

The presidential address by R. Arnold Griswold was entitled “Surgical Teaching Hospitals.”⁷ Griswold emphasized that the newly-developed “health insurance plans” were having an effect on “residency clinical material.” “Many endowed institutions have been forced by financial pressure to admit more private and fewer house patients.” He lamented that university teaching hospitals “may be heavily loaded with patients representing the current research interests of the senior staff or their reputations for performing difficult but unusual operations.” He went on to emphasize the importance of a university-based surgical training program to have “at its disposal a city or county hospital in a metropolitan center” as “the large amount of acute surgery, particularly trauma, in such hospitals is of inestimable value.” Other comments emphasized the importance of affiliating with Veterans Administration hospitals and community hospitals as well. Once again, his final comment is as true today as it was in 1951: “Successful integration of residency programs requires thoughtful study and planning and a

genuine cooperative spirit on both sides but, when attained, pays off handsomely in mutual benefit.”

1952

The meeting in 1952 was held at the Hotel Biltmore in New York City. There were 36 presentations, including 19 on orthopedic injuries and surgery, five during a “Symposium on Fundamental Problems Associated with Skeletal Injuries,” and the presidential address by Arthur R. Metz of Chicago, Illinois. Some of the notable presenters included Kellogg Speed (president, 1938-39), Charles G. Johnston (president, 1956-1957), Harrison McLaughlin (president, 1960-61), William T. Fitts, Jr. (president, 1964-1965), Sawnie R. Gaston (president, 1969-1970), Brigadier General Sam F. Seely (vascular trauma), Francis D. Moore (metabolism), and Frank Glenn (biliary tract surgery and abdominal trauma).

The CLASSICAL paper at this meeting was by John P. North of McKinney, Texas, and was entitled “A Middle Course in Blood and Fluid Replacement in Trauma.”⁸ While this paper preceded the classical work by Shires et al⁹ by 12 years, it emphasized the need for resuscitation with both Ringer’s lactate and blood in a patient with multiple intra-abdominal injuries. The author stated that there was “obviously also a severe deficit of extracellular fluid from displacement of fluid to the traumatized area. The clinical manifestations of blood and salt deficiencies are in general indistinguishable and their correction must therefore proceed simultaneously.” Following this statement he referenced Carl Moyer’s book, *Fluid Balance*, published in the same year.¹⁰ This interesting paper was preceded by a progress report on “The Plasma Substitutes” by Brigadier General Sam F. Seeley from Walter Reed Army Hospital that discussed dextran, polyvinylpyrrolidone (PVP) and gelatin.¹¹ The North and Seeley papers generated a vigorous discussion initiated by future President William T. Fitts, Jr. (1964-1965), and the crystalloid versus colloid debate continues to this day.

The presidential address by Arthur R. Metz was entitled “The Future of the Treatment of Trauma.”¹² Dr. Metz reviewed the data in the National Safety Council’s *Accident Facts, 1952*. He noted that there were 94,000 accidental deaths and that accidents were the leading cause of death in the age groups 1–5, 5–15, 15–25, and the second leading cause in the age group 25–45. In contrast to the modern era, heart disease was the leading cause of death in the country in the age group over 25 years and in all other older age groups. Dr. Metz argued that the answer to future trauma care was “to organize a Board for the Surgery of Trauma – with this Association as the Founder Group – along with the cooperation of the American Board of Surgery and the other Boards dealing with surgical problems...” In addition, he stated that “we should seek to develop in the Department of Surgery of all Class A Medical Colleges, a sub-department for the teaching of the Surgery of Trauma.” We’re still working on his first recommendation 61 years later.

1953

The meeting in 1953 was held at the Drake Hotel in Chicago, Illinois. There were 36 presenta-

tions including 10 on orthopedic injuries and surgery, and the presidential address by Martin C. Lindem of Salt Lake City. Reflecting on the lessons learned in the just-completed Korean War, there were papers on massive transfusion (“20–30 pints of blood”), vascular repair at battle front hospitals, and “traumatic wet lung.” Of interest, the Edward D. Churchill Lecture, later to be given at the Spring Meeting and then the Clinical Congress of the American College of Surgeons, was presented at the meeting by Carl A. Moyer of St. Louis.

The CLASSICAL paper at this meeting was by Brooke Roberts, William T. Fitts, Jr., and I.S. Ravdin of the University of Pennsylvania and was entitled, “Treatment of Thermal Burns: A Ten-Year Progress Report.”¹³ The authors described the treatment of burn shock using the Evans formula (1952). This formula gave colloids including blood (volume in first 24 hours = $\text{kg} \times \% \text{ total body surface area with second- and third-degree burns}$) plus an equal amount of isotonic salt solution plus 2000 mL 5% glucose. As per modern formulas, one-half of the fluid requirements were given in the first eight hours of resuscitation. Of interest, the authors stated that “the more severe burns are probably best treated by giving at least one half of the colloid solution in the form of whole blood.” Reflecting on the “cold war” mentality of this time, the authors stated the following: “Faced with an atomic war, we could not supply the desired quantities of blood and plasma for the treatment of burns. It is in such a situation that the plasma expanders—dextran, PVP and gelatin—would have great value” (see discussion of 1952 meeting). The management of the burn wound involved a review of open versus closed treatment, early excision, and use of homologous skin and enzymatic debridement of the burn. This brief, but comprehensive, manuscript concluded with discussions of nutritional support, infection control, and the unique combination of burns and fractures. Further allusions to an “atomic war” were described in the sections on open versus closed treatment and on “the problem of infection.”

The presidential address by Martin C. Lindem was entitled “Progress in Trauma Teaching.”¹⁴ Dr. Lindem briefly reviewed the accomplishments of the AAST during its first 15 years and returned to an issue described in his predecessor’s presidential address:

The certification of surgeons qualified to treat injured people will soon be realized, as you will hear through proper channels. Most certainly you will approve that the American Board of Surgery assume the responsibility of the issuance of certificates to candidates who have credentials and exhibit practical and adequate training and proficiency in trauma care. It is proposed that candidates first have earned the qualifications of the American Board of Surgery or its equivalent.

Later in his address, Dr. Lindem reviewed the general principles of trauma to be taught to trainees. These included “General or Constitutional Implications of Traumatic Wounds,” “General Principles for the Treatment of Wounds,” “Program of First Aid Procedures for the Hospital Emergency Room,” and “Tools of the Emergency Room”—i.e., the first nonmilitary trauma curriculum.

1954

The meeting in 1954 was held at the Claridge Hotel in Atlantic City, NJ. There were 34 presentations including 14 on orthopedic injuries and surgery, a “skit” entitled “The Teaching of Trauma by the Conference Method,” and the presidential address by Dr. Eslie Asbury of Cincinnati, Ohio. President Asbury spoke at the Friday night banquet as well, and his address was entitled “Breeding a Kentucky Derby Winner.”

The CLASSICAL paper at this meeting was, once again, by I.S. Ravdin and M.A. Casberg of the University of Pennsylvania and was entitled “A Second Look at Surgical Care in Major Catastrophes.”¹⁵ This review focused on lessons learned in the Korean War, where Ravdin stated that only two of every 100 wounded died (excluding those killed in action. He emphasized that severe hemorrhage mandated the administration of “low titer O blood for there will be no time for typing, cross-agglutination and the other tests that are commonly employed in well conducted hospitals and laboratories.” When there are mass casualties, Ravdin stated that “plasma expanders” (colloids) would have to be used. Also, he emphasized lessons later repeated during the Iraqi and Afghanistan Wars, namely, “to splint extremities, to stop hemorrhage, to apply tourniquets and to dress wounds with a temporary sterile dressing.”

For combat wounds, he emphasized “extensive debridement and early institution of adequate antibiotic therapy” and that “aureomycin and terramycin inhibit the growth of clostridial organisms in the lowest concentrations of any of the antibiotics now available.”

He reviewed the impact of the “vest of nylon armor which weighted about 8 pounds... [which] provided a degree of protection against flying missiles but also against small arms fire.” He stated that “68 percent of all missile hits on armored vests worn in combat were deflected.”

Finally, he noted that the Korean War totaled “over 400,000 patient evacuations with only five deaths due to transportation accidents.” He summarized that a “comfortable and rapid evacuation of the severely wounded man plays a major role in the prevention of shock and permits an early surgical attack on the traumatic problem at hand.”

The presidential address by Eslie Asbury was entitled “The Breeding and Care of a Great Surgical Society.”¹⁶ This short history of the AAST described a conversation that Drs. K. Speed (president, 1938–1939), E.L. Gilcrest (president, 1939–1940), R.G. Carothers (president, 1946–1947), and E. Asbury had at the meeting of the Western Surgical Association in 1937. Only one paper on “hip pinning” (by Dr. Asbury) was presented at that meeting, and the four future AAST presidents recognized “that many respectable surgeons and orthopedists looked down on this work” (care of the injured patient). He then described the “hard work” in getting the organization started, the aims of the founders, and the future goals of the association including its relationships with other major surgical and medical groups.

1955

The meeting in 1955 was held at the Drake Hotel in Chicago, Illinois. There were 40 presentations including 13 on orthopedic injuries and surgery and the presidential address by Robert

H. Kennedy of New York City. The growing academic importance of the association was emphasized by the prominence of many of the presenters. Examples included Curtis P. Artz on “Mass Casualties” and on “Burns,” Francis D. Moore and David Hume on “Adrenal Cortical Function in the Severely Burned Patient,” S. Arthur Localio on “Healing Wound,” Frank Glenn on “Traumatic Injuries to the Biliary Tract,” J. Maxwell Chamberlain on “Stab Wounds of the Heart,” and Eugene L. Jewett on “Femoral Neck Fractures.”

The CLASSICAL paper presented at this meeting was by the legendary Frank Glenn of Cornell and New York Hospital in New York City and was entitled “Injuries to the Liver and Biliary Tract.”¹⁷ This was essentially a review article (“we do not have at hand actual data from significant series of cases”) that described the following: incidence (again, no numbers or percentages given), diagnosis, physical examination, preparation for operation, and operation. Dr. Glenn emphasized “temporary compression of the portal vein, if there is active bleeding from the liver”; suture hepatorrhaphy; absorbable hemostatic sponge material; removal of injured gallbladders; wide drainage of hepatic injuries; and T-tube drainage after repair of lacerations of the extrahepatic ductal system. While comprehensive, this paper was somewhat generic in its recommendations and modestly referenced.

The presidential address by Robert H. Kennedy was entitled, “Problem Areas in the Surgery of Trauma.”¹⁸ This address was a broad overview of trauma in the United States at the time. There were comments about improvements in car design (“doors that will not be thrown open on impact at 35 miles an hour, steering wheels that do not crush the chest, safety belts and padded panels”) and the need for preparation for mass casualty situations. Legislative needs (“as regards inflammable clothing”), educational needs for medical students (“trauma cuts across all fields of medicine and surgery”), improved training of surgical residents (“all surgical residents are exposed to the diagnosis and care of many varieties of trauma”) and a “trauma service in a teaching hospital” were all discussed. This enlightened address closed with discussions about *not* admitting multi-injured patients to orthopedic surgery services, the effect of compensation insurance and the importance of rehabilitation for injured patients after discharge. It is recommended that modern leaders in the AAST and other trauma organizations read this address from 57 years ago.

1956

The meeting in 1956 was held at The Biltmore Hotel in Santa Barbara, California. There were 37 presentations including six on orthopedic injuries and surgery, a symposium on “Trauma Incident to High-Speed and High-Altitude Flying,” and the presidential address by Warren H. Cole of Chicago, Illinois. Two of the highlights of the meeting were presentations by Colonel John P. Stapp of the U.S. Air Force. During the symposium, Col. Stapp spoke on “Human Tolerances to Deceleration.”¹⁹ This talk was presumably based on his own experiences as one of several experimental subjects riding a rocket-propelled decelerator sled at Muroc Air Field (now Edwards Air Force Base), California, from 1948-1951.²⁰ His second talk was presented at the Friday night banquet and was entitled “Crash Protection in Automobiles.” This talk

was presumably based on his extensive research experience with restraint devices in military aircraft and his interest in restraint devices for cars. Of interest, Col. Stapp worked at the National Highway Traffic Safety Administration during the last several years of his 26-year career in the U.S. Air Force.²¹

The CLASSICAL paper presented at this meeting was by George C. Morris, Jr., Oscar Creech Jr, and Michael E. DeBakey from Jefferson Davis Hospital/Baylor University College of Medicine (later, Baylor College of Medicine) in Houston and was entitled “Acute Arterial Injuries in Civilian Practice.”²² None of the authors was a member of the AAST, but all had leading roles in Baylor’s development as a cardiovascular center in the 1950s. In this group of 136 patients treated over seven years, lateral repair or end-to-end anastomosis (n=79) or insertion of a homograft (n=14) were performed in 93 patients. Seven amputations were necessary in this group, and three patients died. Ligation of the injured artery was performed in 32 patients, five amputations were necessary, and two patients died. The remaining patients were explored only (n=4) or exsanguinated before a repair could be performed (n=7). This comprehensive and early review of civilian arterial repairs continued the change from arterial ligation as practiced for most injuries in World War II to the emphasis on arterial repair as practiced during the Korean War. Morris et al¹⁹ concluded that “immediate repair of acute arterial injuries by simple suture, or resection and anastomosis or homograft replacement, as indicated, may be expected to produce excellent results.”

The presidential address by Warren H. Cole was entitled “Mechanisms and Obligations in the Teaching of Trauma.”²³ This was a review of the set-up, personnel, and case load in the emergency room at Illinois Research Hospital. What Dr. Cole described was a surgical emergency room that functioned as a triage center as well. He reviewed the care of 1,774 patients with trauma who were treated in the emergency room from July 1955 through June 1956, and noted that the most common injuries were lacerations (n=1108), fractures (n=244), and injuries to the “head” (n=242). The latter part of his presidential address was another discussion of which was the best method for residents in surgery to obtain “training for certification in trauma.” He stated that “if a residency is of the four-year type, it might be appropriate to allow eight to twelve months credit during the residency toward eligibility for the examination...where, then, could the candidate get the rest of his training? This is perhaps the greatest problem and stumbling block in the creation of a program of certification in trauma.” The reader should be aware that Cole’s astute analysis of the training in trauma (and/or acute care surgery) preceded discussions by the AAST on the emerging specialty of acute care surgery by 50 years!

1957

The meeting in 1957 was held at The Homestead in Hot Springs, Virginia. There were 28 presentations, including 13 on orthopedic injuries or surgery. Also, there were symposia entitled “How Can This Association Contribute to Accident Prevention” and “Naval Medicine in Our Time,” a prize-winning essay, and the presidential address by Charles G. Johnston of De-

troit, Michigan. The symposium on naval medicine reviewed long periods under water related to nuclear submarines, the stress of and deaths related to deep sea diving, and SCUBA diving.

The CLASSICAL paper presented at this meeting was by Curtis P. Artz and Thomas K. Williams from the University of Mississippi and was entitled, "Intravenous Fat as Supportive Therapy after Severe Injuries."²⁴ As previously noted, Dr. Artz was a frequent contributor to the AAST meetings in the 1950s (and afterwards) and served as president from 1970–1971. The authors described the use of a 600 mL emulsion containing cottonseed oil, glucose, soybean phosphatide, and polyoxyalkol. This solution provided 960 Kcal, and 302 units were administered to 28 patients. Careful nitrogen balance studies in six patients were provided in the manuscript as well as a frank discussion of the problems of jaundice that occurred as a side effect in certain patients. The authors concluded that, "moderate quantities of fat emulsion are safe for clinical use, but large quantities may evoke a severe response. Interference with liver function and the coagulation mechanism after intravenous fat emulsion infusions over a prolonged period is the primary problem requiring further study." The importance of this paper is that it preceded the report on the effect of total parenteral nutrition (TPN) on puppies by S.J. Dudrick, D.W. Wilmore, H.M. Vars and J.E. Rhoads by a decade.²⁵ And it should be noted that the problem of incorporating lipid emulsions into the standard glucose-crystalline amino acid TPN solution was not solved till the early 1990s.

The presidential address by Charles G. Johnston, one of the most frequent contributors to the AAST meetings in the 1950s, was entitled "Trauma--Twenty Years and After."²⁶ This address was an overview of the progress made by the AAST during its first 20 years of existence, the current epidemiology of trauma ("leading cause of death in the younger age group [one to thirty-five years]"), and the need for special training in trauma. With regard to the latter issue, Dr. Johnston stated that "the lack of opportunity for training in trauma does not excuse those in charge of training programs for not attempting to remedy the situation..." In contrast to several of his predecessors, he stated that, "A separate board of trauma is not the answer, for there are certainly enough boards to divide our surgical family. Recognition of excellence of ability in trauma care under existing boards, or by other means, would offer a stimulus without adding additional problems." As for future goals, he stated that "The development of better training facilities and a closer liaison with those most active in the prevention of accidents is our problem and we cannot avoid it if we are to maintain our position of leadership in trauma."

1958

The meeting in 1958 was held at The Drake Hotel in Chicago, Illinois. There were 35 presentations, including 13 on orthopedic injuries or surgery, a symposium on "The Impartial Medical Testimony Plans", a prize-winning Essay, and the presidential address by W.L. Estes, Jr. of Bethlehem, Pennsylvania. Of interest, there was a follow-up report on Warren Cole's presidential address from the 1956 meeting entitled "The Need for an Active Teaching Program in the Emergency Service."

The CLASSICAL paper presented at the meeting was by W.E. Forsythe and L. Persky from

Western Reserve University Hospital, Cleveland, Ohio, and was entitled “Comparisons of Ureteral and Renal Injuries.”²⁷ The authors reviewed the management of 112 patients with renal injuries and 35 patients with ureteral injuries treated over a ten-year period. Blunt trauma was the etiology in 92.8% of patients with renal injuries, and only 12.5% of patients (n=14) required an operation including 10 who had nephrectomies. Six patients died for an overall mortality of 5.4%, and four of these had a ruptured kidney. The authors concluded that a nonoperative approach was appropriate in most blunt renal injuries, a philosophy that continues to this day. There were 35 patients with ureteral injuries, “which usually occur as the result of surgical procedures, ordinarily pelvic laparotomy.” The authors reviewed the current techniques of ureteral repair, including end-to-end anastomosis, uretero-neocystostomy, Ockerbled flap repair, and ileal graft. Good or fair results were attained in 18 patients after reconstruction, while the need for nephrectomy, nonfunction of the ipsilateral kidney, or death was noted in 17 patients. The authors commented on the morbidity of operative injuries to the ureter as there were 33 further surgical procedures in the 35 patients. The authors concluded that “When extensive pelvic surgery is contemplated or if an extreme pelvic pathologic condition exists, the presence of ureteral catheters, which can be easily palpated, reduces to a minimum the likelihood of an unfortunate urinary tract accident.”

The presidential address by W.H. Estes, Jr. was entitled “The American Association for the Surgery of Trauma and Its Objectives.”²⁸ Dr. Estes reviewed the content of many of the prior presidential addresses and listed the factors that “have been implicated in stimulating this resurgent regard for the surgery of trauma and better care of the injured,” including:

- (1) *The continuing interest of many young surgeons who were trained in the surgery of trauma in World War II...*
- (2) *...the occupation of surgeons for a longer period in the surgery of trauma as a result of the Korean conflict...*
- (3) *Advances and improvement in this field as a result of war experience made applicable to civilian casualties...*
- (4) *Disaster experience...in which all surgeons regardless of specialty should be prepared to participate...*
- (5) *The realization that in atomic age warfare...the huge number of simultaneous casualties to be anticipated will involve every surviving individual with medical training, not merely surgeons...*
- (6) *The holocaust on our highways from the rising tide of motor vehicle injuries...*
- (7) *Farm casualties and accidents... and*
- (8) *The absorbing and fascinating advances in our knowledge of the physiology, pathology and metabolic changes as a result of trauma...have opened wide the doors to a new concept of the fundamental implications of any injury.*

He then reiterated the importance of the AAST to work with the National Safety Council and other surgical and medical societies. Finally, he suggested the formation of a committee to “review...advances in research,” solicit “suggestions for papers on specific topics of lively interest,” and to “study...our present programs to determine if any change is desirable.” He

concluded, “As an organization we have just come of age.”

1959

The meeting in 1959 was held at the Mount Washington Hotel in Bretton Woods, New Hampshire. There were 54 presentations, including 19 on orthopedic injuries and operations and five on burns. In addition, there was a “Forum for Unusual Fracture Problems” hosted by Sir Reginald Watson-Jones, Extra-Orthopedic Surgeon to Her Majesty the Queen, a symposium on “Research in Trauma by the Army Medical Corps,” a prize-winning essay, and the presidential address by Truman G. Blocker, Jr., of Galveston, Texas.

This expanded program attracted an entire generation of leaders in American surgery and trauma as presenters or co-authors, including T. Drapanas, M.E. DeBakey, H.E. Kleinert, F. Glenn, C. Dennis, B.W. Haynes, Jr., J.M. Howard, D.N. Kluge, P.A. Wade, W.T. Fitts, Jr., W.H. Moncrief, Jr., C.P. Artz, W. Shenk, Jr., D.W. Robinson, F.W. Masters, C.A. Hardin, L.F. Peltier, E. Passaro, K.P. Klassen, etc.

The CLASSICAL paper presented at the meeting was by Gerald W. Shaftan from Downstate Medical Center, Brooklyn, New York, and was entitled “Indications for Operation in Abdominal Trauma.”²⁹ Dr. Shaftan has been an active contributor to the AAST for 50 years, is a former Scudder Orator at the American College of Surgeons Clinical Congress, and is considered to be a pioneer in the “observant and expectant” treatment of selected patients with abdominal trauma. The paper described the management of 180 patients with abdominal trauma, 112 of whom had penetrating wounds (103 stab, 9 gunshot), at Kings County Hospital Center, Brooklyn, from 1956–1958. In patients without overt hypotension or peritonitis, a policy of serial physical examinations was followed. Two patients died before evaluation, while 125 had nonoperative management and 53 underwent operation. In the group of 125 patients who had nonoperative management, one patient died from a traumatic brain injury. Of the 53 laparotomies performed, 13 (24.5%) documented that no visceral injury was present. Dr. Shaftan concluded that “The application of trained surgical judgment rather than dogma is the more rational and intelligent approach to the management of abdominal injury...the usual signs of peritoneal irritation, especially auscultation of peristaltic sounds, were valuable and reliable guides in determining the need for exploration. Hematemesis, proctorrhagia or positive abdominal paracentesis were secondary confirming indications for celiotomy.”

The presidential address by Truman G. Blocker was entitled “Notes on a Visit to the U.S.S.R. to Observe Surgical Technics and Research, June 27–July 10, 1956.”³⁰ This was a comprehensive review of hospitals, institutes, research facilities, and medical schools in Leningrad and Moscow. There were interesting comments about the gender of physicians (65% were women); hospitals (“outmoded with extremely poor lighting and plumbing facilities”); equipment and supplies (“in no hospital did we observe modern dressings”); conduct in the operating room (“standards of sterility and hygiene vary considerably from ours...the women surgeons in Leningrad wore no gloves while operating”); and the experimental procedures being performed (regarding transplantation of homografts of the head and upper shaft of the

femur, “it is difficult to see the practical value at present of some of the technical feats which we observed”).

EXECUTIVE SESSIONS IN THE 1950s

During this decade, the minutes of the AAST Executive Sessions reflected efforts to enhance the association’s prominence in the field of surgery. Such initiatives included emphasis on education, injury prevention, support for our ties with the Armed Forces, improved research efforts, and the establishment of a journal dedicated to the specialty of trauma. Additionally, the ongoing changes in the content and format of the scientific program were intended to increase member participation and encourage involvement of surgeons in other disciplines as well as both clinical and laboratory investigators.

TRAUMA EDUCATION

Evidence of the association’s emphasis on trauma education was found in leadership directives, such as the preparation of a trauma manual written in collaboration with the American College of Surgeons Committee on Trauma. Further, throughout the decade, several presidents encouraged the membership to emphasize trauma rotations in the medical school curriculum and a comprehensive program of trauma education in a surgical residency program.^{12,18} Other initiatives that underscored the importance of trauma education included the appointment by President Metz of a committee to “study the problem attendant upon organizing an American Board for the Surgery of Trauma.”

INJURY PREVENTION

Early emphasis on injury prevention served to solidify its importance in the field of trauma. In 1953, the Committee on Immunization Against Tetanus, Gas Gangrene, and Related Bacteria extended its role to recommend establishing legal requirements for gratings on open gas heaters and a reduction in the sale of flammable clothing. The following year, the association, along with the American College of Surgeons Committee on Trauma, petitioned for the improved automobile safety standards. By 1957, the AAST was making its mark in supporting injury prevention activities and had established a strong relationship with the National Safety Council.

MILITARY

Although World War II had ended in the previous decade, the surgical knowledge learned in caring for the military casualties was still making its way into the literature. Many AAST members had served in the war as consultants and chiefs of surgical sections and their advice was highly valued in the civilian sector as surgeons sought to improve the care for civilian casualties. The knowledge and skills of these surgeons were also highly valued by the Armed Forces, as they requested from the AAST “the names and other pertinent data of all members

of the Association for use should consultation be necessary in various areas of the country or in the Armed Forces with regard to trauma.” In 1959, the annual meeting included a special symposium “Research in Trauma by the Army Medical Corps.” Six papers were presented at this symposium, which underscored the association’s commitment to the military, their quality research, and the mission to expand the knowledge into the civilian sector.

RESEARCH

As the AAST matured, it continued to place value on quality research and recognized the mark that it was making in the field of surgery. In 1955, the association offered a \$400 honorarium for a prize-winning essay. This award could be considered AAST’s first scholarship, which remains a core part of our mission today. In 1958, President Estes proposed the formation of a committee to review the research papers that were included in the scientific program of the annual meeting thereby validating their quality and potential for publication. By the end of the decade, there was strong emphasis on research, both clinical and basic science.

THE JOURNAL

In 1959, the AAST made the decision to start a journal dedicated to the field of trauma. Several factors weighed into this decision including the rising cost of publishing the annual meeting’s papers in the *American Journal of Surgery*. The AAST Board of Managers unanimously agreed to contract with the publishing company Williams and Wilkins. The cost for the journal subscription was \$8.50 per year for each active dues paying member. This pivotal decision transformed the AAST, as *The Journal of Trauma* became a vehicle for knowledge dissemination, an engine for economic growth, and a means of global outreach as the AAST expanded its influence to other continents.

CONCLUSION

There were a significant number of presentations on orthopedic injuries and operations at the meetings of the AAST in the 1950s. In addition, there were multiple presentations that reviewed how to perform various operative procedures, but no data were presented. In the latter half of the decade more presentations on injuries to the brain, neck, thorax, abdomen, and peripheral vessels were noted. Many of the controversies that took subsequent decades to resolve—management of penetrating wounds of the neck, abdomen, and colon as examples—were first discussed at meetings in the 1950s. And, as noted several times in the chapter, interest in trauma seemed to be wider, with surgeons prominent in other fields actively participating in the annual meetings. As for the enthusiastic support for a separate board for “traumatic surgery” espoused by past presidents early in the decade, this movement seemed to wane over time. With the introduction of fellowship/residency training in acute care surgery over the past five years, these “ancient” discussions have been revived.

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THE 1960s

CHARLES E. LUCAS, MD, AND ANNA M. LEDGERWOOD, MD

The first issue of the *Journal of Trauma*, in 1961, begins with a tribute by Dr. Isidore S. Ravdin to Dr. Charles G. Johnston, chairman of surgery at Wayne State University (WSU), chief of surgery at Detroit Receiving Hospital (DRH), and the founding editor of the *Journal*. Dr. Johnston died before the first publication and was succeeded by his protégé, Dr. Rudy Noir, former vice-chair at WSU and DRH. Dr. Noir attributed the tremendous success of this new fledgling journal to the outstanding editorial board, most of whom were appointed by Dr. Johnston. Like most trauma surgeons, Dr. Johnston was first a general surgeon who, shortly before he died, lectured one of the authors (CEL) as a third-year medical student on the optimal treatment of breast cancer.

Selecting the best ten manuscripts from the *Journal of Trauma* is a daunting task. Few, if any, members of the AAST have the breadth of knowledge to identify the outstanding seminal papers involving general and thoracic surgery, orthopedic surgery, neurosurgery, surgical specialties, burns, and the many subdivisions of each. Thus, the selected manuscripts, to some degree, represent author knowledge and interest in areas of strength and ignorance in areas of weakness. Although many outstanding papers were published from panel sessions, these erudite collective reviews were discarded since they were recantations and not seminal articles.

1961

TEN YEARS' EXPERIENCE WITH PENETRATING INJURIES TO THE HEART

Vollrad J. von Berg, MD, Luigi Mogge, MD, Lyle F. Jacobson, MD, Prescott Jordan, Jr., MD, and Charles G. Johnston, MD

Dr. von Berg, at the twentieth annual meeting of the AAST in 1960, described 102 patients treated for penetrating heart wound over a ten-year period.¹ Most (90) were stab wounds. The Beck's triad of a small quiet heart, neck vein distention and hypotension, was present in 49 patients, absent in 40 patients, and unknown in the remaining patients. The common sites of injury were the right ventricle (39) and left ventricle (37), with 59 patients actively bleeding at thoracotomy. Acute tamponade, as determined clinically, was present in 50 patients; absence of tamponade was a condition which could easily facilitate exsanguination into the chest while giving the surgeon a false sense of security that there was no heart injury. The important message emphasized by Dr. von Berg was that, once the diagnosis was known, the patient should move rapidly to the operating room for cardiorrhaphy. Pericardiocentesis should be used when the diagnosis is in question or when the patient is "in extremis," when pericardial aspiration might improve vital signs in transit to the operating room. A small number of patients who underwent repeat pericardiocentesis did not do well and, in retrospect, would have been better served with immediate operation. The 13 deaths occurred in the emergency department (2), pre-thoracotomy (3), during thoracotomy (4), including three patients with uncontrollable bleeding from great vessels), brain ischemia (1), congestive heart failure (1), myocardial infarction (1), and abdominal injury (1).

The subsequent paper by Dr. Arthur C. Beall and co-authors, including Dr. Michael DeBakey, recommended that the patient with a cardiac injury should be resuscitated with "colloid solution, vasopressors, and uncrossmatched type O-negative whole blood..." and then observed closely.² If instability develops, pericardiocentesis should be performed and the patient should continue to be observed as long as stability is maintained. During the discussion, Dr. James C. Drye, a senior member of Dr. Rudy Noir's Louisville trauma team, supported the approach presented by Dr. von Berg. Dr. von Berg, in closing, emphasized that Beck's triad is helpful but the most important sign for the need for rapid operative intervention was "involuntary defecation" in a confused patient, a lesson still emphasized at DRH.

COMMENT

The message promulgated by Dr. von Berg was not fully received across the country. Dr. Beall and colleagues, including Dr. DeBakey, reinforced their non-operative recommendations at the 1964 meeting stating that these patients should be "treated primarily by pericardiocentesis, reserving cardiorrhaphy for those patients who do not respond.... or their condition deteriorates."² Dr. Richard Dean, an outstanding graduate of the WSU/DRH program, failed his oral board examination in 1966 because he disagreed with "Dr. Michael DeBakey's approach" to penetrating heart wounds. Dr. Yao and colleagues from the Cook County Hospital, in 1966, recommended early thoracotomy with pericardiocentesis being used only in unstable patients

in transit to the operating room.³ Dr. Pomerantz and coworkers from Denver, at the 1968 meeting, recommended early thoracotomy.⁴ Universal acceptance of early thoracotomy for penetrating heart wounds was delayed until the 1971 meeting when Dr. Beall and colleagues reversed their previous recommendations and recommended routine early thoracotomy.⁵ Thus, the report by von Berg and colleagues was truly a seminal paper.

1962

THE SEATBELT SYNDROME

John W. Garrett MD and Paul W. Braunstein MD.

During the early 1960s, the seatbelt was new and offered as an option on some cars. Professionals who had been involved in seatbelt studies strongly recommended their use but this recommendation was often ignored, even by well-educated people; only 35% of AMA members used seatbelts. Although the research data in animal models suggested that seatbelts would save lives, the question arose as to whether seatbelts, themselves, were the cause of injury.⁶ The authors pointed out that everyone recognized the benefits of penicillin but many were fearful of sudden death caused by penicillin allergy. The only prior data on seatbelt induced injury came from the airline industry showing that lap belts could cause forced flexion and rupture of the thoracic aorta.⁷ In contrast, DeHaven in the "Crash Injury Research" of Cornell University Medical College noted in 1953 that seatbelts are protective in small light plane crashes.⁸

The project of identifying potential seatbelt injuries was monumental. During the study period, less than 3% of cars were equipped with seatbelts and only one of three drivers or occupants was actually belted. Consequently, only three out of every thousand motor vehicle collisions (MVCs) provided useful scientific information. Part of the dearth of information was due to lack of police training to identify whether a seatbelt was in use or to identify whether the seatbelt was defective. A portion of the preliminary data came from the Automotive Crash Injury Research (ACIR) studies from Cornell University which had obtained crash data from 22 participating states.⁸ The retrospective study, herein, was conducted on only 2778 MVCs in cars equipped with seatbelts and with complete data set; this included 3673 occupants.

The investigators demonstrated that injury correlated directly with the speed at time of impact and with vehicular rollover. They demonstrated that the seatbelt was protective of chest and abdominal injuries in patients who had lower torso and extremity injuries that included contusions, sprains, and lacerations. A flexion injury to the lumbar spine at L2–L4 was identified as a seatbelt induced injury; this was before the addition of the shoulder belt. There were 29 instances of seatbelt failure; these were more commonly associated with vehicular invasion of the compartment or disruption of the vehicular floor. These patients, however, appeared to be partially protected prior to the seatbelt failure in that only one of 29 patients had a significant injury. They demonstrated that seatbelt failure could be due to inadequate support at the seatbelt moorings on the floor or along the door panel. The accompanying editorial by Dr. Franklin Wade praised the article concluding that the seatbelt is helpful in preventing

injuries.

COMMENT

Drs. Fish and Wright, in 1965, identified that the seatbelt may be associated with minor injuries but that fatal injuries are prevented.⁹ Saldeen, in 1967, described fatal neck injuries with atlanto-occipital disruption in patients using the diagonal shoulder harness without lap belt, more likely in patients ejected because of faulty door locks.¹⁰ Steckler and co-workers, in 1969, re-emphasized the potential for seatbelt injury to the lumbar spine as an unusual manifestation of the “seatbelt syndrome;”¹¹ this could also include injury to the cauda equina. The increased incidence of intraabdominal small bowel rupture awaited the report by Denis and co-workers from Quebec Province. The Canadian government implemented mandatory seatbelt wearing prior to the United States, thus, providing the opportunity for the above authors to show the increased incidence of small bowel injury.¹² This seminal study by Garrett and Braunstein led to many future studies and to improvements in seatbelt design with mandatory seatbelt use resulting in a marked reduction in life-threatening injuries after MVCs. The process continues as the industry is now looking at lateral belts to protect against lateral crashes.

1963

SURGICAL MANAGEMENT OF CIVILIAN COLON INJURIES

Thomas M. Biggs, MD, Arthur C. Beall, Jr, MD, William B. Gordon, MD, George C. Morris, Jr, MD, and Michael E. DeBakey, MD.

During World War II and the Korean conflict, all soldiers treated for colon injury were to have a proximal colostomy or exteriorization. This ultra-conservative policy reflected the devastating results seen when soldiers with serious peritoneal contamination and prolonged interval from time of injury to operative intervention had primary repairs. The students of the entertaining television program “MASH” recall “Hawkeye” Pierce chastising Major Burns for performing a primary closure of a colon wound in an injured North Korean soldier.

Dr. Biggs and his colleagues emphasized that penetrating civilian wounds cause less tissue damage and receive operative intervention sooner.¹³ They presented their 14-year experience of 279 patients with colon injury due to gunshot wounds (133), shotgun wounds (33), stab wounds (88), and blunt injury in the remainder. Following stabilization, these patients were taken to the operating room where they were treated by primary closure, exteriorization, or primary closure in association with a proximal ostomy. The primary closure was used in patients who had the smaller injuries and were stable at the time of operation; 84 of their 88 patients with stab wounds had primary closure with two deaths; 122 of 169 patients with a gunshot wound had primary closure resulting in nine deaths. The mortality correlated with the number and severity of associated injuries. For example, the average number of associated injuries was 1.5, whereas, this increased to 4.75 in those patients who died. They also noted that age greater than 50 years was associated with a marked rise in mortality averaging 48%. For patients with no associated injuries, there were no deaths after primary repair. The authors

concluded that low velocity civilian colon injuries without numerous associated injuries are best treated by primary closure in contrast to war injuries produced by high velocity missiles, fragments of mines, and associated with much greater tissue destruction.

COMMENT

Like most wise recommendations for a new approach to treatment of injuries, this report was not immediately accepted. Indeed, the authors (CEL and AML) and others continued to recommend routine colostomy for patients with penetrating colon injuries for the next 15 years.¹⁴ The most definitive confirmation of the recommendations by Biggs and co-authors came from the prospective randomized study conducted by Stone and Fabian.¹⁵ This classic study demonstrated that patients who did not meet pre-defined exclusion criteria for randomization had better morbidity and mortality with primary closure compared to either exteriorization or proximal colostomy. The exclusion criteria for randomization included massive fecal contamination, destructive (AIS 4-5) colon injury, severe hemorrhagic shock, and four or more associated injuries. Following the report by Stone and Fabian, the pendulum swung too far as many recommended primary resection and anastomosis for major injuries (AIS 4-5) including patients with the abdominal compartment syndrome (ACS).¹⁶ Fortunately, the pendulum has swung back to the midpoint where most trauma centers follow a policy of doing primary closure in patients with minor (AIS 1-3) colon injuries in the absence of massive contamination and hemorrhagic shock while reserving colostomy or exteriorization to the remaining patients with major (AIS 4-5) injuries or ACS.¹⁷ These more recent studies confirm the wisdom of Dr. Biggs's recommendations.

1964

EVALUATION OF THE PROTECTIVE CHARACTERISTICS OF HELMETS IN SPORTS

E.S. Gurdjian, MD, V.R. Hodgson, MD, W.G. Hardy, MD, L.M. Patrick, MD, and H.R. Lissner

The more senior members of the AAST recall playing football during their high school days with inadequate helmets which did not efficiently blunt external force to the head; possibly that's why some of the senior AAST surgeons are somewhat slow. The American Medical Association in 1962 concluded, on the basis of preliminary studies, that the plastic helmet was superior for football and that the faceguard should be added. This report emphasized the importance of proper fitting and proper cushioning devices from the helmet to the skull.

This AMA recommendation led to an in-depth assessment of the physics of closed head injury. The Gurdjian study assessed this in both cadavers and in anesthetized canine models.¹⁸ The objective was to compare the different types of injuries seen with motor vehicle collisions (MVCs) and in different sporting events. Large dogs were hit, in a rotary manner, with a two pound hammer; the head was either in a fixed position or free to move upon impact. Single versus multiple hits at 10–20 minute intervals were assessed. The cadaver studies were performed in elevator shafts with the patient positioned at a 30° angle to the ground during a vertical fall. The velocity of impact was determined by the height of the fall. The impacts

were compared without helmet and with a variety of racing helmets. The cadaver skulls were also subjected to blunt force administered by 2 lb and 15 lb hammers either singly or multiply. Based upon these studies, the authors were able to correlate how the force correlates with injury in both cadavers and animals with and without protection.

Injury was less when the head was free to move upon impact and the velocity was lower. The severity of injury correlated directly with the resultant intracerebral pressure upon impact. Internal suspension systems were not as protective as reinforced padding in terms of absorbing the external energy before it reached the skull. Protection from skull fracture was associated with a hard helmet shell but there could still be severe underlying brain injury even in the absence of skull fracture. Based upon these studies, recommendations were made for helmet design which would be specific for each sport including racing, motorcycling, and football.

COMMENT

Head injury is a leading cause of death and disability after blunt trauma.¹⁹ This project planted the seed to numerous studies, which continue to this day, on skull and head protection after impact. The more senior AAST trauma surgeons know that their grandchildren playing football are much better protected. Twenty-first century-helmets are very sophisticated and are being used at the high school level despite the increase in cost. The National Football League has recently introduced a 15-yard penalty for helmet-to-helmet contact. A later study by Gurdjian and co-authors identified the pressure-time relationships and their correlation with the concussive effects of blunt trauma.²⁰ These effects are still being investigated by the US Government.²¹ The most recent progress in terms of protection was discussed at length at a 2012 US House of Representatives Judiciary Committee meeting.²² Clearly, this seminal paper has led to significant innovations which are still in progress.

1965

PULMONARY CONTUSION

G.S. Alfana, MD, and H.W. Hale, Jr, MD.

Historically, the pulmonary contusion following blunt chest injury was masked by more obvious injuries including rib fractures, hemothorax, pneumothorax, and flail chest. The one exception to this was the pulmonary contusions seen after “blast injury” in underwater explosions. Within the civilian community, pulmonary contusion was most likely seen following motor vehicle collisions (MVCs) and falls from a height. Again, the more obvious injuries were recognized but the underlying pulmonary contusion received little attention.

This report describes 20 patients who presented with blunt chest injury from multiple etiologies.²³ There was a wide age range; most patients had no evidence of pulmonary contusion for 12–24 hours or longer. The early signs included tachypnea and scattered wet rales; trauma surgeons during that decade still used stethoscopes. Dyspnea and cyanosis often did not appear until day two. The associated pain was thought to result from rib fractures and

chest wall injury. The progressive respiratory distress which correlated with the severity of anatomic and pulmonary injury was not identified until later in the patient's course when life-threatening hypoxia developed. The authors recommended repeated intercostal nerve blocks to reduce pain, tracheostomy to reduce dead space and help with tracheal suction, mechanical ventilation, increased oxygen support, and questioned whether a hyperbaric oxygen environment might be helpful.

The authors emphasized that the pulmonary contusion was different from the blast injury which allows for the pressure wave to pass through the lungs without major chest injury; this distinction, however, is less clear with greater understanding of the physics of chest wall trauma and pulmonary injury. The authors emphasized that hemoptysis will be a frequent complication following severe pulmonary contusion in contrast to its rarity in the fat embolism syndrome. They showed that early evidence of pulmonary contusion radiographically portends a severe contusion and the need for early aggressive intervention.

COMMENT

This prescient article opened the eyes of many trauma surgeons who began to place greater emphasis on the underlying pulmonary contusion as a cause for morbidity and mortality. Indeed, patients with an underlying pulmonary contusion which was out of proportion to the chest wall injury were identified as being at high risk and would be cared for in an environment which would provide intensive monitoring and early intervention.²⁴ This also led to earlier ventilatory support and earlier use of tracheostomy in patients with severe pulmonary contusion. Awareness of this phenomenon produced more sophisticated imaging in order to provide an earlier diagnosis and better definition of severity of pulmonary contusion on admission; this helped determine the need for mechanical ventilation.²⁵ More recent studies have assessed the technique for airway ventilation as it relates to the added complication of ventilator-associated pneumonia in patients with pulmonary contusion.²⁶ Studies have also been conducted on the effects of resuscitation and a secondary insult in terms of the morbidity and mortality for this potentially lethal injury.²⁷ Many recent advances were made possible by this seminal paper.²⁸

1966

THE DIAGNOSIS AND TREATMENT OF SHOCK IN MAN BASED ON HEMODYNAMIC AND METABOLIC MEASUREMENTS

J.H. Duff, MD, H.M. Scott, MD, D.I. Peretz, MD, G.W. Mulligan, MD, and L.D. Maclean, MD.

Prior to the decade of the 1960s, surgical critical care was in its infancy. Many major trauma centers had not established surgical intensive care units (SICU); patients were resuscitated in the recovery room after major operations. Intra-operative extubation after pancreaticoduodenectomies was routine; central lines were rare. Hypotension was treated with Levophed which acquired the name "Lethalped," whereas, oliguria was treated with a loop diuretic or

Mannitol without assessment of circulating volume.

Duff and co-authors were leaders in applying the principles of invasive monitoring for critically ill patients. Peripheral, arterial, and central venous monitoring were used to monitor cardiac output (CO) by a blue dye dilution technique, central venous pressure (CVP) through catheters placed in the superior vena cava, and peripheral blood gasses along with pH and lactic acid levels. Calculated values included oxygen delivery (DO_2), oxygen consumption (VO_2), heart work (LVSW), and total peripheral resistance (TPR).²⁹

Based upon these measurements the authors defined protocols for treatment. Patients with a low CO and low CVP were treated with blood and crystalloids. Patients with a low CO and a high CVP were treated with inotropes. Survival could be correlated with the serum lactate levels or, more importantly, the response of the serum lactate levels to resuscitation and sodium bicarbonate replacement. A series of physiologic parameters were identified in order to guide ongoing therapy. The CVP above 15 cm H_2O was used to institute inotropic therapy. Anemia was acceptable down to a level of 10 gm/dL. High TPR due to excessive vasoconstriction was treated with isoproterenol which overcame the vasoconstriction while also providing both inotropic and chronotropic support. This type of therapy would usually be combined with additional crystalloid replacement. Vasoconstrictors, particularly norepinephrine and metaraminol, were identified as agents that might be successful in restoring the mean arterial pressure (MAP) but could be associated with a reduction in CO, DO_2 , and VO_2 . The authors concluded that invasive monitoring allowed the physician to better understand the underlying physiologic derangement and provide treatment which would be guided by ongoing multiple organ function rather than just blood pressure, pulse, and urine output. The presentation by Duff was followed by a presentation by Fraser Gurd and co-authors reinforcing the importance of a more aggressive approach to invasive monitoring with the resultant therapeutic regimen based upon the results of ongoing organ function changes.³⁰

COMMENT

The work by Duff and co-authors was a seminal report which was imitated widely. More sophisticated techniques for measuring and recording CO, were developed including the pulmonary artery (PA) catheter for determining left atrial pressures, wedge pressure, and more accurate CO.^{31,32} Unfortunately, PA catheters were overused which greatly increased cost. Later analyses of PA catheter value to patient care were flawed by the large denominator of minimally ill patients treated with PA catheters. Thus, current intensivists and trauma surgeons rarely use PA catheters; this has led to increased use of vasopressors in patients with hypotension without concomitant monitoring of central pressure. Hopefully, a proper balance will evolve so that more invasive monitoring will be re-established as a key to success in the very ill patient.

1967

A COMPARISON OF ISOTONIC AND HYPERTONIC SOLUTIONS AND BLOOD ON BLOOD FLOW AND OXYGEN CONSUMPTION IN THE INITIAL TREATMENT OF HEMORRHAGIC SHOCK

A.E. Baue, MD, E.T. Tragus, MD, and W.N. Prkins, MD.

The widespread application of invasive monitoring of patients with hemorrhagic shock (HS) identified that resuscitation with whole blood alone was often inadequate. Sophisticated animal studies showed that the HS was associated with an initial decrease in the interstitial fluid space (IFS) followed by IFS fluid sequestration. Dogs subjected to HS did better if crystalloid solution, such as Ringer's lactate, was added. Additional studies assessed hypertonic and acid correction solutions such as sodium bicarbonate (NaHCO_2) or tris hydroxymethyl aminomethine (THAM) in resuscitation.

The authors evaluated nine regimens in a canine HS model.³³ Following HS, the nine groups were resuscitated, in sequence, with: 1) 7.5% NaHCO_3 , 5.2% NaCl, shed blood, and 6% low molecular weight dextran (LMWD); 2) 5.2% NaCl, 7.5% NaHCO_2 , blood, and 6% LMWD; 3) blood, 6% LMWD, 30% dextrose and water (D/W), and clinical dextran or rheomacrodex (CD); 4) 6% LMWD, blood, 30% D/W, and 6% CD; 5) 0.5% NaCl, 6% LMWD, blood, and NaHCO_3 ; 6) 6% LMWD, 0.5 NaCl, blood, and NaHCO_3 ; 7) blood, and 30% D/W; 8) 30% D/W, and blood; 9) 15 ml/k LMWD, and 50 D/W. The above subgroups were designed to test the effects of the above agents and sequence of administration on restoring circulatory needs.

HS reduced output (CO), mesenteric blood flow (MBF), pH, CO_2 content, O_2 delivery (DO_2), and O_2 consumption (VO_2) equally in all groups. The sequence of 5.2% NaCl, NaHCO_3 , blood, and LMWD produced an excellent restoration of CO, MBF, DO_2 , and VO_2 . These early improvements varied with the amount of solute given and the extent of hemodilution. Blood replacement was more effective in restoring CO, DO_2 , and VO_2 when given after LMWD. The 5.2% NaCl restored plasma volume and CO by initiating an auto infusion from the IFS. There was no difference between the NaCl and the NaHCO_3 resuscitation although the latter more efficiently corrected the acidosis. The benefits of LMWD varied with the dextran concentration and the resultant hemodilution.

The discussion was quite active with Dr. Shenck emphasizing that the addition of crystalloid solution is much better than whole blood alone. Dr. Weil reinforced the opinion that the crystalloid resuscitation is beneficial when given early. Dr. Stahl emphasized that the isotonic saline solution, when buffered, provides better restoration of the IFS.

COMMENT

This very comprehensive study on the use of crystalloid solution, whole blood replacement, hypertonic solutions, and colloid solutions in the resuscitation of HS set the stage for a myriad of clinical and basic science studies over the next 40 years.^{34,35} Thus, there is a much better comprehension of total body changes and hemodynamic responses to varied resuscitation regimens.³⁶ Although controversies regarding the ideal fluids and blood products needed for

resuscitation continue in the twenty-first century, the discussions and the current opinions regarding these controversies take place at a much higher plane.^{37,38}

1968

EXTRICATION OF VICTIMS—SURGICAL PRINCIPLES

J.D. Farrington, MD.

This very practical report showed that extraction of injured patients from vehicles was being performed in a half-hazard and dangerous manner by well-meaning citizens and not so well-trained ambulance drivers.³⁹ Consequently, the injured person was often maimed or even killed while being “pulled out” of an extensively damaged vehicle. Emergency medical service (EMS) programs were non-existent or immature in large metropolitan areas and non-existent in most rural areas. One of the authors (CEL) was involved in some of the early training of basic life support (BLS) as part of the immature Detroit Trauma System at about the time this article appeared; there was no advanced training. This lack of sophistication for EMS training extended throughout the nation.

This excellent report by Farrington included a protocol for ambulance drivers defining the initial survey and the secondary survey that was recommended.³⁹ The initial survey included Feel, Talk, and Observe. The Feel called for palpation of the pulse in order to elevate the legs and cover the patient for a weak pulse or to institute CPR for no pulse. The Talk was to assess the patient’s level of consciousness and, if mentated, to reassure the patient prior to and during transit. The Observe was designed to determine the efficiency of breathing. If breathing was poor, the airway was cleared, the patient was blanketed, open chest wounds were covered, and a flail chest was stabilized. The secondary survey focused on additional injuries such as fractures, lacerations and paralysis. Fractures would be splinted and open wounds dressed.

The different extraction techniques were described as well as the proper use of both the short and long boards. Teamwork with a minimum of two attendants was essential when extracting the patient. This included the proper long board extraction with the patient lying flat in the car and short board extraction from behind the steering wheel. Velcro on the board was recommended to stabilize the head while the patient was moved from the vehicle.

Dr. Farrington foresaw the need for a “can opener” or pneumatic cutting tool to extract patients from the badly damaged vehicle with extensive intrusion. The current “jaws of life” is the twenty-first century “can opener.”⁴⁰

COMMENT

The application of the techniques described in this article spread rapidly across America.⁴¹ The inner-city police station wagon and the rural hearse could no longer carry all of the equipment required for proper EMS emergency extraction and stabilization. Ambulances were enlarged and modified to facilitate resuscitation; EMS programs with different levels of expertise evolved.⁴² Advances emanating from this report include routine intravenous fluid replacement,

airway establishment, and thoracic decompression for pneumothorax.⁴³ One can identify how the primary survey and secondary survey described by Farrington at the scene of a MVC has extended to be an integral part of the current ATLS program by the American College of Surgeons.⁴¹

1969

THE TREATMENT OF LARGE CUTANEOUS BURNS WITH SILVER CREAMS

H.A. Butcher, MD, H. W. Margraf, MD, and D.L. Cravens, MD.

The most important advance in the use of silver for the treatment of burns began with the article by Moyer and co-workers which appeared in 1965.⁴⁴ Moyer described a reduction in surface bacteria and colonization in patients treated by 0.5% silver nitrate (AgNO_3). The AgNO_3 , however, did not deter epithelial bacterial growth; also the AgNO_3 stained the floors, walls, and linens. The AgNO_3 treatment was labor intensive and caused a serious depletion of the chloride ion and, to a less serious extent, other salts.

The combination of the beneficial results and the detrimental byproducts of AgNO_3 led to numerous studies with silver creams. Butcher et al described the use of silver acetate cream which reduced the salt loss and eliminated problems with methemoglobinemia.⁴⁵ More importantly, it was quite effective at reducing bacterial flora and, finally, did not stain floors, linens, and beds. The silver acetate was used until 1968 when silver lactate was developed by their hospital pharmacy; this provided a more soluble solution for the silver. Using this technique, a standard regimen evolved as wounds were cleaned and the silver cream was applied every 12 hours. The application was discontinued when a split-thickness skin graft was applied and then reinstituted 48 hours later. The report has a number of illustrative cases which show the progressive healing of patients with very severe burns. This was associated with important quantitative and qualitative analyses showing improved burn healing and reduced bacteria contamination.

This paper was followed on the program by a presentation by Stanford and colleagues utilizing silver sulfadiazine in both rodent studies and patients.⁴⁶ Their clinical data included civilians and soldiers injured during the Vietnam conflict. Application of the silver sulfadiazine by a gloved hand was not painful and reduced pseudomonas contamination. Both papers were followed by a very lively discussion from burn giants such as John Moncrief, Basil Pruitt, James Bennett, and Boyd Haynes adding to the closing comments of Harvey Butcher and Charles Fox.

COMMENTS

The introduction of silver-containing burn creams to the treatment of civilian and military burns has revolutionized the burn care throughout the world. The same techniques with modifications made on the basis of ongoing experiences are still applied in our nation's burn centers. Although none of the current topical antibiotic creams is perfect, the routine use has

been a major part of improved burn care, especially, when used in conjunction with xenograft, homograft, or biomembrane.⁴⁷ These papers were surely the seminal papers leading to the current treatment of severe burns.

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THE 1970s

KENNETH L. MATTOX, MD

In my view, 1970–1980 was the single most important, pivotal decade for the field of trauma and the American Association for the Surgery of Trauma, with its affiliated organizations. No other decade comes close in being so essential to the current position and mission of the AAST. This section is written from the perspective of a global overview and historical review of that decade, rather than a recitation of the scientific reports from that era.

DEFINITIONS AND PERCEPTIONS

My first recollection of any trauma conference was as a resident, listening to Dr. J.D. “Deke” Farrington talk about the hazards of the ambulance services of the mid-1960s. The basic content was later published in an article entitled, “Death in a Ditch.”¹ The foci of the *Journal of Trauma* prior to 1970 were burns, military injuries, and technical reviews of specific injuries, primarily from large county hospitals, and the articles were more descriptive than scientific. Neither the concept nor the term “evidence based” had yet developed. In the 1960s, the “accident room” was a room at the back of the hospital, usually intermittently manned by the most junior doctor in the hospital, and was just beginning to morph into the “emergency room.” In this room, lacerations were sutured, outpatient fractures were set, and patients seeking a physician after their “regular doctors” offices had closed for the day were seen. More important than the evolving “accident room,” was the identity crisis (or lack of identity) being faced by our “trauma” profession. The very word, “trauma,” was more often associated by both the public and non-surgical medical profession as a psychological event, rather than a phys-

ical injury. The “trauma surgeons” were imbedded in general, orthopedic and other surgical disciplines. Most importantly, by the close of the ’70s, the world not only had an appreciation of the definition of trauma, but also of the surrounding issues of expeditious trauma victim transportation to appropriate treatment facilities and improved understanding of repair and rehabilitation for specific organ injuries. This section relates the progress made during the decade of the 1970s. Much credit for the great strides made in this area during this time goes to the surgical trauma leaders, who had the vision, drive, and tenacity to make this huge transformation happen.

AAST – IDENTITY

At the beginning of the 1970s, as had been its habit since early in its history, the American Association for the Surgery of Trauma met on the Friday and Saturday prior to the American College of Surgeons (ACS) meeting in the same city. When the ACS met in Chicago, the AAST met in the Drake Hotel. The meeting of these two organizations, one after another, made for a long week away from one’s practice, but, at that time, the number attending both meetings was relatively small. The AAST meeting seemed almost an afterthought, with the focal meeting being the ACS. By the end of the ’70s, the AAST had achieved its own identity, with its meeting no longer an add-on to the College Congress, but a free standing meeting held completely separate—different time and different city—with a much larger and ever-growing attendance.

DEVELOPING TRAUMA ORGANIZATIONS, INSTITUTIONS, AND ENTITIES IN THE 1970s

ACS & AAST

The synergy between the trauma initiatives of the AAST and the ACS cannot be overemphasized. The conception, gestation, birth, and development of the committees and projects arose from the same genome and can almost be considered clones. Some would consider the Committee on Trauma of the ACS (ACS-COT) and the organization of the AAST conjoined twins, even sharing critical vital organs, or, at least, similar thought processes. The respect and synergy between these two groups solidified during the decade of the 1970s, when the leadership of the ACS-COT and AAST was comprised of the same individuals. That fact, more than any other, was responsible for the successes and expanded recognition and programs during the 1970s.

EMERGENCY MEDICINE ORGANIZATIONS

Simultaneous to the 1970s development of trauma programs, emergency medicine organizations were emerging in the United States. While numerous groups have claimed to be the initiating nucleus for emergency medicine in the United States, a large number of the initial organizers of the American College of Emergency Medicine, University Association for Emergency

Medicine (later called Society of Academic Emergency Medicine), members of the ad hoc committees for an Emergency Medicine Residency Review Committee, committee to ACGME, formation committee for a Board of Emergency Medicine, and an editorial board for the *Journal of the American College of Emergency Medicine* were surgeons, both in practice and from academia. The notes written on table napkins at an informal all night meeting in the Roosevelt Hotel in New Orleans in late 1973 or early 1974 are often cited as the beginnings of “codification” of the emergency medicine infrastructure. Many of those present later became officers in the newly formed American College of Emergency Physicians (ACEP) and University Association of Emergency Medicine (UAEM), some remaining in emergency medicine for the rest of their careers. Others also later served as chairmen of the board of the emergency medicine foundation for a time. It is not surprising that this should occur, since many areas of focus are shared by trauma, critical care, and emergency medicine, including EMS, triage, resuscitation, evaluation, disaster management, poisonous snake bites, burns, drowning, intubation, ARDS, and exact roles of procedures of various types in the emergency department. This fusion and separation of siblings (surgeons and emergency medicine) occurred during the 1970s.

EMERGENCY NURSING ASSOCIATION

The Emergency Department Nurses Association (EDNA) formed in 1970 from the fusion of two regional emergency room nurses’ groups. The name was changed in 1985 to Emergency Nurses Association (ENA), and it would be another 20 years before the Society of Trauma Nurses (STN) formed. Both ultimately developed courses, websites, and journals in emergency and trauma nursing. ENA evolved to be more closely associated with emergency physicians, and the STN allied themselves more closely with trauma surgeons. The symbiosis of, especially, the EMS, nursing, and surgical organizations was essential to the development of both AAST and the United States trauma initiative.

ASSOCIATION FOR THE ADVANCEMENT OF AUTOMOTIVE MEDICINE

The Association for the Advancement of Automotive Medicine (AAAM) is a sometimes forgotten but essential contributor to the science of trauma management. In 1969, the AMA formed a joint committee with the Society of Automotive Engineers, and their first and continuing focus was to develop a scale for classification of injury severity, assuming the lead role for this task in 1973. The first such scale was published in *JAMA* in 1971 in an article entitled, “Rating the Severity of Tissue Damage - The Abbreviated Injury Scale.” It would take the decade of the 1970s and into the 80s for the trauma community, especially AAST and the trauma research community, to embrace the Abbreviated Injury Scale (AIS) as a useful and reliable injury assessment tool. The basic AIS formed the foundation for subsequent trauma scoring systems, namely the Injury Severity Score (ISS), the Trauma Injury Severity (TRISS), and A Severity Characterization of Trauma (ASCOT). The membership of the AAST, led by the current editor of the *Journal of Trauma*, Dr. Ernest Eugene Moore, took on the task of customizing the trau-

ma scores for each organ injury. The AAST organ injury scales ultimately were published in the *Journal of Trauma*. A number of the leaders in AAST and ACS-COT have held major office in AAAM.

EMS INFRASTRUCTURE

The use of specifically designed pre-hospital transportation vehicles dates back to the *ambulances volantes*, designed by Dominique Jean Larrey (1766–1842), Napoleon Bonaparte’s chief physician. Larrey was distressed that wounded soldiers were not picked up more quickly, since Napoleon’s vehicles were positioned 2.5 miles from the battle scene. He, therefore, positioned the “flying ambulances” near the battle, first in 1793. Various adapted vehicles subsequently were used in various countries, but the prehospital vehicles and personnel did not evolve until the 1970s, when the EMS profession became focused and organized. During the 1960s, the term, Emergency Medical Services (EMS), did not even exist and had no societal identifiable brand.

Although published in 1966 by the Institute of Medicine’s National Academy of Science, National Research Council, the white paper entitled, “Accidental Death and Disability: The Neglected Disease of Modern Society,” had little impact until 1971, when the president of AAST, Dr. Sawnie R. Gaston, championed the need for AAST and the surgical community to publicize the findings of the report and promote its recommendations. This event ignited the spark that lit the flame that set the blaze of three generations of research and education, especially in pre-hospital care.

The phrase, “emergency medical services,” shortened to “EMS,” with its now universally recognized emblem of a flat, six-pronged star (Star of Life), did not even exist in 1970 but was a household icon by 1980. Rarely, in the history of medicine, has an emblem become such a recognized symbol in such a short period of time. Numerous EMS-related organizations emerged, including National Association of EMS Physicians, National Registry of EMS Technicians, National Association of EMTs, and others. As surgeons developed trauma courses during the 1970s, a companion course for paramedics also had its beginnings, led by a surgeon, Dr. Norman McSwain. The standard for the industry, the Pre-hospital Trauma Life Support (PHTLS) course, matured in the 1980s. During the ’70s, the nomenclature of EMS (e.g. paramedic, emergency medical technician, basic life support, advanced life support) became standardized

NATIONAL CENTER FOR EMSS

David Boyd

In the very early 1970s, David Boyd finished his general surgery residency at Cook County Hospital in Chicago, where all surgeons reactively developed an interest in EMS, emergency medicine, and trauma. He and an ER nurse, Terry Romano, began talking about emergency medicine systems for the Chicago area and soon joined with the governor to reorganize trauma centers across the State of Illinois. He spoke of vertical, horizontal, and even circular integration between ambulance services and trauma centers. This endeavor caught the eyes

and interest of the developing EMS, trauma, and emergency medicine training groups. Focus was on the size and capability of the ambulances, as well as standardization of care emergency patients, particularly trauma patients, received at the scene, during transport and upon arrival at the hospital.

Using retired US Army helicopter pilots who had flown in Vietnam, Dr. Henry (Hank) Cleveland was simultaneously developing, and subsequently reporting in the *Journal of Trauma*, his experience with a regional helicopter rescue and transport, hospital-based EMS service for the greater Denver, Colorado, area. Numerous other ground EMS programs developed around the United States, notably in Jacksonville, Florida, Seattle Washington, and Houston, Texas.

The American College of Surgeons Committee on trauma was developing standards and best practices by creating emergency room trauma posters and writing guidelines for hospital and pre-hospital resources needed for the optimal care of the trauma patient. At the beginning of the decade, “emergency rooms” were called various names, i.e., major emergency room or comprehensive emergency room. By the end of the decade, the terminology relating to trauma services was standardized. Many of the formal presentations at AAST and publications in the *Journal of Trauma* came from university and county hospitals, as well as military hospitals.

The US Congress, in 1973, authorized the Emergency Medical Services System (EMSS) Act; in 1974, President Gerald Ford signed this bill and appointed Dr. David Boyd director of the Division of the Emergency Medical Services within the Public Health Service of the Department of Health, Education and Welfare. Almost overnight, a national subculture emerged to address the various associated “systems”—mainly addressing ambulance design, training of the ambulance attendants, and where patients with major emergency conditions should best be taken for definitive treatment. Hospitals were beginning to describe emergency rooms as “basic,” “major,” and “comprehensive.” Dr. Boyd and his now-developing band of disciples, including many members of the AAST and ACS-COT, gave presentations at multiple meetings sponsored by the Division of Emergency Medical Services Systems (DEMSS). Federal funds were acquired to support integrated systems. This movement in states, cities, hospitals, and ambulance services began to produce a relatively consistent common thought, although expressed using different terminology.

Meanwhile, a group of surgeons led by Drs. Donald Trunkey, Tommy Thompson, Henry Cleveland, Frank Mitchell, Jr., Charles Wolfforth, and others were meeting and developing standards for hospitals treating trauma patients. This program, under the supervision of the ACS-COT, produced a six-page white paper entitled, “Optimal Hospital Resources for the Care of the Injured Patient,” published in the *Bulletin of the American College of Surgeons* in 1975, and formally made into a manual in 1976.² This publication proved to be the first of many subsequent ACS-COT “Optimal Resources Books.” This ACS-COT document defined three levels of trauma centers, and created a chart depicting requirements for achieving trauma center verification and recognition, with the “designation” being a political process, usually done at the state health department level. Dr. David Boyd, a member of the ACS, received his copy of this *ACS Bulletin*, and unaware that the Optimal Resources document was going to be published,

was beyond ecstatic as he read it. He made dozens of phone calls and immediately ordered, at the expense of the DEMSS, thousands of reprints of the first Optimal Resources document. Using the newly published guidelines, he became a cheerleader for the movement. It almost appeared as if the US government's DEMSS of the Public Health Service of the Department of Health, Education, and Welfare was the stimulus and endorser of the ACS document.

Under the direction of Dr. Don Trunkey, chair of the ACS Committee on Trauma, and supported by Drs. Cleveland, Thompson, Mitchell, Wolfforth, and others, a meeting was held with the director of the ACS, Dr. C Rollins Hanlon, and members of the Board of Regents, outlining how the ACS-COT would "verify" Level I–III trauma centers using the ACS Optimal Resource Document (thus, a peer review activity), and then, via a governmental process (using state health departments), "designation" of these trauma centers would occur. From this point forward, the subsequent developments in injury classification, surgical critical care, application of civilian trauma advances to military medicine, research in trauma and critical care, proliferation of regional and national trauma conferences, and the ambition of surgeons from various training backgrounds (general, vascular, thoracic, pediatric, orthopedic, etc) to refer to themselves as "trauma surgeons" simply could and would never be stopped. Other related developments might take a couple of decades to unfold and expand, but the trajectory was now indelibly and unalterably set.

These events—primarily the development of and subsequent reprinting and distribution of thousands of the ACS Optimal Resources document, along with the establishment of trauma centers—were the turning points of the 1970s, leading to the redefinition of both the word "trauma" and the unique body of knowledge to which it refers. At that point in time, those in the discussion committee rooms had no idea of the energy and subsequent impact on quality health care they had initiated. Many of these relatively young surgical leaders went on to leadership positions in surgery at the academic, research, and organized medicine levels.

AMERICAN TRAUMA SOCIETY

One of the recommendations from the National Academy of Science, National Research Council (forerunner of the Institute of Medicine) in the 1960s, was that an organization analogous to the American Heart Association and American Cancer Society be developed for trauma. And during the 1970s, the American Trauma Society was formed, with the founding and contributing members made up almost entirely of surgeons. Dr. William Fitts (an early editor of the *Journal of Trauma*), along with Dr. John Howard and Dr. Curtis Artz, were major drivers in this organization. A national organization was formed, with state chapter development encouraged. By the mid-1970s, this organization had little visibility and seemed to be floundering. Drs. Fitts and Boyd held a national meeting at a hotel near O'Hare Airport in Chicago, inviting multiple speakers, but mainly attempting to link a fund raising organization to a public awareness of trauma. This meeting resulted in formation of state chapters and individual regional units of the American Trauma Society, although the Society never gained the same momentum or visibility of the American Heart Association or the American Cancer Society.

UNIFORMED SERVICES UNIVERSITY FOR THE HEALTH SCIENCES

The Uniformed Services University for the Health Sciences (USUHS) was established in 1972 via legislation sponsored by US Representative Felix Edward Hébert of Louisiana. Its first class graduated in 1980. A number of surgeons, many of whom were active members of AAST, were instrumental in strongly lobbying for this U.S. Military Medical School with its allied programs, including an active research program. Graduates of USUHS have distinguished themselves in many important leadership positions. Eighty percent of military physician graduates of USUHS remain in military service for at least 20 years. The majority of the U.S. Army Special Forces physicians are USUHS graduates. A film documentary, *Fighting for Life*, underscored the importance and role of USUHS in military medicine. USUHS is now affiliated with many military and civilian teaching hospitals across the United States. Surgeons on the faculty of USUHS have regularly presented scientific papers at AAST. AAST and USUHS have co-sponsored a number of special conferences on resuscitation and specific management of complex injuries.

PERSONALITIES

With each decade, multiple individuals are identifiable as leaders of any organization or movement. They are recognized here, for it was during the 1970s they each made significant, sentinel contributions to trauma. Undoubtedly, there are numerous others who could and should be noted, but space (and memory) are limiting factors.

CURTIS P. ARTZ

I remember Dr. Curtis Artz as a burn doctor from the Brooke Army Burn Center in San Antonio, a faculty member at University of Texas Medical Branch in Galveston, Texas, and chair of surgery at University of South Carolina in Charleston. However, I remember him best as a champion of the American Trauma Society, as a promoter of the AAST William Fitts Lectureship, and as a fantastic surgical orator. Dr. Artz died near the end of this decade of the 1970s, but his legacy and influence lived on.

CHARLES BAXTER

Dr. Charlie Baxter was self-driven surgeon who did things his way, including his research in burns. He helped develop the Parkland formula for the treatment of burns, and he was a prolific contributor to advances in burn therapy for over 30 years, but the 1970s were his peak productive years.

JOHN BORDER

I can still hear the voice of John Border talking about the immediate and complete operative fixation of all fractures. He was an early voice for this total fixation approach to reduce com-

plications, to improve early mobility, and to aid in expeditious patient recovery. He was the last American general surgeon that I remember who also had a strong interest in orthopedic trauma.

DAVID BOYD

Dr. David Boyd's significant contributions and vision in EMS and trauma systems development were cited earlier. His dogged determination to make EMS/trauma systems a reality had lasting impact.

PAUL "SKIP" COLLICOTT

Dr. Skip Collicott was an annual member of the faculty at the Kansas City Regional Trauma Conference and one of the architects of the ATLS course. He later continued to support local, regional, national, and international trauma educational programs from his position as director of member services of the ACS.

JOHN DAVIS

Dr. John Davis served as the editor for the *Journal of Trauma* from 1975 through 1994, following William Fitts. As such, his role was significant in establishing the *Journal* as the undisputed international forum for scientific exchange in trauma. In addition to elevating the stature of the *Journal*, he also served as president of AAST during this decade.

WILLIAM FITTS

Dr. Bill Fitts was an orthopedic surgeon who was totally committed to developing trauma as a discipline and developing an organization and journal to support it. He was editor of the *Journal of Trauma* and president of AAST during the 1970s, while, at the same time, attempted to create the American Trauma Society. In recognition of his leadership and efforts, the AAST created the Fitts Oration, which is the highest scholarly oration presented at the AAST annual meeting.

OSCAR HAMPTON

My first recollection of an ACS trauma director for organized surgery was Dr. Oscar Hampton. He ran the ACS COT with rigid discipline. While attending an early meeting of the COT, I remember his mandating that ACS State Trauma chairs and the members of the COT meet separately. We spent much time creating resolutions that would be sent to the Board of Regents for review and reaction. The task of the Committee on Trauma annually writing "resolutions" ended during the 1970s, as focused work on the trauma center verification process developed.

JOHN HOWARD

Dr. John Howard's contribution to trauma during the 1970s was a yeoman's effort to create

national and state infrastructures for the American Trauma Society. He was able to raise seed funding through memberships and hold annual meetings of the Board of Directors, including presentation of papers related to the dangers and epidemiology of trauma. While achieving attendance by some trauma surgeons, it proved difficult to create a lot of enthusiasm for this new organization. Very few non-surgeons became early members of the American Trauma Society, and this organization would never have gained the status it ultimately reached, had it not been for the efforts of Dr. John Howard.

NORMAN RICH

Dr. Norm Rich entered the decade of the 1970s with one of his more classic papers published in the *Journal of Trauma* (May 1970), having also presented it earlier at AAST. Dr. Rich was the first vascular trainee at Walter Reed Hospital and became “the military voice of vascular trauma” for several decades, but he was most prolific in education and publication during the 1970s. He also became the first and longstanding chair of the department of surgery at USUHS, which now bears his name. It was during the 1970s that Dr. Rich established the USU Surgical Associates and a series of named awards and lectureships at USUHS, all focused on military medicine and trauma surgery. He was a frequent presenter at AAST and regularly published in the *Journal of Trauma*.

TOM SHIRES

Dr. Tom Shires became an icon of trauma, beginning in the 1960s, when he was chair of surgery at Southwestern Medical School and chief of surgery at Parkland Hospital. His research in fluid balance and body compartments is classic, as are his contributions to burn resuscitation. During the 1970s, he was editor and author of one of the few active textbooks on trauma, *Principles of Trauma Care*. He was chairman at four different medical schools, where he established strong basic science research laboratories as well as clinical departments with strong interest in trauma and critical care. His faculty regularly presented papers at AAST. He was president of the American College of Surgeons and was a major voice in trauma development, particularly during the decade of the 1970s.

TOMMY THOMPSON

For his great vision and leadership as both Oklahoma state chair of trauma for the ACS, and chair of the Committee on Trauma during the 1970s, the American College of Surgeons ultimately awarded Dr. Tommy Thompson the prestigious Distinguished Service Award. It was undoubtedly Dr. Thompson who brought together the several surgeons who formed the nucleus of the COT Trauma Center Verification Program, the ATLS, the designation of trauma centers, and many other of the national programs of the ACS-COT. His was an operational and visionary leader.

DONALD TRUNKY

Dr. Donald Trunkey established his style, leadership, vision and reputation as a lecturer and writer during the decade of the 1970s, and has since continued on that focus and trajectory. It was during this time that he finished his trauma fellowship with Dr. Shires in Dallas and, went to San Francisco General Hospital, where he worked with the legendary Dr. William Blaisdell. During this time, he established his trauma clinical expertise, his leadership in the Committee on Trauma of the ACS, and his basic science interest in the metabolic effects of injury. His clinical expertise, research, and publications were exclusively in trauma areas.

ALEXANDER WALT

During the 1970s, Dr. Alexander Walt served as chair of the department of surgery at Wayne State Medical School and chief of surgery at the historic Detroit Receiving Hospital. While there, he and his staff had a very active clinical research program, and their contributions to trauma presentations at AAST are legendary. His faculty included Drs. Anna Ledgerwood and Charles Lucas, among many others who became trauma leaders in their own right. Dr. Walt had a wonderful way with words and gave superb lectures that mirrored his great written words and influenced many.

TECHNOLOGY

During the 1970s, technology began to explode. Apple computers first emerged and Microsoft began as a software company. Plastic polymers and spinoffs from the space industry were being applied to health care.

MAST PANTS

External, lower extremity and abdominal counter pressure devices, such as an aviator's "antigravity suit" date back to the early 1900s. In the 1960s, Col. Robert Bailey constructed the Military Anti-Shock Trousers (MAST) to be evaluated in Vietnam. The device did seem to elevate blood pressure and so was introduced into civilian emergency medical services in 1970. In 1977, the COT recommended MAST as an essential device on all ambulances. From the beginning, there was debate surrounding MAST's effectiveness in favorably influencing outcome. The Mattox/McSwain debates on MAST were conducted at almost every trauma conference in the country. However, it was not until the next decade that evidence was presented demonstrating this device actually had a survival disadvantage.

SPECIAL AIRWAY TUBES

With the expansion of emergency medicine and EMS, it was logical that new airway devices beyond the routine endotracheal tube would be developed. The esophageal obturator airway (EOA) was one of the early devices developed during the 1970s. It was intended to be purpose-

fully inserted into the esophagus, followed by large balloon inflation in the esophagus, and placement of an air sealing mask over the nose and mouth, with ventilation then forced into the hypopharynx. Not only were tears in the esophagus reported, there was also an almost 100% vomiting and aspiration rate seen on removal of the device. Its use was terminated prior to the end of the 1970s.

CT SCANNING

The first commercially viable CT scanner used X-rays and was invented by Sir Godfrey Hounsfield in Hayes, United Kingdom, at EMI Central Research Laboratories. Hounsfield conceived his idea in 1967. The first EMI-Scanner was installed in Atkinson Morley Hospital in Wimbledon, England, and the first patient brain scan was done on 1 October 1971. As an interesting aside, it was the success of the Beatles that enabled EMI to fund research and build early models of the CT scanner for medical use. Thus, clinical application of CT Scanning, initially limited almost entirely to patients with head injuries, was a product of the 1970s.

DIAGNOSTIC PERITONEAL LAVAGE

Developed by Dr. David Root in the waning years of the 1960s, the clinical use and widespread reporting of diagnostic peritoneal lavage (DPL) for many traumatic conditions belongs to the 1970s. Every major surgical program and trauma center published not one, but many papers on DPL. Both closed and open techniques were described, and no other single diagnostic procedure for trauma patients received more attention during the decade of the 1970s.

VASCULAR GRAFTS

The 1960s ended with a limited number of substitute vascular conduit options available—knitted/woven Dacron and the saphenous vein. During the 1970s, different vascular prosthetics emerged and were widely applied for a variety of conditions, especially in trauma. PTFE (expanded polytetrafluoroethylene) grafts were first introduced as a synthetic cloth in search of an indication. Mr. Bill Gore, the inventor, made a short tube graft for Dr. Ben Eiseman, who first used it to replace the portal vein during a Whipple operation for a traumatic injury. PTFE was used in areas of potential infection with success and was used where smaller prosthetic conduits were required. Homografts and collagen impregnated grafts were also introduced. During this decade, a few temporary uses of polyethylene tubes were anecdotally reportedly used in peripheral vascular trauma, and, on occasion, chest tubes were used as temporary aortic conduits.

POLYPROPYLENE SUTURE

In the 1960s, the suture choices of silk and plain/chromic catgut were initially joined by braided plastic and polyethylene. With the addition of monofilament polypropylene suture in the early 1970s, a stronger, reliable suture was available. It did not deteriorate with time, thereby reducing the potential for vascular suture line pseudoaneurysms.

AMBULANCE DESIGN

The station wagon-like ambulances of the 1960s were replaced in the 1970s with larger truck cabs in front of a large “box” patient space that allowed paramedics lots of room for interventions during transport. Also during the early 1970s, ambulances added telemetry of patient physiologic data and enhanced communication with receiving hospitals.

SPECIAL CLAMPS & INSTRUMENTS

Being presented with patients with complex advanced injuries, surgeons developed new, innovative instruments, including large “liver clamps,” abdominal aortic compressors, special vascular clamps to encircle intravascular tubes, and a number of special intra-vascular balloons and catheters.

CIVILIAN HELICOPTERS

During the 1960s, helicopters were extensively used in the Vietnam War for transport, gunships, and air ambulances. It was logical that this technology would be applied to civilian ambulance operations during the 1970s. Numerous cities developed successful and profitable programs. Standards for when to use (or not) these air ambulances did not develop.

AUTOTRANSFUSION

Blundell, in 1818, is credited with introducing the concept of using the patient as his/her own blood donor by developing an autotransfusion device. With the advent of the discovery of blood typing and blood banking in the first half of the twentieth century, pursuits in autotransfusion disappeared. In 1973, several surgeons and device companies resurrected interest in autotransfusion for use in hemothorax, vascular trauma, and complex thoracoabdominal aneurysms. Several special autotransfusion meetings occurred during the 1970s, and several devices were sold commercially. Autotransfusion was also acceptable to some members of the Jehovah Witness faith, as long as the tubing circuit was kept in continuous contact with the patient.

ARTIFICIAL BLOOD

At my very first attended AAST meeting in 1973, I met Dr. Gerson Greenberg, who informed me of his work with stroma-free hemoglobin. I had heard about the fluorocarbon research with mice, which sparked my interest in “artificial blood.” Unfortunately, despite three more decades and millions of dollars spent, artificial blood is still not clinically viable as a substitute for human blood and blood products.

TRAUMA PUBLICATIONS OF THE 1970S

The trauma literature of the 1970s was not stellar. Only two textbooks in trauma were pub-

lished from the United States: Shires' *Principles of Trauma Care* and Robert Rutherford (of later *Vascular Textbook* fame) edited a larger trauma textbook. Neither of these textbooks was current or extensive. The ACS published the pamphlet, "Hospital Resources for the Care of the Injured." The ATLS course book would not be written until the 1980s. The *Journal of Trauma* was developing. Throughout the 1970s, most issues of the *Journal of Trauma* contained a section of abstracts of articles of trauma interest from both domestic and international journals.

THE SEARCH FOR A "BETTER WAY"

An explosion of curiosity regarding EMS, emergency medicine, trauma care, surgical critical care, and the infrastructure and basic science supporting these areas occurred during the 1970s. A new energy in the many new converts, mostly relatively young surgeons, to these disciplines resulted in the development of a systematic new look at this niche in medicine. That new approach stemmed from the statement, "There must be a better way, and we are out to find it." The surgeons involved in trauma during this decade used words like, "systems," "integration," "quality," "systematic review," and "evidence," long before any report from the Institute of Medicine or business principles of TQM became popular. The search for a better way was simply focused on the patient. The result was the creation of an infrastructure, which, in later years, would emerge in the first and second decades of the twenty-first century as the best model in medicine for "systems quality review." Some of the areas of focus for this pursuit for a "better way" follow.

PREHOSPITAL TRANSPORTATION

Advances in emergency medical services, prehospital telemetry, treatment during transportation, EMS/hospital integration, air ambulance transport, and physician oversight of this phase of trauma care were a major focus during the 1970s decade.

DIAGNOSIS

Techniques and equipment to aid in a more precise ability to diagnosis conditions such as hemoperitoneum, vascular trauma, and CNS injury were enhanced by arteriography, CT scanning, DPL, and ultrasound.

VASCULAR TRAUMA

No other anatomic area got more focus and interest from the "new" trauma surgeons than did the area of vascular trauma. Large series of cases from both the military and civilian sectors reported on every named vascular bed. All of the vascular surgery complications were studied, and methods of definitive and temporary control were reported. Techniques of intraluminal control and temporary shunting were cited and occasionally used. It would take several decades and improvements in imaging and devices before such intraluminal therapy would become a common approach.

ORTHOPEDIC TRAUMA

Whereas for centuries fractures were frequently treated by long term and often complex traction, during the decade of the 1970s, focus turned to early (and complete) fixation of fractures. In addition, the morbidity of complex, unstable pelvic fractures was recognized as having a significant morbidity and mortality. During this decade, various pelvic clamp devices were introduced.

THORACIC TRAUMA

The understanding and classification of thoracic injury was simplified during the 1970s. The critical volume of 1500 ml of hemothorax blood loss was identified, along with a calculation of the rate of bleeding that signaled the need for thoracotomy. Screening and diagnostic criteria for blunt injury to the thoracic aorta were standardized, as were techniques for operative repair. Penetrating cardiac injury reports gained in number and quality, demonstrating that most cardiac injuries could be repaired successfully without cardiopulmonary bypass and cardiothoracic surgeons.

BURN MANAGEMENT

Following the lead of the US Military Burn Center at Brooke Army Hospital, civilian trauma centers focused on early burn eschar excision and control of burn wound sepsis. Silver nitrate and Sulfamylon became standard topical treatments. Research in “artificial skins” began.

SURGICAL CRITICAL CARE

Surgical intensive care unit beds began to be developed in association with trauma centers, with surgeons having a special interest in surgical patients with critical care problems. For many of these surgeons, their ICU interests exceeded their desire to be in the operating room. These individuals became essential in the development of the specialty of critical care, and served on the editorial board of the *Journal of Critical Care Medicine*, and served as officers in the Society of Critical Care Medicine (SCCM). Prominent trauma surgeons were often on the annual programs of the SCCM.

COMPLEX PANCREATO-DUODENAL INJURY

Wounds to the “surgical soul” resulted in complex pancreato-duodenal injury. In this decade, several different approaches were described to manage this injury, including Whipple operation, with its significant operative mortality, multiple tube drainage, duodenal diverticulization, and pyloric exclusion. The Jordan Procedure, named after Dr. George L. Jordan, Jr., of Houston, emerged as the most practical approach to achieve nutrition while preventing a side duodenal enteric fistula.

THE COLON

Entering the decade of the 1970s, colon injury resulted in an immediate mandatory colostomy. During this decade, alternate approaches to colon injury were being explored, to include: exteriorization of a repair, primary repair, primary repair with a proximal protective stoma, and others. This research on colon injuries resulted in a new standardized approach during the 1980s and 1990s. Similarly, the dogma of mandatory presacral drainage and washout of the distal colon for rectal injuries below the peritoneal reflection began to be challenged during the 1970s.

THE EDUCATIONAL ENVIRONMENT

ATLS

A major impact on trauma had its beginnings in the 1970s but would develop mainly in the 1980s and really blossom in the decades thereafter. The Advanced Trauma Life Support Course (ATLS) has been *the* principle vehicle for standard communication relating to the initial evaluation and treatment of the trauma patient. The beginnings for this concept were born of a tragic airplane accident and the pursuits of an orthopedic surgeon in Lincoln, Nebraska, the same initial origin of the Advanced Cardiac Life Support Course (ACLS).³

In 1976, Dr. James K. Styner, an orthopedic surgeon was piloting his own light aircraft, when he crashed in a Nebraska field. His wife, Charlene, was killed immediately, and three of his four children sustained critical injuries. He survived and carried out initial triage on his family, and flagged down a passing car to transport him to a nearby hospital, only to find it closed. The hospital eventually opened, but Dr. Styner acutely recognized and stated that the emergency care in this small regional area was “inadequate and inappropriate.”^{2,3} Later, in Lincoln he said, “When I can provide better care in the field, with limited resources, than what my children and I received at the primary care facility, there is something wrong with the system and changes must occur” (6). Upon his return to work, Dr. Styner and his associate, Dr. Paul “Skip” Collicott, using the template of the ACLS course and personnel, and with the assistance of the Lincoln Medical Education Foundation, developed the initial ATLS course that was first given in 1978. Taking this original course were Drs. Styner, Norman McSwain, Skip Collicott, Henry “Hank” Cleveland, and others. Finally, in 1980, the ACS Committee on Trauma formally adopted the ATLS Course and began a program for national and international dissemination. On March 22, 2013, the ACS COT formally changed the name of their annual “Award for Meritorious Service in ATLS” to the “James K. Styner Award for Meritorious Service,” in honor of Dr. Styner’s vision and contributions.

After taking this course, Dr. McSwain asked the ACS COT for permission to give the course to EMTs and paramedics who were members of the National Association of EMTs (NAEMT). It was suggested that since this course was developed for physicians, he could develop an EMT/paramedic course linked to the ATLS. He developed the Pre-Hospital Trauma Life Support (PHTLS) course, which is now taught throughout the world. The seeds for PHTLS

were planted in the 1970s, but it was not until well into the 1980s that PHTLS was completed and formal courses given.

REGIONAL TRAUMA CONFERENCES

Several regional trauma conferences developed in the 1970s. Several longstanding trauma courses were already in place, including the trauma postgraduate course at the ACS, the Detroit Trauma Course, and the every five years trauma focus of the University of Minnesota Surgical Post Graduate Course in Minneapolis. Although officially beginning in late 1960s, the Las Vegas “Western States” Committees on Trauma Course developed its true and recognized identity in the 1970s, under the direction of Drs. John Batdorf, Chris Cammack, Cuth Owens, and Henry Cleveland. This regional course inspired in the formation of similar courses, one in Kansas City under the direction of Dr. Frank Mitchell, Jr., and the other in Atlantic City, New Jersey, led by Dr. Charles Wolfforth. These courses competed for course material, faculty, and registrants, and created an educational foundation that has continued to this day, expanding to be the first to include surgical critical care and acute care surgery. Additionally, the Las Vegas course helped create a venue and seed funding for the Society of Trauma Nurses.

In summary, the decade of the 1970s was pivotal in the development and expansion of AAST, trauma as a discipline, and an entire new paradigm to regional and systems approach to a public health issue—trauma.

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THE 1980s

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OVERVIEW OF THE DECADE

The 1980s were a peaceful decade for the United States, with the only military intervention being the invasion of Grenada for a 51-day period late in 1983. The decade was characterized by President Ronald Reagan's strong stance against communism in Russia, the growth of personal computers, a global recession, worldwide population growth, and the fight against the AIDS epidemic.¹

Extraordinary changes occurred in the care of injured patients as well, and these were well-documented during the annual meetings of the American Association for the Surgery of Trauma (AAST) from 1980–1989. And, it is not surprising that many of the clinical papers presented at the annual meetings came from well-known urban Level I trauma centers.

SYSTEMS AND CENTERS

The introduction of the Trauma Score (TS) in 1981 (not at an AAST meeting) was followed by an analysis by Champion et al² from the Washington Hospital Center of patients with a $TS \leq 4$ at the 1985 meeting. The lack of survivors in this group was noted, and this was one of the first efforts in trauma centers to use physiologic scoring as a predictor of outcome.

The description of the composition and processes of the Medical Audit Committee in San Diego County by Shackford et al³ at the 1986 meeting prompted the development of trauma death audit meetings at all major trauma centers in the following years. With more comprehensive descriptions of causes of deaths than at routine "morbidity and mortality"

conferences, trauma death audits have become one of the single most important performance improvement processes in trauma care.

PREHOSPITAL CARE

The 1980s were characterized by significant changes in the transport of injured civilian patients. These changes were prompted by the success of rapid helicopter evacuation of wounded soldiers during the Korean War (1950–1953) and during the period when U.S. combat troops were in the Vietnam War (1965–1975). At the 1983 meeting, Fischer et al⁴ from the University of Texas-Houston/Hermann Hospital described the importance of helicopter transport to the scene of injury in a congested urban environment. In 577 flights to the scene (mean: 14.4 miles from the trauma center), 279 patients (48.3%) required intubation, chest tube placement or other invasive procedures. A related paper from Alexander et al⁵ from the University of Florida in Gainesville presented at the 1983 meeting as well, described the importance of prehospital Advanced Life Support in saving injured patients in the state of Florida. It is important to note, however, that the preponderance of patients described in the studies above had sustained blunt trauma.

MANAGEMENT OF SHOCK

The use of type O uncrossmatched blood in injured patients was described by Schwab et al⁶ from Eastern Virginia Medical School/UMDNJ–Camden at the 1985 meeting. Using a protocol in which type O Rh positive blood was administered to males and O Rh negative to females, the authors noted that this blood product was immediately available and safe for all recipients. In addition, the use of O uncrossmatched blood was noted to avoid the clerical and technical problems associated with the use of type-specific blood. While never widely used in trauma centers, type O uncrossmatched blood has always been an interesting alternative to type-specific blood.

There were two interesting papers on the incidence and risks of hypothermia in injured patients at the 1986 meeting. In the paper by Luna et al⁷ from Harborview Medical Center/University of Washington, 94 injured patients with endotracheal tubes and esophageal temperature probes inserted in the field were assessed. Mild (34–36°C) and severe (<33.8°C) hypothermia was noted in 43% and 28% of all patients, respectively. While the mean Injury Severity Score (ISS) was essentially the same in the normothermic and mildly hypothermic groups (28 vs. 29), there was a trend toward decreased survival in the group with mild hypothermia (78% normothermia vs 59% mild hypothermia). The ISS was significantly greater in the severely hypothermic group when compared to the normothermic group (36 vs. 28, $p < 0.05$), and there was a significant (and presumably related) decrease in survival (41% severely hypothermic vs 78% normothermic, $p < 0.05$). The related paper by Jurkovich et al⁸ from the University of South Alabama at the 1986 meeting described 71 patients with “severe truncal trauma” (ISS >25). The incidence of hypothermia increased with “higher ISS, massive fluid resuscitation, and the presence of shock”. Mortality with a core temperature <34°C, <33°C, and <32°C was 40%,

69%, and 100%, respectively. Both of these papers were instrumental in the later descriptions of the “lethal triad” (hypothermia, acidosis, coagulopathy) associated with hemorrhage shock.

BRAIN AND SPINAL CORD

With improved emergency medical services, the ready availability of CT-scanners, and the presence of surgical intensive care units, one would think that the importance of traumatic brain injuries (TBI) in trauma centers would have been recognized in the 1980s. Of interest, there were few clinically relevant papers on traumatic brain injuries at the AAST meetings during this period.

At the 1988 meeting, Gennarelli et al⁹ from the University of Pennsylvania reported on the mortality of “head injuries” (traumatic brain injuries, TBI) from the Major Trauma Outcome Study (MTOS) based at the Washington Hospital Center. The mortality of 16,524 patients with injury to the brain or skull was 18.2%, while the mortality of 32,619 patients without such injuries was 6.1%. In summary, while only 33.6% of patients in the MTOS had injuries to the brain or skull, this group accounted for 60.4% of all deaths. The authors noted that, “Head injury is the single largest contributor to trauma center deaths.”

An interesting paper on the prognostic significance of the Glasgow Coma Scale (GCS) and cerebral perfusion pressure (CPP) in patients with TBI from Changaris et al¹⁰ from the University of Louisville was presented at the 1986 meeting. The authors noted that 98% of patients with a GCS of 3 or 4 on day 1 or 2 after trauma died. Patients with a CPP <60 mm Hg on >33% of hourly measurements on day 2 accounted for 36% of all subsequent deaths. The authors noted that both GCS and CPP were correlated to outcome in patients surviving at least 1 year following injury.

At the 1987 meeting, Pal et al¹¹ from the Montreal General Hospital described 371 patients with “multiple trauma” and examined the incidence of spinal fractures. Based on their analysis, they recommended that in patients with a “skull fracture or altered consciousness, the entire spinal column should be assessed radiographically.” This was because the incidence of fractures in the thoracic spine was the same as in the cervical spine, and even fractures to the lumbosacral spine were present in 17% of patients.

The report by Welling et al¹² from the Good Samaritan Hospital/University of Cincinnati on blunt injuries to the internal carotid artery at the 1986 meeting was one of the largest reported since this injury was rediscovered in 1967¹³. The outcomes of 14 patients with an arterial stenosis or occlusion, extracranial or intracranial aneurysm, or carotid-cavernous fistula were reviewed. Of interest, only one of the 6 patients with arterial stenosis or obstruction who were treated with intravenous heparin improved. These data are, of course, significantly different from those reported over the past decade and suggest that this small group of patients mainly had significant narrowing or obstructions when diagnosed.

One of the most important papers on cervical vascular injuries was presented by Sclafani et al¹⁴ from King’s County Hospital/Downstate Medical Center at the 1984 meeting. Angiography rather than an emergency operation was performed in 46 patients with penetrating wounds between the lower border of the mandible and the base of the skull (Zone

III).¹⁵ Angiography was normal in 22 and abnormal in 24 patients. In this latter group, operative management was necessary in only seven patients, and all other injuries were either successfully embolized or observed. While there has been a change to CT-arteriography and less interest in imaging patients without symptoms or signs of a vascular injury in Zone III in the modern era, this review will always be cited as documenting the high incidence of occult vascular injuries with these wounds.

CHEST

The time interval of in-emergency room observation for asymptomatic patients who have been stabbed in the chest was the topic of a study presented by Weigelt et al¹⁶ from Parkland Memorial Hospital/University of Texas Southwestern Medical School at the 1981 meeting. A delayed pneumothorax or hemothorax occurred in 9% of patients, and all these abnormalities were present on the follow-up chest x-ray at 6 hours. Based on this study and others,¹⁷ the “6-hour rule” remained the standard of care until the “3-hour rule” was studied and found to be as accurate in 1992¹⁸.

One of the earliest studies of diagnostic and therapeutic thoracoscopy in patients with penetrating wounds of the chest was presented by Jones et al¹⁹ from Tulane University at the 1980 meeting. Only three of 36 patients required a thoracotomy, while one of these and nine others needed a laparotomy for lower chest wounds (including six with documented perforation of the diaphragm). Of interest, none of the 8 patients with >1,500 ml drainage through a thoracostomy tube needed a thoracotomy after thoracoscopic exploration. At the time, this was the largest series in the American literature and was instrumental in stimulating interest in the technique.

Studies of blunt cardiac rupture were presented at the AAST meetings in 1980, 1983, and 1985.²⁰⁻²² In the era before surgeon-performed ultrasound for a rapid diagnosis of cardiac tamponade, it is impressive that the survival was 61.3% when results of these studies are combined. As has been noted in all studies presented at AAST meetings since 1985, patients with blunt cardiac rupture who arrive in cardiopulmonary arrest have 100% mortality.

The role of using mediastinal widening as a marker for possible rupture of the descending thoracic aorta was discussed by Gundry et al²³ from the University of Michigan at the 1982 meeting. Mediastinal widening was the most reliable X-ray finding of a rupture of the thoracic aorta according to the panel of surgeons and radiologists involved in this retrospective review of chest x-rays. Unfortunately, not all patients with ruptures were detected by the panel using findings on the chest X-ray. Therefore, the authors wisely concluded that “clinical judgment and consideration of the forces involved in the injury” should have important roles in assessing the need for a thoracic aortogram—the diagnostic study of choice at the time.

The role of the Gott aneurysm shunt (Sherwood Medical Industries, St. Louis, Mo) in 40 patients undergoing operations on acute (n=20) or chronic (n=20) traumatic ruptures of the descending thoracic aorta was discussed by Verdant et al²⁴ from the University of Montreal at the 1984 meeting. The 9-mm Gott or ascending-to-descending thoracic aortic shunt was used in all patients, and 38 survived (95%). The only two deaths occurred in the acute group and were due

to traumatic brain injuries. There were no cerebral, cardiac, renal or neurologic complications in the survivors. These results were the best noted at the time, were better than the “clamp and sew” technique that became popular subsequently, and are equivalent to those achieved with the centrifugal pump.

ABDOMEN

As diagnostic tests and splenic injuries are discussed comprehensively in the section on CLASSICAL PAPERS to follow, this section reviews only management of selected organ injuries.

Four papers on perihepatic packing as a “damage control” procedure were presented at the AAST meetings in 1980, 1983, and 1985. In the two reports from Feliciano et al^{25,26} from Ben Taub General Hospital/Baylor College of Medicine, perihepatic packing was enthusiastically endorsed for patients “in whom coagulopathies, hypothermia, and acidosis make further surgical efforts likely to increase hemorrhage.”²⁵ In the 1985 study, packing was used in only 5.3% of patients undergoing operation, corrected survival (not including patients requiring thoracotomy or in extremis upon arrival in the operating room) was 57.1%, and 10 postoperative fluid collections, hematomas, or abscesses occurred in 9 patients (9/49=18.4%)²⁶. Perihepatic packs were removed at a mean of 3.7 days. This was in marked contrast to the mean of 17 hours for pack removal in the 1983 study reported by Carmona et al²⁷ from San Francisco General Hospital/University of California. Survival was 88% in this review. The enthusiastic endorsement of packing described above was not shared by Ivatury et al²⁸ from Lincoln Medical and Mental Health Center/New York Medical College at the 1985 meeting. In the 14 patients who had perihepatic packs inserted, only six survived (42.8%) and five of these (83.3%) developed intra-abdominal abscesses. In the modern era when patients with only the most severe hepatic injuries undergo operation, perihepatic packing is still required in 5–20%. The most common time of pack removal is 36–48 hours²⁹, and 5–15% of patients will develop perihepatic fluid collections, hematomas, or abscesses—much as after elective hepatic resection or transplantation.

The role and type of perihepatic drains after operative treatment of hepatic trauma was discussed by Gillmore et al³⁰ from Charity Hospital/Tulane University at the 1985 AAST meeting. In two groups of patients with comparable hepatic and other injuries, patients treated without post-repair drains (n=32) and with closed suction drains (n=24) had abscess rates of 3.1% and 4.2%, respectively. This was in marked contrast to the 23% rate of intra-abdominal abscesses when post-repair Penrose drains were used in a prior group of patients with hepatic injuries treated at the authors’ institution. The authors logically concluded that open Penrose drains are contraindicated after operative treatment of hepatic trauma; however, discussants at the meeting defended the Penrose drain and advised that Grade III and IV hepatic injuries should always be drained. All now agree that minor hepatic injuries are not drained, while closed suction drains have replaced Penrose drains after operative treatment of Grade III and IV injuries.

The management of injuries to the extra-hepatic biliary system was reviewed by Ivatury et al³¹ from Lincoln Medical and Mental Health Center/New York Medical College at the 1984 meeting. Based on their own experience with injuries to the hepatic or common duct and a

literature review (total=100 ductal injuries), the authors recommended that primary repair of ductal lacerations with or without a T-tube was appropriate. Based on a stricture rate of 55% after end-to-end anastomoses of transected ducts in the literature review, the authors concluded that a choledcho- or hepatodochojunostomy should be performed. These recommendations continue to this day with some additions as follows: (i) minimal proximal periductal dissection to avoid disruption of the blood supply at 3 and 9 o'clock; (ii) no clamp is placed across the proximal hepatic or common duct at any time; (iii) if the duct doesn't bleed, debride 1 mm proximally at a time until active oozing occurs; (iv) interrupted absorbable sutures in one or two layers with the knots placed outside the lumen are used to complete the biliary-enteric anastomosis without tension; (v) the Roux limb is fixated in the retrocolic window; and (vi) a closed suction drain is placed in Morison's pouch posterior to the anastomosis.

One of the most important papers on pancreatic trauma during the 1980s was presented by Bouwman et al³² from Detroit Receiving Hospital/Wayne State University School of Medicine at the 1983 AAST meeting. In this study of 61 patients admitted with blunt trauma, there was essentially no correlation between serum amylase or isoamylase (pancreatic or nonpancreatic) levels and the presence or absence of pancreatic trauma. For example, 16 of the 61 patients without any evidence of pancreatic trauma had elevated pancreatic isoamylase levels. Two other patients with injuries to the brain had "substantial elevations of pancreatic isoamylase."

Operative management of 283 consecutive patients with pancreatic trauma was described by Stone et al³³ from Grady Memorial Hospital at the 1980 meeting. This 30-year experience documented that closed sump drainage was safer than open Penrose drainage, that distal resection was appropriate for lateral ductal injuries, and that the results of Roux-en-Y internal drainage were dismal. The overall mortality was 13.8%, a figure not dissimilar from that reported in modern centers.

A series of four patients with "post-traumatic pancreatic sequestrum" was reported by Kudsk et al³⁴ from the Ohio State University at the 1985 meeting. All four patients had a history of blunt trauma to the upper abdomen with a posttraumatic pancreatic fistula (n=1) or pancreatitis (n=3). All patients subsequently developed "recurrent symptoms of epigastric pain radiating into the back," starting from one month to two years after the original injury. Based on history (n=1) or ERCP (n=3), three distal pancreatectomies and one pancreatojejunostomy were performed resulting in relief of the patients' pain. The major lesson from this small series is that chronic upper abdominal pain with or without associated hyperamylasemia after peripancreatic trauma mandates an ERCP to rule out a ductal stricture.

Injuries to the superior mesenteric artery were reported by Accola et al³⁵ from Ben Taub General Hospital/Baylor College of Medicine at the 1985 meeting. There was a 50% survival in patients with arteriorrhaphy, 22.2% survival in patients with complex grafting procedures, and no patients survived after ligation. One lesson learned from this series was that complex grafting procedures performed at the first operation are simply "too much surgery" in patients with profound hemorrhagic shock. In the modern era, patients with significant injuries to the proximal superior mesenteric artery are managed with insertion of a temporary intraluminal

shunt at the first operation, i.e., damage control. The second lesson learned was that complex grafting procedures to replace the proximal superior mesenteric artery should never be performed adjacent to an associated injury to the pancreas. This is because a postoperative leak from the injured pancreas will cause dehiscence of a plastic graft or dissolution of an autologous graft. Those problems are avoided by placing the origin of a bypass graft on the inframesocolic abdominal aorta and inserting the graft onto the posterior (underside) aspect of the superior mesenteric artery.

INTERVENTIONAL RADIOLOGY

The contributions of Salvatore “Sal” J.A. Sclafani, former chairman of the department of radiology at Downstate Medical Center and chief of radiology at Kings County Hospital Center Brooklyn, are known to all trauma surgeons. In addition to reference #14 discussed previously, there were numerous other important presentations by Dr. Sclafani at the AAST meetings in the 1980s. At the 1981 meeting, 51 injured patients who had undergone 53 “radiologic catheter techniques” were described.³⁶ The procedures were primarily angiographic hemostasis or drainage of abscesses. The conclusion was “that a radiologist, knowledgeable about trauma and expert in catheter techniques, plays a vital role in improving patient survival and should be integrated into the trauma team approach.” A related paper was presented at the 1983 meeting and described percutaneous drainage of posttraumatic abscesses in 27 patients.³⁷ A reoperation was avoided in 21 of the patients, three had unnecessary follow-up operations, and three had later therapeutic operations. Sclafani et al³⁷ concluded that “radiologic drainage should be attempted before surgical reexploration in most situations after diagnostic procedures have demonstrated an accessible collection.” This remains sound advice to this day.

CLASSICAL PAPERS

AAST meetings in the 1980s were replete with important presentations that far exceeded the number suggested for review in this section of the chapter. Therefore, a decision was made to expand the number to be reviewed from 12–15 to 20.

THE ROLE OF MAST (MILITARY ANTI-SHOCK TROUSERS)

The pneumatic anti-shock garment, available since the early 1900s, was recommended for pre-hospital use at the beginnings of the Advanced Trauma Life Support Course of the American College of Surgeons.³⁸ Concerns were soon raised about its use with certain unsuspected injuries and whether it was truly beneficial to patients with hemorrhagic shock.^{39,40} In the presentation by Mackersie et al⁴⁰ from San Francisco General Hospital/University of California at the 1983 meeting, the (nonrandomized) use of the MAST garment did not improve Trauma Score, blood pressure index or mortality when compared to patients without the MAST garment.

At the 1985 meeting, Mattox et al⁴¹ from Ben Taub General Hospital/Baylor College of Medicine presented the first of two AAST papers on a clinical study involving use of the MAST by emergency medical services in Houston, Texas. Nonpregnant patients 15 years of

age or older with blunt or penetrating trauma and an initial prehospital systolic blood pressure less than 90 mm Hg were entered into the study. The randomization scheme—namely, “subjects entered into the study were randomized into the MAST and No-MAST treatment groups by an alternate day assignment”—generated significant discussion after the meeting and publication of the manuscript. There were 342 patients (88% penetrating trauma) randomized into MAST (160 patients) and No-MAST (182 patients) groups that were well-matched demographically. Of interest, MAST patients required three minutes more at the scene. For the analysis of results, patients were divided into Group A (all patients), Group B (patients with head or extremity injuries and a presenting Trauma Score of 1), and Group C (initial field systolic blood pressure 70 mm Hg or less). In summary, there were no differences in survival between the MAST and No-MAST groups in the analyses of Group A, B, or C.

Because of continuing controversy after publication of the study described above, the same study was extended for another two years, 911 patients were entered, and the CLASSICAL follow-up presentation was at the 1986 meeting.⁴² Randomization was the same as described above and, after exclusions for transfers, unavailable medical records, inappropriate randomization, or MAST deflations, there were 345 patients in the MAST group and 439 in the No-MAST group. As in the previous study, over 85% of the patients had sustained penetrating trauma. An extensive analysis of the data documented that the application of the MAST garment did not confer any significant increase in survival to patients with the following: (i) prehospital blood pressure of 70 mm Hg or less; (ii) thoracic trauma; (iii) abdominal trauma; (iv) blunt trauma; and (v) prehospital time greater than 30 minutes. It should be noted that there was actually a significant decrease in survival in patients with a primary thoracic injury when the MAST garment was applied.

The discussion of this paper at the 1988 meeting was quite robust. All agreed, however, that the use of the MAST garment in an urban setting with a significant incidence of penetrating trauma and short (<30 minutes) or long transport times does not improve survival. In patients with thoracic trauma, MAST decreases survival. The role of the MAST garment in patients with severe pelvic fractures or multiple fractures in the lower extremities, particularly in a rural environment with longer transit times, remains unclear.

PREHOSPITAL STABILIZATION OF INJURED PATIENTS

James Francis “Frank” Pantridge (1916–2004) of the Royal Victoria Hospital in Belfast, Ireland, is known as the “Grandfather of Prehospital ALS.”⁴³ His contribution was the invention and placement of a portable defibrillator on an ambulance, thus creating a mobile coronary care unit.⁴⁴ As prehospital advanced life support became the standard of care in many urban emergency medical services, the same principles of management used in patients with medical emergencies were applied to those who had been injured.⁴⁵ It soon became obvious, however, that patients with penetrating cardiac wounds or truncal trauma with active bleeding were not benefiting from prolonged attempts at resuscitation in the field.

Techniques of resuscitation in the field and transport of injured patients have always been a major focus of AAST meetings. This is related to the fact that J.D. “Deke” Farrington

(1909–1982), president of the AAST from 1975–1976, is considered to be the “father” of modern emergency services.^{46,47}

A number of papers presented at AAST meetings in the 1980s, including the CLASSICAL PAPER to be described, raised concerns about delays in transport of injured patients. At the 1989 meeting, Kaweski et al⁴⁸ from the Naval Hospital, San Diego/Mercy Hospital and Medical Center reviewed the effect of prehospital fluids on survival in trauma patients. There was no improvement in survival when prehospital fluids were administered to any of the five groups studied as follows: “ISS<25; ISS 25-50/initial systolic BP>90; ISS 25-50/initial systolic BP <90; ISS >50/initial systolic BP >90; and ISS >50/initial systolic BP <90.” The authors concluded that, “...the mortality rate following trauma is not influenced by the prehospital administration of intravenous fluids,” a fundamental component of ALS.⁴⁸

Gervin and Fischer⁴⁹ from Kino Community Hospital/University of Arizona described the importance of prompt transport of patients with penetrating cardiac injuries at the 1981 meeting. The authors reviewed the records of 23 patients with penetrating wounds of the heart brought to their center over two years. Two patients were clinically dead and eight others had obviously fatal injuries, so there were 13 patients whose prehospital care was reviewed. In the group of seven patients who had “extensive in-field treatment” lasting 25 minutes or more, none survived. The comparison group of six patients who had a “scoop and run” approach and a scene time of 9 minutes or less had a survival rate of 83% (5/6). The authors stated that, “... prompt transfer to the hospital without attempts at field resuscitation provides a better chance for survival among patients with penetrating heart wounds.”⁴⁹

The CLASSICAL reference in this section was presented at the 1983 meeting.⁵⁰ There were 52 patients with a prehospital or arrival systolic blood pressure less than 100 mm Hg who had advanced life support before receiving care at the University of California, Davis. The patients were divided into three groups including the following: (i) Group A: those without an auscultated or palpable blood pressure; (ii) Group B: those with a blood pressure less than 70 mm Hg; and (iii) Group C: those with a blood pressure less than 100 mm Hg, but greater than 70 mm Hg. The mean time to establish an intravenous line at the scene exceeded the transport time to the trauma center in all three groups of patients. The main scene Trauma Score was decreased upon arrival to the trauma center in patients in Groups A and B and increased 9.2% in Group C. The amount of prehospital fluid infused (Group A, 1037.5 mL; Group B, 990 mL; Group C, 451 mL) had no impact on survival in any group. So, much as in the previously described review by Kaweski et al⁴⁸, the insertion of intravenous lines and the infusion of crystalloid solutions had no positive impact on the survival of patients injured in an urban setting with less than 30 minute transport times.

Results similar to those reported by Gervin and Fischer⁴⁹ and Smith et al⁵⁰ were noted in the interesting study presented by Ivatury et al⁵¹ at the 1986 meeting. From a larger group of patients with penetrating thoracic injuries who needed an emergency room thoracotomy, the management of 69 patients with cardiac injuries was reviewed. In the group of 33 patients who had “stabilization” in the field, one survived (3.3%). This was significantly different from the 22.2% survival in the group of 36 patients who had immediate transport to the trauma

center ($p=0.01$). The authors concluded that, "...immediate transportation without attempted stabilization in the field constitutes the optimal prehospital management for these moribund patients."⁵¹

EMERGENCY DEPARTMENT THORACOTOMY (EDT)

EDT is indicated primarily in patients with penetrating thoracic wounds and suspected or documented cardiac tamponade, exsanguination, or a recent arrest, especially when the operating room is geographically distant. The second indication is a suspected subclavian vessel injury with intrapleural exsanguination. Less common indications are chest wall injuries or congenital abnormalities, pregnancy, or a nontraumatic cardiac problem in which internal cardiac massage will be necessary. On occasion, EDT is used in a patient with a penetrating abdominal wound and a cardiopulmonary arrest upon or shortly after arrival.⁵² While those indications are certainly clear, it became obvious in the 1980s that many patients had emergency department thoracotomies for many other reasons than the classical indications described above.⁵³

The CLASSICAL reference in this section was presented at the 1982 meeting.⁵⁴ This was a report of 400 consecutive emergency department thoracotomies at Denver General Hospital/University of Colorado ($n=304$) and St. Anthony's Hospital ($n=96$). There were 294 deaths (73%) in the emergency department, while 106 patients had further treatment in the operating room. In the group of 28 patients who survived beyond the operating room, 16 were discharged from the hospital, but four had permanent neurologic impairment. Therefore, only 3% (12/400) of the 400 patients who had undergone an emergency department thoracotomy survived and were neurologically intact. The authors reviewed the impact of signs of life (pupillary reaction, blood pressure, respiratory effort) and described four factors that "appeared predictive of poor prognosis." There were no survivors with blunt trauma who arrived in the ED without signs of life or with penetrating trauma to the torso without signs of life at the scene. In addition, there were no survivors amongst patients who had asystole without tamponade after the thoracotomy was performed. Finally, patients who failed to generate a systolic blood pressure greater than 70 mm Hg after cross-clamping of the descending thoracic aorta all died as well. Based upon the large numbers of patients with either penetrating (51%) or blunt (49%) trauma and the careful review of prognostic factors as described, the authors recommended a "selective approach in the application of ED thoracotomy."⁵⁴ One of the other valuable points mentioned in the 1983 paper was the high cost of the ED thoracotomy—namely, \$1280.

A similar study by Bodai et al⁵⁵ had been presented at the 1981 meeting. This was a review of 38 consecutive patients with blunt trauma who had undergone an ED thoracotomy at the University of California, Davis. There were no survivors in this report "regardless of age, sex, and time from injury to arrival."⁵⁵

Millikan and Moore⁵⁶ from Denver General Hospital/University of Colorado presented another valuable study on resuscitative thoracotomy and cross-clamping of the descending thoracic aorta in the operating room at the 1983 meeting. From 1978–1982, 39 (5%) of 791 patients requiring laparotomy for abdominal trauma (29 penetrating/10 blunt) had a resuscitative thoracotomy. Patients were divided into a preceliotomy group (systolic blood pressure <80

mm Hg) and a postceliotomy group (systolic blood pressure fell to <60mm Hg). There were 12 survivors (31%), six of whom developed major abdominal complications; however, only two patients had minor pulmonary problems in the postoperative period. The authors concluded that resuscitative thoracotomy was “successful in salvaging nearly one third of patients with life-threatening abdominal hemorrhage”.

Papers on ED thoracotomy have continued to be presented at the AAST meetings and elsewhere since the papers described from the 1980s.^{57,58} Because of the paper by Cogbill et al⁵⁴, subsequent papers have emphasized the selective approach based on history and admission physiologic status. The most valuable guidelines in the more recent era have been from the Working Group, Ad Hoc Subcommittee on Outcomes, American College of Surgeons Committee on Trauma (Asensio et al) in 2001.⁵⁹

THE EFFECT OF HEMORRHAGIC SHOCK ON THE CLOTTING CASCADE OF INJURED PATIENTS

While there has been much recent interest in the clotting abnormalities of patients with shock after trauma,⁶⁰⁻⁶³ it is important to recognize the CLASSICAL reference in this section that was presented at the 1988 meeting.⁶⁴ This study described the clotting abnormalities that occurred in 22 injured patients (21 penetrating/1 blunt) receiving 10 or more units of blood at Detroit Receiving Hospital/Wayne State University School of Medicine. The thrombin, prothrombin, and activated partial thromboplastin times were prolonged in the operating room, while the fibrinogen, factor V, and factor VIII levels were decreased. After hemorrhage was controlled, clotting times and factor levels normalized. Of interest, fibrinogen, factor V, and factor VIII levels exceeded normal levels by postoperative day 4. Fibrin split products were measured as well, and were found to be normal in the operating room. These levels, however, rose progressively through postoperative day 4.

Harrigan et al⁶⁴ suggested that the acute decrease in clotting factors was likely due to “increased hemostatic demands, plasma dilution from resuscitation, and extravascular relocation from shock-induced extravascular expansion.” The authors also stated that the delayed “factor restoration” was likely due to “enhanced hepatic synthesis, factor half-life, and intravascular relocation”. This process was described as a “biphasic response” in which clotting times reflect factor levels.

This study, in which patients actually received 21 ± 13 red blood cell transfusions versus $1.26 \pm .58$ liters of fresh frozen plasma, documented that the transfusion paradigm of the time (4 units PRBC to 1 unit FFP) was likely to cause a coagulopathy. It was only much later that it was recognized that the acute coagulopathy of trauma-induced shock induces “systemic anti-coagulation and fibrinolysis” even before transfusion is initiated.⁶¹

MYOCARDIAL CONTUSION (BLUNT CARDIAC INJURY)

In the 1980s before airbags were available on cars in the United States (1987: first airbags as standard equipment on Porsche 944 and 944S, 1988 in Chryslers), there was significant interest

in and numerous presentations on “myocardial contusions” at all surgical meetings. There was a lack of a precise definition, no precise diagnostic test, and an uncertain outcome if an actual blunt cardiac injury was confirmed. The definition was somewhat clarified in an editorial in the *Journal of Trauma* in 1992.⁶⁵ And, over time, a normal admission electrocardiogram was accepted as a highly accurate screen to rule out the presence of a blunt cardiac injury.⁶⁶ This eliminated the need for routine measurement of creatine phosphokinase myocardial band (CPK-MB) enzyme levels, radioisotope cardiac scans, and transthoracic/transesophageal echocardiograms.⁶⁷ Some groups continue to use measurements of cardiac troponin I (TnI) in addition to the admission electrocardiogram to detect the presence of a blunt cardiac injury.

There was a significant overdiagnosis rate of myocardial contusions throughout the 1980s. In addition, there were major concerns about the safety of operating on injured patients who actually had a true diagnosis of a blunt cardiac injury. The CLASSICAL reference on this latter topic was presented at the 1985 meeting.⁶⁸ In this review of 19 patients at the R Adams Cowley Shock Trauma Center/University of Maryland, the diagnosis of a blunt cardiac injury was confirmed by serial EKGs, CPK-MB isoenzyme determinations and radionuclide angiography. Operative treatment for other injuries was necessary in all 19 patients, including 15 (79%) on the day of admission. Inotropic support was required in 11 patients, and another patient needed an intra-aortic balloon pump. It was reassuring, however, that no cardiac complications occurred and none of the patients died. The authors concluded that, “...myocardial contusion does not constitute an absolute contraindication to necessary operations in polytraumatized patients.” A similar conclusion was reached by another group some years later, including the caveat that hemodynamic monitoring for early detection of arrhythmias was necessary during emergency operative procedures.⁶⁹

DIAGNOSTIC PERITONEAL LAVAGE

The development and clinical introduction of diagnostic peritoneal lavage was due to the efforts of Harlan D. Root, John F. Perry, Jr., and William R. Olsen in the late 1960s and early 1970s.⁷⁰⁻⁷⁵ This technique was introduced when it became obvious that physical examination of the abdomen was often inaccurate in patients with multisystem blunt trauma. Also, the four-quadrant abdominal paracentesis had too many false-negative studies and always had the risk of injuring the gastrointestinal tract.

The CLASSICAL reference in this section was from St. Paul-Ramsey Medical Center/University of Minnesota and was presented at the 1980 meeting.⁷⁶ Adding to the prior work of Root, Keizer and Perry^{71,72} in 1967, the 1980 presentation evaluated the role of quantitative analysis of red blood cell and white blood cell counts as well as amylase level in lavage effluent. The authors performed diagnostic peritoneal lavage in 1,588 patients with blunt trauma, and the test had an accuracy of 98.6%, sensitivity of 94.3%, and specificity of 99.8%. The false-positive and false-negative rates were only 0.1% and 1.3%, respectively. Of interest, 59 patients had “equivocal” taps, but positive cell counts on quantitative analysis and were in the true-positive group. In the eight patients with positive white blood cell counts only, all had injuries to the gastrointestinal tract at the time of laparotomy. As five of the six patients with

elevated amylase levels had elevated white blood cell counts also, the authors concluded that, "...lavage-fluid amylase measurement is costly and is of insignificant yield."⁷⁶

This and other early studies as listed above document the excellent accuracy of quantitative diagnostic peritoneal lavage, a diagnostic technique that remains valuable to this day.

COMPUTERIZED TOMOGRAPHY (CT) OF THE ABDOMEN

The development of computed tomography (CT) by Sir Godfrey Newbold Hounsfield (1919–2004) of Electric and Musical Instruments in England was truly one of the landmark events of modern medicine.^{77,78} Clinical trials of the EMI head scanner commenced in England in 1972, while the general purpose scanner was first described in 1975.⁷⁷ The first reports of the use of CT-scanning to evaluate patients with blunt abdominal trauma in the United States were from San Francisco General Hospital in 1981 and 1982.^{79–81}

The CLASSICAL reference on the use of CT scanning in abdominal trauma was presented at the AAST meeting in 1984.⁸² Abdominal CT scans were performed in 103 patients with blunt abdominal trauma after the administration of oral and intravenous contrast. Subgroups included patients with scans before tap and lavage, after "negative" or borderline lavages, or to evaluate hematuria. In the group of 42 patients with "negative" lavages, 16 patients were found to have 22 injuries on the abdominal CT. When 14 patients with a borderline lavage were studied, six patients were found to have nine injuries including two with actively bleeding spleens. Finally, in the 85 patients with hematuria, 17 were noted to have abnormalities in the genitourinary system. The authors nicely summarized this report by stating that, "CT is the diagnostic modality of choice in the hemodynamically stable patient with nonpenetrating trauma for the evaluation of intra-abdominal injury or hematuria."⁸²

A number of other papers on the value of CT scanning in patients with blunt abdominal trauma were presented at AAST meetings in the 1980s as well.^{83–86} In a comparison between lavage and CT at the 1984 meeting, Marx et al⁸³ described a high-incidence of false-negative CT scans in patients with blunt trauma and stab wounds. A similar comparison by Fabian et al⁸⁴ presented at the AAST meeting in 1985 expressed concerns about the reliability of CT in evaluating blunt abdominal trauma, also. Both of these studies evaluated patients with "first generation" scanners that, obviously, were rapidly improved upon in subsequent years. In contrast to both of these studies, Peitzman et al⁸⁵ reported a 98.3% accuracy in evaluating 100 patients with blunt abdominal trauma at the 1985 meeting as well. Finally, Meyer et al⁸⁶ evaluated 301 patients with equivocal examinations after sustaining blunt abdominal trauma with a CT scan followed by a lavage. At the 1988 meeting, they concluded that: "Selective use of both procedures is appropriate as long as one recognizes the inherent limitations of each."⁸⁶

PENETRATING TRAUMA TO THE FLANK AND BACK

Much as with anterior abdominal stab wounds in the 1950s–1970s, posterior and flank wounds were managed with mandatory laparotomy at many centers in the early 1980s. The rationale was similar to that used for anterior wounds—namely, laparotomy avoided missing injuries to

the gastrointestinal tract.

A selective approach to such wounds was first reported at the 1978 meeting by Jackson and Thal.⁸⁷ One group of 108 patients with “deep wounds of the flank and back” had laparotomy based on location of the wound and local wound exploration (“semi-selective”). This group was compared to 109 patients who underwent serial physical examinations, selective lavage, and selective non-CT imaging studies. The incidence of “negative” celiotomies was reduced from 85.2% in the first group to 7.3% in the second group. At the 1980 meeting, Peck and Berne⁸⁸ performed serial physical examinations on 465 patients with “stab wounds limited to the posterior abdomen”. “Nonessential” celiotomies occurred in 6% of patients, morbidity was 11%, and mortality was 1.1%.

The CLASSICAL reference in this section from Kings County Hospital/Downstate Medical Center offered another diagnostic approach and was presented at the 1985 meeting.⁸⁹ The contrast-enhanced CT enema (CECTE) technique is actually the simultaneous administration (after earlier administration of Gastrografin [Squibb] through a nasogastric tube x 2) of contrast agents through the nasogastric tube (3% Gastrografin), intravenously (2m/Kg 60% diatrizoate), and per rectum (3% Gastrografin). In the 56 patients who underwent a CECTE, 52 were successfully observed. Two patients had non-therapeutic explorations, one was lost to follow-up, and one had operative repair of an injury to the renal artery diagnosed on an angiogram that followed the CECTE. The authors concluded that, “CECTE can be useful in the management of stable patients with penetrating trauma to the back and flank...”⁸⁹

A similar study was reported by Meyer et al⁹⁰ at the 1988 meeting. Using oral and intravenous contrast in 205 patients with stab wounds to the back, an accuracy rate of 97% was noted. Since the presentation of the paper by Phillips et al⁸⁹, and the other papers described above, trauma centers in the United States have had the choice of serial physical examinations versus the CECTE. Each diagnostic approach has advantages and disadvantages, and the choice of a preferred technique has been dependent on volume of patients, available surgical manpower, and the enthusiasm and skill of local radiologic technologists.

INJURY SCORING FOR PENETRATING TRAUMA TO THE ABDOMEN

The Abbreviated Injury Scale (AIS) described in 1971 to define magnitude of injury and the Injury Severity Score (ISS) described in 1974 have allowed for comparison of treatments and outcomes.^{91,92} While attempts had been made to validate the use of the ISS in categorizing patients with penetrating trauma, it was obvious that there were significant limitations. This was especially true in patients with multiple intra-abdominal injuries following gunshot wounds.

The CLASSICAL paper in this section from Denver General Hospital/University of Colorado was presented at the 1980 meeting.⁹³ The Penetrating Abdominal Trauma Index (PATI) is a sum of the individual abdominal organ injury scores. These scores were derived by grading the severity of injury to each organ system using a “simple modification of the AIS” and multiplying this grade (1-5) times a “risk factor” assigned by the authors. The “risk factor” of 5 was the highest number assigned and was used when injuries to the duodenum or pancreas were

present. Injuries to the liver, large intestine, and major vascular structures were assigned a “risk factor” of 4. Therefore, a patient with a duodenal injury scored as a 3 and a hepatic injury scored as a 4 would have a PATI of 31 [duodenum (AIS 3 x risk factor 5) + liver (AIS 4 x risk factor 5)]. The authors evaluated the PATI in 222 patients with penetrating abdominal wounds who survived for greater than 24 hours after a laparotomy. Postoperative complications were noted to increase in patients with either stab wounds or gunshot wounds to the abdomen as the PATI increased from 5 to greater than 26–35 (stab) or 46–55 (gunshot).

In 1990, the same group revised the “risk factors” assigned to six of the 15 organ systems based on an updated “critical reassessment.”⁹⁴ The major revisions were a downgrading of the risk factor of the duodenum from 5 to 4 and an upgrading of the risk factor of a major abdominal vascular injury from 4 to 5.

The PATI remains one of the consistently reported scoring systems used in all papers describing patients with penetrating abdominal trauma and allows for more valid comparisons of outcomes between trauma centers than the ISS.

INJURY TO THE SPLEEN

The single best AAST presentation on splenic trauma prior to the meetings in the 1980s was the presidential address by Roger Sherman at the 1979 meeting.⁹⁵ The CLASSICAL reference in this section was presented by Hebel et al⁹⁶ from Hermann Hospital/University of Texas-Houston at the 1981 meeting.⁹⁶ This was a report of 172 consecutive patients (blunt 142/penetrating 30) with documented splenic injury over a two-year period and emphasized the selective approach that was becoming popular at the time. Splenectomy was performed in 107 patients (62.2%), splenorrhaphy in 33 (19.2%), and nonoperative management in 32 (18.6%). The incidence of infectious complications was 36% in the 107 patients undergoing a splenectomy, but only 9% in patients with splenic salvage by splenorrhaphy or nonoperative management. In the 38 patients with infectious complications after splenectomy, 14 (36.8%) developed subphrenic abscesses.

There were many interesting aspects to this paper. These included the following: (i) the continuing significant incidence of splenectomy at the time; (ii) the valuable role of abdominal CT and angiography in the original diagnosis and in following patients with nonoperative management; (iii) the recognition that splenorrhaphy could have been performed in many patients with minor injuries; and (iv) the significant risk of infectious complications after splenectomy due to magnitude of injuries and, perhaps, post-splenectomy immunosuppression.

There were two other interesting papers on injuries of the spleen presented during the AAST meetings in the 1980s. At the 1988 meeting, Lange et al⁹⁷ reported on a 67% salvage rate in a one-year series of 33 patients with splenic injuries. Splenorrhaphy was accomplished with “conventional” techniques in 13 patients and with a polyglycolic acid mesh wrap in nine. Other than two perisplenic fluid collections that were sterile on aspiration in the patients with splenic wraps, postoperative complications were similar in the splenectomy, conventional splenorrhaphy, and mesh splenorrhaphy groups. The authors concluded that, “Splenic wrapping is both a safe and efficacious method of splenic preservation.”⁹⁷

At the 1984 meeting, Green et al⁹⁸ reported on a review of their “Asplenic Registry” which included 144 patients (blunt 111/penetrating 6/intraoperative injury 27). With a mean follow-up of 61 months, 15 major septic complications occurred in 13 patients (9%) and minor septic complications occurred in 44 patients (30%). All but two of the major septic complications were due to encapsulated organisms. As has been noted in other series, late major septic complications occurred significantly more frequently following incidental versus trauma splenectomies (18.5% vs. 5.9%, $p < 0.05$). Even though the authors noted a mortality of only 7% in their patients with major septic complications, they recommended attempts at splenic salvage, patient education, careful follow-up and use of the pneumococcal polysaccharide vaccine.

PELVIC FRACTURES

A large number of presentations on the diagnosis,⁹⁹ classification,¹⁰⁰⁻¹⁰² and treatment¹⁰³⁻¹⁰⁷ of pelvic fractures were presented at the AAST meetings in the 1980s. The CLASSICAL reference in this section was presented by Dalal et al¹⁰⁰ from MIEMSS/University of Maryland at the 1988 meeting. In this study, major pelvic ring fractures in 343 patients were subdivided into four major groups: antero-posterior compression (APC), lateral compression (LC), vertical shear (VS), and combined mechanical injury (CMI). The APC and LC groups were divided into Grades 1-3 of increasing severity. The authors correlated patterns of associated injuries, complications, and mortality with the aforementioned groups. The greatest 24-hour fluid requirements were in patients with APC 3 injuries. Also, APC injuries were associated with truncal trauma and shock, ARDS, and sepsis, but traumatic brain injuries were not a common cause of death. In contrast, traumatic brain injuries associated with shock caused a significant percentage of deaths in the higher grades of LC injuries. When reviewing patients with the “more severe” pelvic fractures, namely APC 2 and 3, LC 2 and 3, VC, and CMI, the authors described incidences of shock and sepsis of 35% and 30%, respectively. The overall mortality rate in this series was 15.5%, and the authors attributed this to an “aggressive multidisciplinary approach.”¹⁰⁰

Cryer et al¹⁰¹ from the University of Louisville proposed another variation of pelvic fracture classification at the 1987 meeting. Fracture patterns were divided into “stable” and “unstable”, and this simplified scheme was predictive of a patient population at “higher risk for massive hemorrhage.” A third classification was proposed by Mucha and Farnell¹⁰³ from the Mayo Clinic at the 1983 meeting. Patients in the authors’ “complicated” group were then subdivided into those who were hemodynamically stable, could be stabilized, or were exsanguinating. Of interest, the authors emphasized the importance of associated injuries in eventual outcome as the pelvic fracture represented the “major cause of death” in only four of the 34 deaths in this series of 533 patients.

Confirming the value of angiographic embolization first described by Margolies et al¹⁰⁸ a decade earlier, Panetta et al¹⁰⁶ from Kings County Hospital/Downstate Medical Center reported on their results with the technique at the 1984 meeting. In 31 patients with extensive pelvic fractures and hypotension, angioembolization was successful in controlling hemorrhage in 27 (87.1%). The authors emphasized the value of “coil blockade” in this report as well.

IMMEDIATE JEJUNOSTOMY FEEDING

As techniques of resuscitation and operating rapidly improved in the 1980s, there was increased focus on initiating critical care with procedures performed in the operating room by trauma teams. The recognition that burns, multiple injuries, long bone fractures, and traumatic brain injuries initiated a profound catabolic state prompted strong interest in furnishing early nutritional support to these patients. The CLASSICAL reference in this section was presented by Moore and Jones¹⁰⁹ from Denver General Hospital/University of Colorado at the 1985 meeting. Patients with an abdominal trauma index greater than 15 at the time of an emergency celiotomy were then randomized into two groups. One group (control) was to receive D₅W intravenously for the first five postoperative days followed by total parenteral nutrition (TPN) if the patient was not tolerating an oral diet by that time. The second group had a needle catheter jejunostomy inserted at the time of the emergency celiotomy, followed by initiation of an enteral elemental diet at 18 hours. The nutritional goal in this latter group was 3,000 kCal per day by 72 hours. The groups were comparable in terms of mechanism of injury, shock on admission, and in magnitude and distribution of injuries. There were 24 of the 31 control patients (77%) and 28 of the 32 enteral-fed patients (88%) who were anergic in the immediate postoperative period. Nine of the 31 control patients required TPN, while 20 of the 32 enteral-fed patients were maintained on the elemental diet for greater than 5 days and four required TPN. Significant improvements in nitrogen balance occurred in the enteral-fed group at 4 and 7 days and in the total lymphocyte count at 7 days. Septic morbidity was greater in the control group when compared to the enteral-fed group ($p < 0.025$). In addition, sepsis in the abdominal trauma index group 15–40 was significantly greater in the control group ($p < 0.01$). This study was important in the evolution of nutritional support for seriously injured patients for the following reasons: (i) confirmed that needle catheter jejunostomy was safe in patients with abdominal injuries and not just in those with general surgery problems¹¹⁰; (ii) confirmed that early enteral feeding with an elemental diet was well-tolerated in patients after trauma celiotomies, even when shock was present on admission; (iii) proved that early nutritional support with a protein-containing solution would have a significant impact on the patient's nitrogen balance as early as 5 days after a celiotomy; and (iv) added further evidence to the relationship of a patient's nutritional status to immunocompetence. In a follow-up study presented at the 1988 meeting, injured patients undergoing celiotomies were randomized to receive TPN versus elemental feedings via a needle catheter jejunostomy initiated within 12 hours of operation.¹¹¹ As in the prior study, the incidence of major septic morbidity in the enteral-fed group (3%) was significantly different from that in the TPN group (20%) ($p = 0.03$).

REASSESSMENT OF THE ROLE OF ARTERIOGRAPHY IN PENETRATING PROXIMITY EXTREMITY TRAUMA

During the 1970s and early 1980s, trauma groups at Detroit Receiving Hospital/Wayne State University School of Medicine and Ben Taub General Hospital/Baylor College of Medicine emphasized the importance of exclusion arteriography in wounds to the extremities.^{112,113} The

intent was to avoid a missed injury of an artery in an extremity and prompt early operative intervention in a patient with an abnormality on an arteriogram. The CLASSICAL reference in this section was presented by Frykberg et al¹¹⁴ from the University Hospital, Jacksonville/University of Florida at the 1988 meeting. Patients with proximity extremity trauma underwent arteriography, and 27 arteriographic abnormalities were documented in 135 patients over 24 months. Major arteries were injured in 16 of the 27 positive studies. Only one acute arteriovenous fistula underwent an immediate operation, while one other pseudoaneurysm enlarged and was operated on 10 weeks later. In the remaining 14 lesions that were observed, nine resolved, three remained clinically unchanged at a mean of 2.7 months, and two improved. The author's conclusions were as follows: (i) clinically occult arterial injuries usually have a benign course; (ii) exclusion arteriography could be delayed for up to 24 hours; (iii) "soft" signs were "not clinically useful predictors" of vascular injury; and (iv) "with the exception of shotgun wounds, arteriography did not appear to be a cost effective screening modality." This paper and others that questioned the value of exclusion arteriography subsequently changed the practice of evaluating all patients with penetrating proximity extremity trauma with this invasive study. This paper is clearly one of the most important in the modern history of vascular trauma.

At the 1990, 1997, and 2000 AAST meetings, Frykberg, Dennis and colleagues added significantly to the importance of the first study described above by emphasizing the following: (i) the value of physical examination alone in evaluating penetrating extremity trauma¹¹⁵; (ii) results of long-term follow-up in patients evaluated with physical examination and managed with nonoperative management¹¹⁶; and (iii) the value of physical examination alone in evaluating patients with dislocations of the knee.¹¹⁷

The value of exclusion arteriography was questioned by Gomez¹¹⁸ at the 1984 meeting as well. In a group of 72 patients with penetrating proximity extremity trauma only, only one of 17 patients with arteriographic abnormalities underwent operation, and no vascular injury was found. The authors suggested that, "Routine arteriography in proximity injury only may be unnecessary..."¹¹⁸

SYNTHETIC PROSTHESIS IN VASCULAR WOUNDS

An early report from the Vietnam Vascular Registry by Rich and Hughes¹¹⁹ at the 1971 meeting condemned the use of synthetic prostheses in military vascular wounds. In 28 early survivors who had Dacron or Teflon prostheses placed in contaminated military wounds (5 carotid/subclavian/axillary, 10 abdominal aorta/iliac, 13 femoral/popliteal), 20 (77%) had major complications. These included infection in nine, thrombosis in nine, stenosis in one, and false aneurysm in one. Also, it was noted that there was a "100% failure rate" of synthetic prostheses in patients with grafts in the axillary, superficial femoral, and popliteal arteries.

This report was used as evidence that synthetic prostheses should not be used in civilian vascular injuries either in the subsequent decade, although not all agreed with this approach.¹²⁰ In civilian centers with large numbers of patients with peripheral and truncal vascular wounds, it was obvious that approximately 20% of young male victims had saphenous

veins that could not be used for arterial replacement. This was due to inadequate luminal size, poor quality vein, size discrepancy between vein graft and vessel to be grafted, and the need to save venous outflow in patients with bilateral venous injuries in the extremities.¹²⁰ In addition, retrieving an autogenous saphenous vein graft was simply too time-consuming in exsanguinating patients (“damage control”). The CLASSICAL reference in this section by Feliciano et al¹²¹ from Ben Taub General Hospital/Baylor College of Medicine was presented at the 1985 meeting. From 1978-1983, 236 polytetrafluoroethylene (PTFE or Teflon) grafts) were inserted in 206 arteries and 30 veins in 206 injured patients (>82% penetrating). Nearly 85% of grafts were placed in vessels of the extremities, while the remainder were placed in the neck/check (8.8%) and abdomen (6.3%). Peripheral PTFE graft infections did not occur in the absence of exposure of the graft or the presence of osteomyelitis in an adjacent bone. The most disappointing result in the study was the significant early occlusion rate when smaller (4-mm and 6-mm) PTFE grafts were used for arterial replacement. In the 12 patients with occlusion of arterial grafts in the first 30 days, seven had 4-mm grafts and five had 6-mm grafts. Three of these patients needed amputation of an extremity, and two died for other reasons. On very limited late follow-up (38 patients=18.4%), 11 patients were found to have late occlusions. All of these grafts were 4-mm or 6-mm diameter except one (6.5-mm).

This study demonstrated that patency rather than infection was the major problem associated with PTFE grafts inserted in traumatic vascular injuries. Over time, the use of oversized grafts, ringed grafts, postoperative low molecular weight dextran, long-term (3 months) low dose aspirin, and cessation of smoking by the patient have all contributed to substantial improvements in patency. For this reason, a PTFE graft is now considered to be an acceptable alternative when an autogenous vein is unacceptable for the reasons listed above or a “damage control” situation is present.¹²²

BURNS

The number of papers on the treatment of burns has always been limited at meetings of the AAST. In the 1980s, the CLASSICAL paper was presented by Herndon et al¹²³ from the Shriners Burn Institute/University of Texas Medical Branch at the 1985 meeting. Twelve children who survived after treatment of 89% total body and 82% third degree burns (7–8 operations) underwent a variety of physical and psychologic tests at a mean of 1.4 years post-discharge from the Shriners Burn Institute. Physical impairments were present in 60% of the survivors, though 50% of the children old enough to be tested were “completely independent in activities of daily living”. Excessive fear, regression, and neurotic and somatic complaints were present in 1/3 of the survivors, but the authors commented on the patients’ “remarkable energy in adapting to their disabilities”.

The Galveston group headed by David N. Herndon has continued to study children who have been severely burned over the past 25+ years since the report described above. The prolonged metabolic sequelae of a severe burn, hormonal changes, effect on growth, and ultimate extraordinary recovery of these children have all been reported.

SEVERELY INJURED LOWER EXTREMITIES

There were numerous presentations on orthopedic injuries at AAST meetings during the 1980s, with many describing operative management. The CLASSICAL reference in this section presented at the 1987 meeting by Bondurant et al¹²⁴ from Hermann Hospital/University of Texas-Houston had a much broader focus. In a group of 263 patients with Gustilo grade III open tibial fractures, 43 had amputations. In the group of 14 patients (32.6%) who had primary amputations, there was a mean of 1.6 surgical procedures, a 22.3 day length of stay, and a hospital cost of \$28,964.00. The group of 29 patients with delayed amputations had a mean of 6.9 surgical procedures, a 53.4-day length of stay, and a mean hospital cost of \$53,462.00. In addition, six patients in this latter group developed sepsis related to the injured extremity and died. The authors urged caution in choosing limb salvage in grade IIIC tibial fractures and noted that there was a need for the “development of objective means for early assessment of tissue viability”.

This oft-quoted paper was a first realistic attempt to assess outcome after treatment of IIIC tibial fractures including mangled extremities. More recently the Lower Extremity Assessment Project (LEAP) Study Group has updated the data in Bondurant et al¹²⁴ in numerous publications.¹²⁵⁻¹²⁸

RENAL TRAUMA

The 1981 presentation by McAninch and Carroll¹²⁹ from San Francisco General Hospital/University of California on preliminary vascular control before exploring renal injuries prompted a controversy that continues to this day. In an older series of 39 patients in whom preliminary vascular control was not performed, the authors noted a nephrectomy rate of 56%. In a more recent series in which vascular control was obtained before opening the retroperitoneum, the nephrectomy rate decreased to 18%. None of the patients in the latter group “needed reoperation or had delayed hemorrhage, urine extravasation, retroperitoneal abscess, or hypertension.”

The CLASSICAL paper in this section by Carroll et al¹³⁰ from the same institution was presented at the 1987 meeting. This was a review of 19 patients who underwent renal exploration alone and 79 patients who had renorrhaphy, partial nephrectomy, nephrectomy, vascular repair or a combination of these. Eight patients died, ten developed azotemia, and 35 had a major complication. Statistically significant associations were noted between the extent of injury and subsequent azotemia as well as between the type of repair and subsequent azotemia, major complication, and death. The authors noted, however, that the extent of renal injury or the method of repair was less influential in causing an adverse outcome than the magnitude of associated injuries. This was thought to be due to the increased evidence of sepsis and multiple organ failure in these patients.

GERIATRIC TRAUMA

There were several broad reviews on outcome for geriatric trauma patients presented at the

AAST meetings in the 1980s. Unfortunately, their conclusions differed—"88% of these (survivors) did not return to their previous level of independence"¹³¹ versus "the majority return to independent living after trauma".¹³²

The CLASSICAL paper in this section was presented at the 1988 meeting by Scalea et al¹³³ from the Kings County Hospital Center/S.U.N.Y. Health Science Center. The authors had recognized a significant mortality in patients greater than 65 years of age with multisystem blunt trauma who were admitted to their facility in 1985. They committed to an increased use of early monitoring in such patients in 1986, and the mean time from admission to monitoring was 5.5 hours. In a group of 15 patients, eight had an initial cardiac output less than 3.5 L/minute and/or a mixed venous oxygen saturation less than 50%. Even with invasive monitoring directing resuscitation, all eight patients died. Another seven patients had an initial cardiac output from 3.5–5 L/minute, but five of these had a mixed venous oxygen saturation less than 50%. Despite resuscitation, six died, and the overall survival in both groups was only 7%. In 1987–1988, diagnostic tests in the emergency department were minimized, and the mean time to monitoring decreased to 2.2 hours. Thirty patients were managed with the new protocol, and 17 (53% survived). This figure is deceptively low as there were five deaths from traumatic brain injuries, two unexplained cardiac arrests, and only six deaths from "pump failure" and/or multiple organ failure. The authors noted that geriatric trauma patients who appear to be "seemingly stable may have a dangerously low cardiac output." They rightfully concluded that, "Emergent invasive monitoring identifies occult shock early."

PEDIATRIC TRAUMA SCORE

After the first presentation of the Pediatric Trauma Score (PTS) at the 1985 AAST meeting, further studies were obviously needed to validate the score.¹³⁴ The CLASSICAL paper in this section presented at the 1986 meeting was by Tepas et al¹³⁵ from the University Hospital/University of Florida. The six components of the Pediatric Trauma Score (size, airway, systolic blood pressure, central nervous system, skeletal, cutaneous) can be readily assessed in a short period of time in the field and in the emergency department. The authors analyzed the relationship of the PTS with the Injury Severity Score (ISS) in 615 children entered into the National Pediatric Trauma Registry (mean age 8.2 years/mortality 3.5%). When PTS was compared to ISS, there was a statistically significant correlation ($p < 0.001$; $r^2 = 0.89$). Further analysis of PTS cohorts documented that there was a 0% mortality in children with a PTS greater than 8. When the PTS decreased from 8 to 0, there was a progressive increase in mortality ($r^2 = 0.86$). Finally, children with an admission PTS less than 0 had a mortality of 100%. The authors concluded that there is a linear relationship between PTS and ISS and that PTS is "an effective predictor of both severity of injury and potential for mortality."¹³⁵

The predictive validity of the PTS was described at the 1987 meeting by Ramenofsky et al¹³⁶ as well. When comparing the PTS assigned by a paramedic in the field to that by a physician in the emergency department, $r^2 = 0.982$. And, much as in the previous report by Tepas et al,¹³⁵ no deaths occurred in patients whose PTS was greater than 8. The authors designated this as the "Critical Triage Point" and noted a sensitivity and specificity of this value at 95.8% and

98.6%, respectively.

PHARMACOKINETIC MONITORING IN THE INTENSIVE CARE UNIT

The CLASSICAL reference in this section was presented by Reed et al¹³⁷ from Hermann Hospital/University of Texas-Houston at the 1988. It had long been recognized that aminoglycoside antibiotics and vancomycin cause nephrotoxicity, particularly in patients with a recent acute kidney injury and when used in combination. For this reason, appropriate dosing is critical when these antibiotics are indicated.

The authors recognized that there are variable volumes of distribution and elimination of antibiotics in patients in a surgical intensive care unit. For these reasons, standard dosing regimens based on guidelines at the time often lead to nontherapeutic levels of antibiotics. The Surgical Pharmacokinetics Consultation Service at the authors' institution arranged for multiple blood samples with accurate time recording to measure levels of gentamicin, tobramycin, and vancomycin. When the blood levels of these antibiotics based on standard dosing regimens were nontherapeutic on pharmacokinetic monitoring, a revised dosing regimen was recommended. Further pharmacokinetic monitoring documented that therapeutic levels of these nephrotoxic antibiotics were much more likely to be attained with the revised dosing (gentamicin 9% standard vs. 91% revised, $p<0.000$; vancomycin 30% vs 67%, $p<0.0001$). This presentation introduced pharmacokinetic monitoring to surgical intensivists on trauma services at the time and is now a daily practice in all intensive care units.

CONCLUSION

The 1980s were a critical decade in the evolution of trauma care in the United States, and many of the advances were first reported at AAST meetings. The major changes summarized in this brief review have been as follows:

1. Changes in resuscitation: Decreased resuscitation in the field, decreased indications for the MAST garment, decreased utilization of emergency department thoracotomy, recognition that transfusion paradigms caused coagulopathies;
2. Recognition that clinically significant blunt cardiac injury was uncommon and did not impact outcome after emergency operations;
3. Evolution from the highly sensitive, but nonspecific, quantitative diagnostic peritoneal lavage to contrast-enhanced CT for blunt and penetrating trauma of the abdomen;
4. Recognition that the Injury Severity Score was inadequate to characterize injuries from penetrating wounds and should be replaced by the Penetrating Abdominal Trauma Index;
5. Recognition that splenic injuries could be managed nonoperatively based on CT and repaired if operation was necessary;
6. Categorization of pelvic fractures and recognition of patterns with increased risk of hemorrhage;
7. Recognition that early jejunal feedings were tolerated and decreased septic mortality after

trauma;

8. Acceptance that exclusion arteriography was not indicated in most patients with “soft” signs after penetrating proximity extremity trauma and that physical examination was very accurate in diagnosing vascular injuries requiring repair;
9. Recognition that PTFE vascular conduits were acceptable alternatives to autogenous saphenous vein grafts, as long as precautions were taken to improve patency;
10. Acceptance that further long-term outcome of severely burned children, who would formerly not have survived, would be necessary to assess quality of life;
11. Recognition that there was considerable morbidity and occasional mortality when repair rather than amputation of Gustilo grade III tibial fractures, especially in mangled extremities, was chosen;
12. Acceptance (at the time) that preliminary renovascular control increased the salvage of an injured kidney under a retroperitoneal hematoma;
13. Recognition that occult shock was often present in injured geriatric patients and that early hemodynamic monitoring improved survival;
14. Acceptance that the Pediatric Trauma Score was easily obtained and was a valid prognostic indicator; and
15. Acceptance of pharmacokinetic monitoring to guide antibiotic regimens, particularly when nephrotoxic antibiotics were being administered.

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11

THE 1990s

C. WILLIAM SCHWAB, MD

The pace of discovery was explosive throughout the '90s and nowhere was this felt more than in science and medicine. Computers and information technology became universal and the ability to manipulate data, share observations, disseminate information, and report findings moved the flow of reporting to a feverish pitch. In just a few years, we witnessed the first genetically cloned animal, a vehicle landing on and broadcasting from Mars, the unfolding and power of the World Wide Web, and the human genome was revealed just at the break of the new millennium. The effect of technology and science on medicine and health was profound. Three dimensional imaging, directed cancer therapies, controlling AIDS, intravascular manipulation in cardiovascular disease, robotic and remote surgery, the cessation of smoking, advancement of transplantation, the widespread use of seatbelts (becoming mandatory in 1989) and outfitting of automobiles with air bags, to name only a few, affected millions of lives and made our country healthier and safer.

We were energized to conquer all facets of death by injury, and the AAST meetings, at times, sounded like we were doing just that. But the enthusiasm to accomplish for the greater good was hard to sustain, as the fiscal overhauls in health care were sobering. Managed care organizations took hold of medicine in the 1990s and redistributed the money. Hospitals and physicians were forced to focus on cost containment, and a lower profitability removed revenue that was previously directed to research, teaching or shifted to cover the underpayment for emergency and trauma care. Many academic medical centers slashed budgets in response to lowered payments by the Centers for Medicare and Medicaid Services (CMS) and insurance

companies. Thus, at a time when our field had all the necessary tools and was documenting the effectiveness of trauma care, on the home fronts there was a constant struggle with budgets, cutting positions and “staying alive.” In 1995, the country saw the first successful law suits by the federal government against several prestigious medical centers for potential Medicare fraud, tightening the financial noose that had been placed around healthcare systems by increasingly powerful health management organizations (HMOs). Tens of millions of dollars were levied and collected by the feds, while the media had a field day insinuating wrong doing by hospitals. The public and government demanded more regulation and the HMO model seemed to provide just that. Executives and administrators, fearful of having to pay these enormous amounts plus sustain public embarrassment demanded our energies to be focused on mandatory documentation training, coding compliance, and medical record “qualitology” to assuage the auditors and anti-fraud units. Coping with the fiscal demand of downsizing, eliminating positions and keeping the trauma centers afloat became our everyday toll and we as a profession, were fearful of our future.

During such challenging times, one might expect little strategic movement within an academic guild, but such was not the case in the AAST. The stewardship of the officers and managers of the AAST in the late eighties and nineties was pivotal in securing the future. Their vision and decisions directed better fiscal management, including building a substantial portfolio to assure that, in crisis, the AAST could survive if annual revenues ran short. With the assistance of Williams & Wilkins, they raised the profit of the *Journal of Trauma* and, combined with better meeting management, began an infusion of money that continues to enable the work of the organization and benefited the membership even today. They affirmed the core value of the AAST as “the science” organization of trauma and engineered a plan to acquire new monies to support research. This focus on basic science and finding a means to fund studies was especially important to develop young surgical scientists in our field. The scholarly focus of the AAST was broadened to include surgical critical care and, in 1993, the governance structure added a manager position to represent critical care. The content of the meetings greatly expanded as studies in biomedical engineering, crash investigation, vehicular design, injury prevention, performance improvement and outcomes flourished. As impactful, the world leaders in trauma were embraced and welcomed as speakers, presenters and included in discussions as thought leaders, which added richness to the science and politic views of the AAST leadership. These last two efforts—expanding the intellectual focus of our scholastic work and becoming the first format for global thought about trauma—propelled the Association and *Journal* to higher levels of achievement and prestige. Last, but no less important, the continued presence of these key leaders as advisors and mentors was profoundly felt and resulted in a more substantial growth of the AAST, assured an ongoing global presence, and expanded reputation. Today it is easy to see this transformation if one reviews the program books of the AAST. The unfolding of the story is exciting and instructive to understand who we are and how we got to the very enviable position the AAST holds in the world today.

In review of this journey, many people guided the AAST. Lew Flint, Don Trunkey, Jim Carrico, Gene Moore, David Root, Ken Mattox, J. David Richardson, and many more were

instrumental. However, John Davis as the editor-in-chief deserves recognition for his constant presence, stewardship, and quiet leadership. Dr. Davis' Fitts Oration of 1993¹ is a must-read if one wished to capture the full extent of the transformation that occurred over the two decades of his service as our editor. Dr. Davis is a member of "great generation" of Americans that grew up during World War II. He served as a combat surgeon in Korea, was elected to the AAST in 1960 during the formative years of the Association, and was "mentored" in the trauma world by the founders of the modern trauma movement. John was passionate about studying injury, teaching trauma care and guiding the next generations of trauma leaders. His goals as the editor were strategic and two were especially important in elevating the reputation of the journal and enabling scientific investigation. First, to make the *Journal* "the repository of the most important literature on trauma" and, second, to "provide enough profit (from the publishing and advertising with the *Journal*) to enable the association to offer 2–3 scholarships annually." The reputation of the *Journal*, monies flowing into scholarly pursuits were and assuring science as our core his gift to our future. We owe him a great deal.

It is impossible to write about the milestones in trauma care without studying the *Journal* as those bound (and now digital) sheets of content define the history of our field. They capture the concerns, questions and advances of improving the care of the critically injured and ill. Over the decade, these writings also reveal the passion and commitment of our specialty to struggle with preventing death and disability. The addresses by our presidents, Fitts orators and scholars add great clarity to how the thought leaders of the day charted the course of the trauma movement.

A series of unifying steps unfolded over the decade and assured the *Journal of Trauma's* position as "the" publication for trauma surgery. In 1988, the newly-formed Eastern Association for the Surgery of Trauma (EAST) requested that the *Journal of Trauma* become its official journal. EAST wished to have the meeting papers and other societal deliberations published in the *Journal* following the precedent afforded to the Trauma Association of Canada and the Western Trauma Association (WTA). At the time, there was concern that *J Trauma* might be overwhelmed with the rapidly rising number of scientific papers and not able to accommodate the increased volume of manuscripts that EAST envisioned. Drs. Davis and Pruitt, among others, were supportive and the *Journal* published the first of these in 1989. The effect of this integration became apparent as the *Journal* expanded in page number, published articles and scholarly addresses. The diversity of work undertaken by EAST and WTA was stimulating as this added consensus statements on public health issues and public policy. At the same time, the results of multi-institutional trials and the development and permeation of clinical management guidelines added new and powerful dimensions for the readership. These contemporary and clinically important publications directed best practices and allowed concurrent comparisons for management and outcomes of difficult injuries and trauma patients – they made the *Journal* relevant and vital.

Under Dr. Pruitt's continual guidance, the *Journal* had grown to over 2400 content pages and the scientific merit and clinical impact of the publications improved. He further intensified the focus on the international world of trauma and burn injury and became a global

diplomat and ambassador for the AAST. His high standards and demand for excellence were profoundly felt and rewarded with bountiful requests for publication of the best discoveries in our field. By the millennium, the *Journal* had become the most sought-after scientific periodical in the trauma world.

THE MILESTONES

With over 20,000 content pages in the *Journal*, it is difficult to include all the significant trends and important contributions of the decade. What follows are several of the most significant milestones that unfolded over this ten-year period. In order to add an objective measure to our observations of the times, reading of the *Journal* and program books of the annual meetings, we used citation number as a means to measure impact of individual papers. This measure identified the “top” papers of the period and quantified the most prolific authors and thought leaders of the times (see Tables 1 and 2). These authors, many working together, published the papers that we believe, and subsequent use by peers, identified many of the significant contributions of the decade. While this list is useful in highlighting the work of several authors and institutions, it should be considered exclusive of the numerous authors (many of whom have well over thirty manuscripts throughout the decade) who worked tirelessly to advance our knowledge of trauma care.

Table 1. Top Cited Publications, 1990–1999

Title	Authors	Reference
The role of secondary brain injury in determining outcome from severe head injury.	Chestnut RM, Marshall LF, Klauber MR, Blunt BA, Baldwin N, Eisenberg HM, Jane JA, Marmarou A, Foulkes MA.	<i>J Trauma</i> . 1993 Feb; 34(2):216–22.
Epidemiology of trauma deaths: a reassessment.	Sauaia A, Moore FA, Moore EE, Moser KS, Brennan R, Read RA, Pons PT.	<i>J Trauma</i> . 1995 Feb; 38(2):185–93.
The Major Trauma Outcome Study: establishing national norms for trauma care.	Champion HR, Copes WS, Sacco WJ, Lawnick MM, Keast SL, Bain LW Jr, Flanagan ME, Frey CF.	<i>J Trauma</i> . 1990 Nov; 30(11):1356–65.
Damage control': an approach for improved survival in exsanguinating penetrating abdominal injury.	Rotondo MF, Schwab CW, McGonigal MD, Phillips GR 3rd, Fruchterman TM, Kauder DR, Latenser BA, Angood PA.	<i>J Trauma</i> . 1993 Sep; 35(3):375–82; discussion 382–3.
Organ injury scaling: spleen and liver [1994 revision].	Moore EE, Cogbill TH, Jurkovich GJ, Shackford SR, Malangoni MA, Champion HR.	<i>J Trauma</i> . 1995 Mar; 38(3):323–4.

Title	Authors	Reference
Prospective study of blunt aortic injury: Multicenter trial of the American Association for the Surgery of Trauma.	Fabian TC, Richardson JD, Croce MA, Smith JS Jr, Rodman G Jr, Kearney PA, Flynn W, Ney AL, Cone JB, Luchette FA, Wisner DH, Scholten DJ, Beaver BL, Conn AK, Coscia R, Hoyt DB, Morris JA Jr, Harviel JD, Peitzman AB, Bynoe RP, Diamond DL, Wall M, Gates JD, Asensio JA, Enderson BL, et al.	<i>J Trauma.</i> 1997 Mar; 42(3):374-80; discussion 380-3.
Gut bacterial translocation via the portal vein: a clinical perspective with major torso trauma.	Moore FA, Moore EE, Poggetti R, McAnena OJ, Peterson VM, Abernathy CM, Parsons PE.	<i>J Trauma.</i> 1991 May; 31(5):629-36; discussion 636-8.
A modification of the injury severity score that both improves accuracy and simplifies scoring.	Osler T, Baker SP, Long W.	<i>J Trauma.</i> 1997 Dec; 43(6):922-5; discussion 925-6.
Lactate clearance and survival following injury.	Abramson D, Scalea TM, Hitchcock R, Trooskin SZ, Henry SM, Greenspan J.	<i>J Trauma.</i> 1993 Oct; 35(4):584-8; discussion 588-9.
Predicting life-threatening coagulopathy in the massively transfused trauma patient: hypothermia and acidoses revisited.	Cosgriff N, Moore EE, Sauaia A, Kenny-Moynihan M, Burch JM, Galloway B.	<i>J Trauma.</i> 1997 May; 42(5):857-61; discussion 861-2.

Table 2. Most Prolific *J Trauma* Authors, 1990–1999

Author	Hospital Affiliations	<i>J Trauma</i> Publications
Ernest E. Moore	Denver General Hospital	91
Steven R. Shackford	University of Vermont	83
Frederick A. Moore	Denver General Hospital/Houston Medical School	57
Basil A. Pruitt	U.S. Army Surgical Research Institute	53
David B. Hoyt	Valley Medical Center (Fresno) and UCSD	52
Gregory J. Jurkovich	Denver General Hospital	43
Timothy C. Fabian	University of Tennessee Health Science Center	41
Ronald V. Maier	Harborview Medical Center	40
C. William Schwab	University of Pennsylvania Hospital	36
Howard R. Champion	Washington Hospital Center	35
J. David Richardson	University of Louisville	35

WAR AND THE URBAN FIREARM EPIDEMIC

History records that the greatest advancements to the care of the injured comes from the battlefield. These discoveries have greatly affected medicine beyond surgery and have had

profound effects on the overall health of the world. The '90s were not immune to war, however, the type combat was remarkably different than any previously seen. The 1991 operation to liberate Kuwait and contain Saddam Hussein was a high-tech missile-directed “video game” war characterized by “smart bombs” and widespread media coverage. The same technology that allowed coalition forces to advance on Kuwait City with the relative protection of far advanced weaponry brought the battles of the front line to the televisions of the entire world. Viewers watched the war unfold in near real time. Although a large contingency of military medical and nursing corps were mobilized, few saw much action. But the exercises conducted by these dedicated personnel served as the template for battlefield care that would serve the military in years to come. The expediency of this “100 Hour War” was reflected in success of surgical care delivered, almost immediately to injured soldiers by U.S. Army forward surgical teams. The value of having a surgeon control bleeding and re-establish perfusion as early as possible after wounding was documented as life-saving. This precipitated the need for expedient evacuation of subsequently critical casualties down range to other larger surgical hospitals for interval care and across continents while receiving ongoing critical care. Though there were few publications, many lessons were learned. The needs and design of the medical system for future military campaigns was envisioned and what unfolded in 2003–2009 in Iraq and currently being used today in Afghanistan.^{2,3}

The other “war” caught much less media attention. Civilian firearm deaths and devastating injuries had begun to rise in the late 1980s and, by 1992, it appeared that an epidemic of gun wounding and deaths was surging in American cities. In fact, deaths from gun violence became the only major trauma category to increase rather than decrease from the 1980s to the 1990s. Susan Baker, in her 1995 Fitts oration, stunned the trauma community with the data presented in Figure 1.⁴

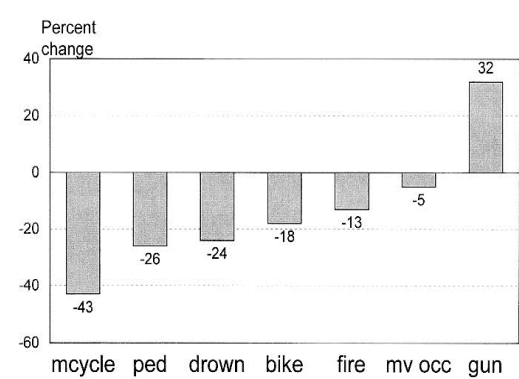


Figure 1. Percent change in death rates, ages 0 to 19 years, 1986–1992 versus 1980–1985.

(From S Baker, *J Trauma*. 1997;42(3):369–373. Reproduced with permission from Lippincott Williams & Wilkins)

At the center of this was a recently legalized type of handgun, the 9mm semiautomatic pistol with larger firing capacity and wounding capability. This change in weaponry and the widespread flourish of violence brought to trauma centers types of injuries rarely seen before. Young men were being shot many times with multiple injuries in several body cavities, bleeding from vessels and viscera and defying the surgeon’s efforts to save them.^{5,6} Because this was urban based, EMS and trauma systems triaged these wounded to trauma centers, many of which were academic medical centers. Surgeons at

these centers responded with innovation and imagination as they came to understand that conventional approaches would not work. A myriad of papers describing wounding patterns,

altered physiology and characteristics of these multiple injuries came forth. In addition, new concepts involving resuscitative operations, abbreviated care, staged procedures, blood component based resuscitation and reversal of coagulopathy were developed and quickly adopted as a means to improve survival. As important, these civilian centers became the hubs for the cultivation of thought about divesting injury and quickly became training sites for future surgeons. Trauma and surgical critical care fellowships had matured at many of these high volume “penetrating” centers. The military supported further training of general surgeons in the field and as early as 1994. The Army, Navy and Air Force were sponsoring trainees for these fellowships. Unbeknownst to us, we were preparing the next generation and many key physicians and surgeons for the military campaigns to come after September 11, 2001.

DEVELOPMENT AND VALIDATION OF THE TRAUMA SYSTEM

Another milestone was the establishment of the American trauma system as lifesaving, self-improving and cost effective. Papers examining the role of the trauma surgeon, trauma center and system used population-based studies to substantiate many of the claims of the 1970s and '80s. Investigators were now equipped with large trauma registries and excellent performance improvement tools (standardized injury nomenclature, grading, and scoring) and had national- and state-based outcome data for comparisons.⁷ Trauma surgeons, epidemiologists and outcome scientists showed the effect of these centers and eventually where trauma systems existed on lowering death and disability across large populations of the U.S. citizens.⁸

Of note, a paper documented that a patient with serious injury who arrived at a trauma center had the best chance of survival.⁹ This NIH-funded population-based study of the Denver metropolitan service area looked at all trauma deaths that occurred in 1992. They carefully analyzed prehospital and trauma center mortalities, and redefined the epidemiology of traumatic death in a modern trauma system. The study showed more people who eventually died were reaching the trauma center alive, thus changing the location of death. Most deaths were from exsanguinations and CNS injury and almost all of these died within 48 hours of arrival (Figure 2). The increased prevalence of gunshot wounds and exsanguination as mechanisms and paths to death was documented. Sophisticated review instruments and performance improvement methods were drawn on to arrive at their conclusions. The observations provided a roadmap for other developing trauma systems as to how to improve overall performance. In addition, their observations suggested a refocusing of research

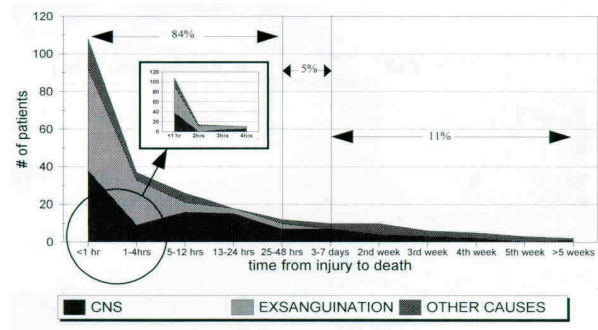


Figure 2. Temporal distribution of trauma deaths, excluding individuals who were found dead by police.

(From A Sauaia, et al. *J Trauma*. 1995 Feb;38(2):185-93. Reproduced with permission from Lippincott Williams & Wilkins)

efforts to further prevent death. In all phases of care, the study analyzed the errors made and concluded that error prevention, especially in critical care management, was the next important next step in achieving the goal of optimal care. From a historical perspective, the trimodal distribution of death described by Trunkey in 1983 had changed and redistribution of cause and location of death had occurred.¹⁰

There are many innovative aspects of this important paper. It ranks number two for citation in the *Journal* and the highest-cited clinical paper presented in the AAST forum for the decade. A novel aspect of the discussion calls on the trauma and critical community to define futile care and reframe organ donation within the domains of our specialty. Overall, this well-referenced and conducted study describes the work and status of a very good trauma system in the early 1990s. It amalgamates the “best practices” of performance improvement and uses them to further direct enhancements of surgeon, center and system progress.

By the late '90s, examiners reported on the various components of the trauma system and struggled to dissect out the most important components and link these findings to the Committee on Trauma and its Verification Committee. ATLS education, strong performance improvement structure and periodic outside peer review of the centers and systems performance were shown to be key to achieving optimal survivals. The numerous outcome studies and performance improvement lessons brought forth by the San Diego, Seattle, and Portland groups confirmed our value as a profession and established the trauma system as one of the greatest public health advances of the twentieth century.^{11,12}

By the decade's end, the long-term outcome of patients treated for major trauma was examined and demonstrated remarkable recovery and reduction of disability.¹³ This and several other papers examined re-entry to society and showed similar results. The return of people after critical injury to a high quality of life was a celebration of the hard work invested by countless surgeons and validated to society the efforts of the last 25 years.¹⁴⁻¹⁹

DAMAGE CONTROL, UNDERSTANDING RESUSCITATION, AND ABDOMINAL COMPARTMENT SYNDROME

As trauma systems became increasingly organized (particularly with regard to pre-hospital care) and with urban handgun violence on the rise, the clinical realm of trauma surgery was poised for the next great advancement in treating severely injured patients. In 1981, Dave Feliciano, Ken Mattox, and George Jordan, Jr., published their experience at the Ben Taub General Hospital on the use of intra-abdominal packing for control of hepatic hemorrhage.²⁰ The authors keenly described massive life-sustaining transfusions that were coupled with diffuse oozing, hypothermia, and metabolic acidosis. In the authors' words, “the use of intra-abdominal packing around the liver to tamponade diffuse hepatic oozing was a last desperate maneuver.”

Around the same time, the Emory group of Stone, Strom and Mullins described their experience with bleeding diatheses that developed during laparotomy. Of these patients, 17 underwent truncated laparotomy, abdominal packing, and return to operation once the coagulopathy resolved. Eleven patients survived compared to only one survivor among patients who remained in the operating room until the all facets of the planned surgery were completed.²¹

In 1993, our group at the University of Pennsylvania proposed a formal approach to this technique (Figure 3). Exsanguinating patients underwent exploration of their injuries, rapid

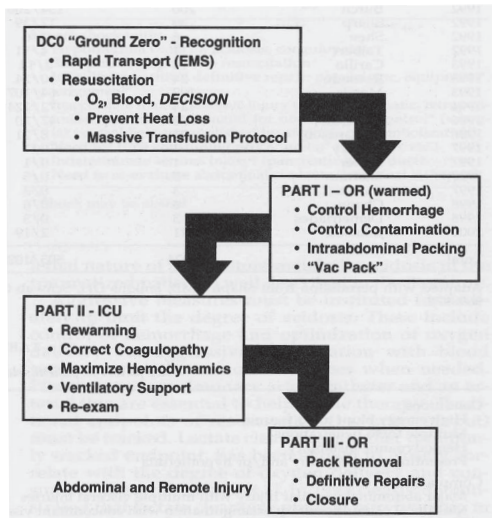


Figure 3. Four phases of damage control approach to critically ill and exsanguinating patients created in 1999.

(Reproduced with permission of SAGE Publications Ltd., London, Los Angeles, New Delhi, Singapore and Washington, DC. From Hoey BA, Schwab CW. *Scand J Surg.* 2002;91(1):92-103. Copyright © Finnish Surgical Society)

cessation of hemorrhage, control of contamination, and temporary abdominal closure before completion of resuscitation and later return to the operation room for definitive surgery. In our experience, this “damage control” procedure was associated with a significantly higher survival rate relative that of definitive laparotomy (77% vs. 11%).²² Simultaneously, several well-respected trauma groups described their experience with similar techniques. The operations were known by several names: abbreviated laparotomy, staged celiotomy, planned re-exploration, etc., but the concept was the same: stop bleeding and repair the injuries later.²³⁻²⁸ The concept of damage control was refined throughout the decade. The utility of the approach eventually spread to the early phases of patient care and rapid institution of different approaches to resuscitation, early decision to perform damage control, and understanding of the open abdomen lead to improved patient outcomes.^{29,30}

By decade’s end, the clinical applications and use of damage control surgery were expanding well beyond its original description.³¹ Novel techniques to control bleeding, contain contamination and secure the abdomen with a temporary synthetic closure emerged and were widely accepted. Surgeons became comfortable with the need to temporize life and limb threatening injuries until resuscitation was complete. Saving the life of the patient at any cost was a driving force for innovation of things such as vascular shunts, balloon tamponade, vac-pack dressings and a host of abdominal wall closure techniques.³²⁻³⁵

RESUSCITATION

The movement towards damage control surgical care was complemented by more algorithmic resuscitation strategies. As surgical intensivists and scientists gained an increasing presence within the Association, goal-directed therapies became more common in trauma research circles. The goals, however, could not be “arbitrary,” and defining the appropriate endpoints of resuscitation became a cornerstone of trauma research throughout the decade.

A major breakthrough in the science of resuscitation strategies followed the seminal work of Rutherford and colleagues regarding base deficit.³⁶ Studying the complement of base deficit, namely lactic acidosis, Abramson showed 100% survival among patients who cleared

serum lactate in less than 24 hours, compared to only 14% survival among patients who normalized lactate after 48 hours.³⁷

Today, over 20 years after Abramson's paper, the trend of serum lactate remains an important part of any resuscitation strategy, from the emergency department to the medical intensive care unit to the surgical intensive care unit. The science of resuscitation continued (and continues) to evolve. The balance between intravascular fluid status, pulmonary function, the dynamics of now open abdomens, and the use (or non-use) of pulmonary artery catheters and ultrasonographic cardiac assessment were popular research topics throughout the 1990s. The race was on to appropriately resuscitate patients but avoid the terrible complications that were becoming increasingly common as once non-salvageable patients thrived.

THE ABDOMINAL COMPARTMENT SYNDROME

Oftentimes, in medicine, the treatment of one problem comes at the expense of another. Patients "left open" as a result of truncated operations required large volume fluid transfusions to meet the physiologic stress of the massive inflammatory response to their injuries. The resultant phenomenon, which had long been described as increased intra-abdominal pressure, and later described by Fietsam as the "abdominal compartment syndrome" became a focus of research throughout the 1990s and beyond.³⁸ Even the visceral edema resulting from a large volume resuscitation (in the absence of abdominal injury) could raise the intra-abdominal pressures to dangerous levels.³⁹ The group from Wayne State led the science of intra-abdominal hypertension. Using anesthetized pigs, their data clearly showed that increased intra-abdominal pressure, even with maintained mean arterial pressures, leads to severely impaired intestinal mucosal blood flow and hepatic micro-circulatory blood flow.^{40,41} These data were paramount in appreciating of the pathophysiology that would later be described by so many researchers at the bedside (treating the abdominal compartment syndrome) as well as at the bench-top (explaining the role of bacterial translocation, mucosal stress ulcers, and Kupffer cell inflammatory response). These ideas were unified at the end of the decade in Ivatury's work describing clinical entity, and treatment of abdominal compartment syndrome.⁴² The importance of a complaint abdominal compartment was even linked to traumatic brain injury, as increased intra-abdominal pressure was found to increase intra cranial pressure and decrease cerebral perfusion pressure.⁴³

UNRAVELING OF MULTIPLE ORGAN FAILURE AND SYSTEMIC INFLAMMATORY RESPONSE

As trauma systems evolved, so too did the care of trauma patients. Those patients that were salvaged by rapid pre-hospital transport and temporization of their injuries faced new battles in the form of an overwhelming immune response to injury and the sequelae of life-saving resuscitations. The early part of the decade was hallmarked by the cytokine search. The biology of inflammation unfolded to reveal the key roles of interleukin-6,⁴⁴ interleukin-2 and tumor necrosis factor,⁴⁵ as well as the moderating effect of interleukin-10. Coincidentally, AAST and the *Journal* also unfolded, becoming the *Journal of Trauma, Injury, Infection, and Critical*

Care, underscoring the role of inflammation and, more importantly, immune modulation in the care of the critically injured patient. No mention of the immune response would be complete without recognizing the tireless efforts of the Denver Group under the guidance of Gene and Fred Moore. One need only look through the 1,022 citations of just four manuscripts to fully appreciate the impact of their research on the literature.⁴⁶⁻⁴⁹ The Denver group distilled extremely complex pathophysiology into potent shots that every physician and surgeon could understand: the injured patient is primed for an inflammatory response, and if we are not careful, the saved patient might become lost to a second hit.

Three of the most-cited papers published in the *Journal* during the decade serve as historic guideposts as to our understanding of post injury immune response and organ failure. The paper delivered by Gene Moore at the John Davis Science Symposium, “The postischemic gut serves as the priming bed for circulating neutrophils that provoke multiple organ failure” is a “best” read if one wishes to study review the understanding of this field in the mid 1990s (Figure 4).

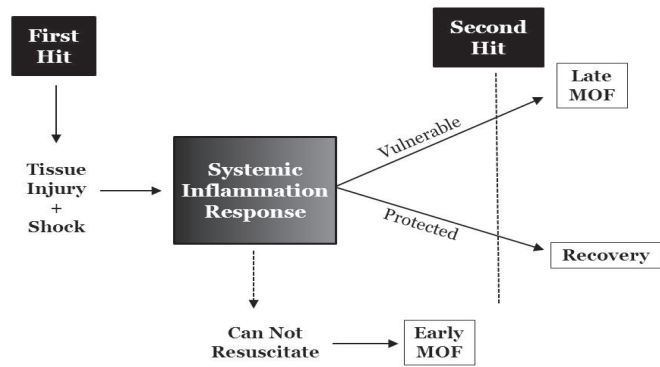


Figure 4. Postinjury multiple organ failure (MOF) is typically produced by multiple insults (two-hit model), which can be characterized as priming (systemic inflammatory response) and activation (secondary event).

(From EE Moore, et al. *J Trauma*. 1994;37(6):881-887. Reproduced with permission from Lippincott Williams & Wilkins)

TRAUMATIC BRAIN INJURY

Throughout the decade and still today, the single most frequent cause of death in trauma is severe brain injury. The modern approach is generally standardized with universal descriptive nomenclature, high resolution 3-D imaging, categorization and grading of injury and management guidelines for the acute, critical care and recovery phases. Several important trends in the management of brain injury developed in the 1990s, not the least of which was the need to concentrate these patients at trauma centers with immediate neurosurgical care and operative capabilities. Early intubation, optimal oxygenation and ventilation and normalization of blood pressure were shown to be necessary to avoid increases of mortality and disability. Computed tomography of the brain combined with full cervical spine imaging became a standard recom-

mendation and further affirmed the strong association between concomitant upper spine and brain injury. Management guidelines for critical care that addressed intracranial pressure (ICP) monitoring, manipulation of ICP, criteria for repeat brain imaging and early aggressive enteral feeding were some of the advances reported and confirmed during this time. As important, better standardization of management emerged as protocol driven care was shown to remove variability of care by individual providers and result in less complications and shorter ICU stays.

Several papers by Rosner challenged and changed the therapeutic approaches to elevated ICP and standardized care. He showed with elegant observational studies that the focus of brain resuscitation should be on optimizing cerebral perfusion pressure rather than lowering ICP. He observed that by keeping the cerebral perfusion pressure CPP at 90–100 torr, avoiding dehydrating the patient with fluid restriction and diuretics, (in the day known as “drying the patient out”) patients did better and “iatrogenic” ischemic areas were avoided. At the same time, he demonstrated improved outcomes of severe coma/brain injured patients when multiple modalities were continually evaluated, manipulated and optimized. The broader understanding that this dynamic, inter-related, and dependent set of therapeutic modalities for better outcomes of severe brain injury solidified the need for total body management of head injured patients. As important, these and other similar studies catalyzed the discussions by the national neurosurgical and trauma groups to begin the development of consensus statements and treatment guidelines for brain injury.

The concept of the “second hit” and the devastating impact on periods of hypotension and hypoxia on the brain injured patient were implicitly embedded in trauma management before the 1990s. Clinical observations death was prevented with early intubation and shock management decreased made this type of management a standard of care and our teaching. However, the paper by Chestnut in 1993 was explicit in showing that any extracranial injury resulting in decrease in blood pressure or hypoxia resulted in an inordinately proportional mortality.⁵⁰ Using National Trauma Data Base records, the study showed that in patients with hypotension and hypoxia the mortality was 150% higher compared to those without these conditions. This paper has highest citation index of any paper published during the 1990s by the *Journal of Trauma*. Its impact went well beyond the neurosurgical community as it instructed all providers on the need to rapidly recognize and reverse any condition that resulted in poor brain perfusion and oxygen delivery.

MATURATION OF NONOPERATIVE MANAGEMENT

While techniques were being advanced in response to massive injury and exsanguination, the art of nonoperative management in blunt injury was maturing and dominated most of the care rendered by trauma surgeons. The use of ultrasound,^{51,52} computed tomography^{53,54} and MRI allowed surgeons to select patients who could forgo operation and allow the body to heal its own injuries. Better understanding of the natural history and outcomes of injury emerged for injuries of the liver, spleen, aorta, cerebral vascular (carotid) arteries and kidney.⁵⁵⁻⁵⁹ Excellent imaging linked with accurate grading (AAST Injury Scoring Committee) and several

large multi-institutional studies made us confident that nonoperative management⁵⁸ would heal most of these without an intervention. In those that had normal physiology, especially blood pressure, many injuries to solid visceral, larger arteries and veins were controlled and managed by angio-embolization or temporary balloon tamponade. Interventional radiology emerged as increasing attractive and less invasive means to control active bleeding by occlusion of visceral and skeletal arteries.^{60,61} Scoring and grading systems for pelvic fracture helped both visceral and orthopedic surgeons⁶² identify those fractures needing fixation, early transfusion and angio-embolization.⁵⁸

In a similar manner, better understanding of the sequence of interventions emerged and the combination of resuscitative operation to control bleeding (damage control) linked to angio-embolization showed great promise to decrease morbidity and mortality from massive liver, pelvic and retroperitoneal injury. We as trauma surgeons found ourselves operating less and patients doing well. Our successes were putting us out of the operation business and generated an image of trauma surgery that was in need of change.

CLINICAL MANAGEMENT GUIDELINES

The concentration of injured patients in trauma centers and better outcome measures prompted the need to standardize management. The response was a boon to the development of clinical or patient management guidelines. These evidence-based guidelines created by EAST and disseminated by the *Journal* (later on the internet) allowed clinicians the opportunity to refine clinical care and improve outcomes.⁶³⁻⁶⁵ The process of developing these guidelines was standardized and included comprehensive review of published data, vetting by a multi-disciplinary panel of experts, and peer review to a published guideline. These proved to be important aids in improving bedside care in all phases of injury management around the globe. Subsequently, the clinical management or patient guideline concept proliferated to other disciplines and now is standard method of changing and optimizing care throughout medicine.

GLIMPSES OF THE FUTURE

CAREERS IN TRAUMA: *Richardson & Miller, 1992*

There are very few of us who would be here today without the help and guidance of a mentor. Exciting operations late into the night, often time bring trauma teams together, but they also demand a high price in the form of time away from families, sometimes thankless service, and fatigue that can make a sustained commitment to trauma challenging. Long before the general surgeon shortage made headlines and online surveys were commonplace, Richardson and Miller confronted the emerging conflict above and nonoperative trauma surgeon problem head on.⁶⁶ It was their insight during the early part of the decade that revealed the challenges of attracting residents to trauma care. In short, their message was that trauma surgery as the surgical trainee saw it in 1990 was dead. Their study served the wake-up call that we must change and return to our roots as general surgeons. It stimulated several blueprints to attract trainees to careers in trauma surgery.⁶⁷ Perhaps by its universal appearance as references in the current

papers documenting the successful evolution of trauma and acute care surgery, it is a profound contribution and has changed the course of history of our profession.

VASSOPRESSIN: *Malay et al, 1999*

In 1999, a small clinical series using vasopressin in the treatment of vasodilatory septic shock was reported by Malay and others.⁶⁸ This double-blinded study comparing vasopressin to a placebo showed substantial benefit to supplementing the resuscitation with vasopressin if other vasoactive agents failed to reverse shock. Though only ten patients were entered into each arm, the results and discussion of this early paper are notable as we look at the current interests and uses of this substance. Malay's work appeared nearly a full decade before vasopressin appeared in the Surviving Sepsis Campaign.⁶⁹

THROMBELASTOGRAPHY: *Kaufmann et al, 1997*

Kaufmann and authors reported on the use of thrombelastography (TEG) to better understand and treat coagulopathic states after trauma.⁷⁰ Of interest, the article describes both the hypercoagulable state early after trauma and subsequently, the development of the hypocoagulation which was the focus of the day in the latter 1990s. This is the first clinical report using TEG to guide component therapy. Subsequently, the U.S. Military medical corps used TEG on the battlefields of Iraq and Afghanistan to direct and individualize patient therapy and preserve blood and blood components for the all that might need them.

HYPOTENSIVE RESUSCITATION: *Kowalenko et al, 1992; Martin et al, 1992*

Towards the end of the 1980s and beginning of the 1990s, some physicians suggested delaying aggressive intravenous fluid resuscitation for some trauma patients. Although the concept was described decades before this,⁷¹ modern pre-operative trauma care made the notion seem, in some regards, ancient. The idea was simultaneously intuitive and cerebral. It was both orthodox and heretical. The work of Kowalenko and Martin (published sequentially in 1992) is mandatory reading for any surgeon who prides him or herself on caring for bleeding patients.^{72,73} Both papers were presented at the 1991 AAST meeting from two different medical centers. One was an elegant swine shock model and the other an observational outcome study of patients with torso penetrating trauma; both reported on the efficacy of holding fluid resuscitation until after definitive surgical control of bleeding. These papers were discussed together and thus neither paper received the necessary focus. However, the discussion by Carrico is excellent and rebuttal by presenters Kowalenko and Martin are noteworthy. Though discussants varied on their criticisms and comfort with the implications of the conclusions, many recognized the potential implications of hypotensive resuscitation. As one surgeon said "...whether or not this paper turns out to be a landmark contribution...remains to be seen. I suspect, however, ...it might become one." The rest is history!

There were over 3500 scientific papers published in the *Journal of Trauma* during the 1990s. Within this short review, we have only scratched the surface. The context in which

these topics were investigated is as interesting as the works themselves. And while the methodology used to quantify the significance of the articles is robust, it fails to capture countless publications that fascinated readers, inspired investigators, and changed the way that we care for patients with injury and in our intensive care units. Some of them changed the way that we look at our patients (both figuratively and literally), and some of them changed the way by which we perceive ourselves. But all of them represent the best of our contributions to trauma care.

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12

THE 2000s

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MILESTONES IN TRAUMA CARE: 2000 AND ON

The onset of the new millennium saw a continuation of the ongoing explosion in medical knowledge and application of evidence-based medicine from empiric to exploratory investigations and covering the gamut of trauma care. While the breadth of issues was expansive, overall, the decade since 2000 can best be defined by the intense focus on improvements in resuscitation strategies, particularly for the newly identified major contributor to mortality in the massively injured patient: trauma-induced coagulopathy (TIC). Enhanced greatly by observations and interventions from the decade long battlefields of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), the resultant identification of the problem, elucidation of underlying pathophysiology and improvements in care that have occurred make this the Decade of Damage Control Resuscitation. And, while many of the traditional tenets and recently learned lessons from past decades remain valid and must not be forgotten, the growth of knowledge surrounding improved resuscitation of the critically injured and bleeding patient is indeed exciting and portends of further improvements in patient survival and overall outcome.

However, this focus is not meant to lessen the other major insights and improvements accomplished. Using the *Journal of Trauma and Acute Care Surgery*, the official organ of the American Association for the Surgery of Trauma as the optimal purveyor of advances in trauma, this review will attempt to summarize the lead peer-selected topics, as defined by annual top-cited articles and reviews in the *Journal* during the decade beginning in 2000.

DAMAGE CONTROL SURGERY

As we began a new millennium, we were continuing to codify one of the great advances in the care of the severely injured patient. The concept of damage control surgery (DCS), begun in the 1980s, has become firmly ingrained and broadly applied in the approach to these challenging cases. Interestingly, implementation of this process over the previous two decades followed the now well-documented process in modern medicine requiring, on average, 17 years for broad acceptance and utilization of proven advances in disease management. This approach of limited surgery to control life-threatening hemorrhage and ongoing gross contamination from bowel spillage with drainage as indicated and temporary treatment with an open abdomen led to dramatic improvements in survival and decrease in complications. Abbreviated operative intervention prior to development of acidosis, hypothermia, and coagulopathy, that combine to yield the highly lethal “bloody triad,” correlated with significant improvements in outcome.

During the early years of decade 2000, several large long-term studies of the impact of DCS confirm the benefits and improved long term outcome. More recent studies focused on the remaining challenge to obtain delayed primary closure of the open abdomen to avoid the major long term morbidity associated with secondary healing, associated risk of fistula formation and giant hernias due to an unclosed open abdomen. Application of DCS, along with improvements in restricted goal-directed volume resuscitation (limitation of excess crystalloid), aggressive diuresis, and early return to the OR for definitive closure have produced successful delayed primary closure for upwards of 90% of these patients. Additional improvements in technique, commonly employing abdominal wall advancement flaps, also have been employed to obtain early closure of these wounds with healthy endogenous tissue and increasingly supported by an underlay of biologic mesh.

Currently, as is frequently seen with advances in care, the application of DCS has been extrapolated beyond the initially proven indications and applied to a broad array of disease states. This resultant application to a diverse number of acute care surgical diseases has produced an epidemic of open abdomens requiring an increased expertise for acute care surgery in closure of these challenging abdomens and an ongoing debate as to which conditions truly warrant a DCS approach.

ABDOMINAL COMPARTMENT SYNDROME

During the beginning of the millennium, there was further resolution of a similar iatrogenic process driven by excessive application of an “improvement” in the care of the critically injured patient. Based on a proposed deficiency in oxygen delivery in the acute resuscitation phase, excessive resuscitation was used to drive cardiac output and eliminate the “oxygen debt” of occult hypoperfusion. The deleterious impact of this approach was identified by prospective trials and led to dissection of the facets underlying the major iatrogenic epidemic of the prior decade: abdominal compartment syndrome (ACS). The development of pathologic levels of intraabdominal hypertension during and acutely following this aggressive resuscitation of the severely injured patient is now recognized to have created the iatrogenic ACS. The

progressive elevation in abdominal pressures due to increasing tissue fluid volumes within a firm, poorly distensible fascia-contained compartment produced a sequence of pathophysiologic processes, which impacted virtually all major organ systems and led to diffuse organ dysfunction. Eventually, organ dysfunction and failure required opening of the abdomen and contributed to the potential demise of the critically injured patient.

DAMAGE CONTROL RESUSCITATION

The iatrogenic epidemic of excessive resuscitation came to an abrupt end during the decade of 2000. Similar to other epidemics, it was controlled by recognition of the etiology of the problem and implementation of sound physiologic interventions. The first phase was recognition of the deleterious effects of excessive resuscitation using balanced salt water solutions, i.e. “salt water drowning,” on numerous organ functions. The second phase confirmed the beneficial effects of controlled or goal-directed resuscitation in the severely injured and bleeding patient. Several retrospective studies delineated the association of improved outcomes with lesser volumes of fluid resuscitation. And finally a key randomized controlled trial (RCT) confirmed an improved survival and decrease in organ dysfunction in patients treated with controlled volumes of salt water solution. In these studies, aggressive fluid resuscitation was shown to double the incidence of intracranial hypertension (ICH), acute respiratory distress syndrome (ARDS), and intraabdominal hypertension (IAH), along with ACS. In addition, mortality was also significantly higher. Each of these derangements is benefitted by a controlled approach to volume resuscitation. Overall, this should not have been surprising, since the development of balanced salt solution resuscitation was based on a rapidly accessible approach to restore blood volume losses to preserve perfusion and organ function. However, when there is evidence of ongoing bleeding, immediate intervention to control sources of blood loss is mandatory prior to ongoing volume resuscitation. The infusion of crystalloid solution until salt water drowning occurs was never advocated by the original investigators.

Application of the balanced approach to resuscitation and limiting resuscitation to a systolic pressure of approximately 90 (a palpable radial pulse in the field), confirmed the association of improved acute survival in the severely injured hemorrhaging patient on the battlefields of OIF. Thus, in the appropriate patient, limitation of resuscitation to limits adequate to maintain critical organ perfusion, while limiting deleterious effects on hemostasis, are now commonly applied. Once again, care must be exercised to ensure appropriate application to the appropriate patient. Many patients in civilian practice, primarily with blunt trauma, have ongoing fluid losses not due to active hemorrhage, which need to be met to avoid unnecessary organ injury. In addition, many injured civilians also have concomitant head injuries. While little can be done with the initial damaged CNS tissue, the primary goal is to prevent secondary injury. The goal of therapy is to avoid any episodes, even short lived, of hypotension or hypoxia. This is the one variable in care of the injured CNS that has been demonstrated to affect long-term recovery and functional outcome. Overly aggressive “permissive hypotension” is potentially devastating to the injured brain. Thus, current approaches to resuscitation use the balanced or goal-directed resuscitation approach, similar to that employed by the military,

by raising the systolic pressure to approximately 90 until evaluation and definitive control of bleeding sources, if necessary, are achieved. Similarly, as repeatedly shown in the past, fluid resuscitation must be used until blood volume is restored prior to implementing vasopressors to maintain mean arterial pressure.

HYPERTONIC SALINE AND ONCOTIC AGENTS

Concerns for over-resuscitation versus inadequate volume to preserve tissue perfusion have stimulated the search for improved resuscitation fluids. An ongoing approach has been the utilization of hypertonic saline (HS). Preliminary animal studies demonstrated a rapid reversal of hypotension, restoration of perfusion and preservation of organ function, in particular the brain, using small volume hypertonic resuscitation. Preliminary clinical studies supported the beneficial effects. However, prospective RCTs, most recently performed by the Resuscitation Outcomes Consortium (ROC), were unable to confirm an improvement in outcome and the most recent clinical trial was stopped for futility. These studies were severely limited by both limiting the volume of HS due to the ensuing negative physiological impact of large volume resuscitation with HS, and the restrictions placed on trial design by regulatory agencies for fear of unintended consequences. Currently, while remaining an appealing approach, evidence does not exist to support utilization.

Colloids have been tested to further enhance the effectiveness of the resuscitation fluid, either alone or in combination with balanced salt solutions (BSS) or HS. However, repeated meta-analyses and RCTs have demonstrated no measureable benefit over judicious use of BSS alone. In fact, most studies have demonstrated a worse outcome and a delayed resuscitation phase when colloids are used. Addition of colloid to HS similarly has not been shown to improve survival or outcomes. And, lastly, a commonly used oncotic agent, hetastarch, has recently been shown to have potential deleterious effects with increased renal injury and mortality. Thus, while the ideal solution remains elusive, the judicious use of BSS as originally proposed in the 1960s (with rapid assessment for ongoing hemorrhage and necessary surgical intervention for control), is the best approach currently available.

TRAUMA-ASSOCIATED COAGULOPATHY

Hemorrhage-related trauma deaths remain the primary preventable cause of mortality in the severely injured patients that survive to reach the hospital. Epidemiological studies have confirmed previous observations, first described by Trunkey et al. The majority of mortality from trauma occurs at the scene and can best be impacted by improvements in prevention and safety design. The second peak occurs soon after arrival at the hospital with death complicated by uncontrolled hemorrhage the major cause and the most rapid, with 80–90% occurring within 24 hours of injury. Similarly, the next largest portion of mortality occurs in patients with devastating traumatic brain injury (TBI) and leads to death within the first 2–4 days post injury. Lastly, the more delayed mortality group is more diffuse occurring over 1–2 weeks and is due primarily to complications of the initial insult whether it be multiple organ failure

(MOF) or infectious and other complications.

Traditionally, coagulopathy associated with trauma was thought to be predominantly due to dilution of coagulation components. During the early years of the century, several studies focused on attempts to better optimize coagulation after resuscitation for significant blood loss with evidence of a severe coagulopathy, presumably due largely to loss and/or consumption of coagulation components and dilution due to use of packed red blood cells (pRBCs) and crystalloid resuscitation. The primary focus of these studies was on activated recombinant Factor VII (rFVIIa) as an adjunct to enhance and restore hemostasis. Subsequent prospective cohort studies and RCTs demonstrated a benefit to treatment with rFVIIa with an apparent good safety profile. However, a large parallel RCT in both blunt and penetrating trauma demonstrated only a modest decrease in blood transfusion requirement and only a trend in improvement in survival. Simultaneously, scattered reports of potential links to devastating unintended thrombotic events, such as pulmonary embolism or myocardial infarction, were being reported. These concerns, along with the excessive cost of the agent, had the net effect of preventing further implementation and extremely limited utilization of the product, primarily as an agent of last resort in the exsanguinating patient. While still of potential value, the current inability to clearly identify the patient who will receive optimal benefit at an early stage of disease to minimize risk of complication remains a major deterrent.

TRAUMA-INDUCED COAGULOPATHY

Since initial empiric observations during the beginning of the decade, many of which arose during combat care in OIF and OEF, enormous progress has been made confirming, diagnosing, and developing treatments for the early onset severe coagulopathy present on arrival at the emergency department (trauma-induced coagulopathy, or TIC). Studies in OEF and OIF of patients receiving a massive transfusion (> 10 units pRBCs in 24 hours) demonstrated an independent association with decreasing death from hemorrhage as the ratio of FFP to pRBC increased from the traditional ratio of 1:4 or 1:5 to 1:1. Subsequent investigations revealed a major consumptive process with excessive fibrinolysis as the etiology of the coagulopathy. The rapidity and degree of the fibrinolysis were shown to correlate directly with mortality. Thus, to prevent early hemorrhagic death required early intervention (within 3–6 hours for effect) with replacement coagulation components. Civilian studies using the combined approach of both damage control laparotomy (DCL) and damage control resuscitation (DCR), now including early component therapy with FFP and platelets, produced dramatic improvements in survival and reduction in overall total requirements for blood components along with a reduced incidence of MOF and ICU complications. While the optimal ratio is still debated, an attempt to reach a 1:1 ratio appears appropriate, recognizing logistics will prevent completely achieving the 1:1 goal.

Numerous studies are being completed to better define the optimal approach to treatment of the life threatening coagulopathy. In one study, while coagulation derangements continue to improve as the 1:1 ratio is approached, the optimal survival appeared to occur at an approximately 1:2 ratio. In patients undergoing massive transfusion, FFP to pRBC ratios

greater the 1:1 do not appear to confer any additional advantage over a 1:1 ratio in improving hemostatic effects. Importantly, the benefit of early FFP is limited to patients with an existent coagulopathy. Use of FFP as a resuscitation fluid in the absence of a coagulopathy not only has been linked to a significant increase in complications, primarily involving infections and ARDS, but it has also increased mortality. This deleterious impact appears to be similar to the detrimental effects seen in patients receiving blood bank transfusions to maintain an arbitrary hematocrit of 30 or more that had been a long-standing tradition in the critically ill. Thus, while using FFP to treat coagulopathic processes in critically ill patients produces a dramatic decrease in hemorrhagic mortality, presumably from a reversal of the coagulopathy. The amount of FFP given is frequently less than that needed to replete the deficient factors and the exact mechanisms involved in the beneficial effect remain unclear and under intense study. In addition, it is unclear, whether FFP or fibrinogen in combination with an inhibitor of fibrinolysis, such as tranexamic acid, will provide a more optimal approach and requires prospective clinical trial testing.

VENOUS THROMBOEMBOLISM

Due to the difficulty in diagnosing venous thromboembolism (VTE), extensive inherent individual variability and absence of controlled trials in the trauma patient, overall recommendations are based on limited high quality data and constantly changing. The trauma community continues to derive recommendations on extrapolated meta-analyses of elective operations and other disease states, retrospective datasets with incomplete data, and expert consensus to attempt standardization of care and decrease morbidity. The most recent guidelines by EAST only identified Level I evidence for spinal cord injury or spinal fractures as high-risk for VTE. Level II evidence supports older age (but not the specific age), increasing ISS, and blood transfusions. Most traditional risk factors identified in institution-specific analyses—such as long bone fractures, pelvic fractures, or TBI—are not confirmed in large meta-analytic approaches. In addition, recommendations for prophylaxis lack firm confirmatory data. There are no high-quality studies showing benefit to pressure compression devices as prophylaxis. And their mechanism of action is poorly understood, believed to involve, at least, both flow enhancement and improved fibrinolysis.

Similarly, there are little data supporting efficacy of low dose heparin (LDH) in prevention of VTE after trauma. Class I data do support low molecular weight heparin (LMWH) for prophylaxis in moderate and high-risk trauma patients, including pelvic, long bone and spinal fractures or cord injury with motor deficits, over LDH. However, the risk-benefit ratio is challenging due to the significant risk of LMWH causing enhanced bleeding and significant morbidity with each of these injuries and others, such as solid organ injury and TBI. As such, implementation must frequently be delayed, often during the early period of presumed greatest risk. Recent studies continue to assess the safety of pushing the balance of risk-to-benefit with earlier implementation at approximately 24 hours after evidence of stabilization of hematocrit and lack of clinical bleeding. While inferior vena cava (IVC) filters have little convincing evidence of prevention of VTE complications, placement should be considered in patients

at extremely high risk, particularly due to prolonged immobilization due to CNS injury and inability to anti-coagulate due to risk of significant morbidity from ongoing bleeding.

CO-MORBIDITIES AND METABOLIC CONTROL

As America ages, the number of patient co-morbidities grows exponentially. While once the disease of the “young and reckless”, trauma is also the disease of the elderly and frail. The loss of motor strength, particularly core strength, and lack of resilience to damage, have combined to make the elderly an increasing proportion of the trauma population, and falls are the number one mechanism of injury. Even ground level falls lead to devastating injuries and severe long-term dysfunction and significant mortality risk. An important previously neglected component of care for the elderly is subsequent to discharge. While discharge rates increase, there is an increased majority transferred to extended care facilities, rather than home. Recent publications have shown the increased mortality for these post-trauma frail patients in the extended care facility more than compensates for the early improvements in survival. The net effect is no improvement in outcome by one to two years post injury.

The decade has seen several studies investigating the beneficial effect of metabolic control on outcomes from injury. While the beneficial impact of early enteral feeding and the detrimental impact of intravenous feedings has been well established, articles continue to refine the benefits and modifications to the approaches, content and timing of the support. Recent studies have confirmed the safety of early enteral feeding and the limited contraindications to initiation. Feeding is tolerated safely within 24 hours of intestinal surgery, open abdomen damage control procedures, and even during surgery if endotracheal intubation is in place. Absolute contraindications are few, and include bowel discontinuity, lack of access, and hypotension requiring vasopressors.

What has been a focus of the past decade is the control of hyperglycemia. The presence and degree of hyperglycemia on admission and/or persistence of hyperglycemia post-resuscitation have been identified as a predictors of poor outcome and potential complications including death. Epidemiologic studies have confirmed the negative impact in elective surgery, trauma and burns. Similarly, the hormonal aberrations that produce hyperglycemia have been linked to severity of injury and outcome. The catecholamine surge induced by trauma is closely matched to biomarkers of tissue damage, risk of coagulopathy including hyperfibrinolysis, and predicts outcome including mortality. Seminal studies in mixed ICU populations have shown control of glucose levels to improve survival and decrease complications, particularly infectious complications. Subsequent studies, probably due to insufficient differences in levels of glucose in various arms, demonstrated no significant benefit. Importantly, attempts at tight control of glucose are associated with increased episodes of dangerous hypoglycemia. And, in surgical patients, particularly head injured patients, these episodes are associated with increased mortality and prolonged ICU stays. Thus, tight control of glucose to 80–100 mg/dL is not recommended. Several studies have shown the breakpoint for increased complications with increasing glucose levels is approximately 150 mg/dL. Current recommendations based on these studies in injured patients recommend a range of 120–150 mg/dL or slightly higher

to buffer against detrimental hypoglycemia while avoiding the complications associated with glucose levels approaching 200+ mg/dL that were the common standard not long ago and clearly linked to major increases in complications.

ORGAN-SPECIFIC INJURIES

Advances in the care of individual organ injuries continue but no major paradigm shifts in overall care or major technical advances have been widely adopted over the last decade. Many details of care remain variable and inconsistently applied from trauma center to trauma center. Increasing indications for use of non-operative technology and minimally invasive surgery continue to advance and prove, in most cases, to be not inferior to the traditional open surgical approach, albeit with less post-operative pain and increased cost. Angioembolization technology continues to expand and is applied to an increasing number of injuries, eliminating the need for many open approaches to trauma care. A slow but progressive expansion of ultrasound techniques is being employed. The trauma and acute care surgeon of the future will need to be versatile in the daily use of this technology from acute diagnosis, ranging from acute pneumothorax to assessment of volume resuscitation and intracranial pressures using optic vein diameters.

Liver resections continue to decline and are rarely required, being limited to grossly devitalized segments defined anatomically by the injury pattern itself. Major hepatic vascular injuries remain life threatening with most, even major venous injuries treated by compression and restoration of gross anatomic alignments using packing and damage control approaches. While major arterial injuries undergo direct ligation, rarely is major hepatic artery ligation necessary. Increasingly, selective angioembolization to control bleeding and maximally preserve tissue is preferred for persistent bleeding. Non-operative treatment of splenic injuries remains successful in the vast majority, regardless of age or extent of injury. If persistent bleeding occurs resection or embolization based on local resources and preferences are utilized. Presence of a “blush” on abdominal CT frequently does not continue to bleed and is considered an over read of a false aneurysm in many cases. Recent large series have shown a potential overall increased splenic salvage rate with aggressive use of angiography. However, overall benefit for the patient and the health care system is unproven. Lastly, in addition to observation of most blunt injuries to the kidney, penetrating injuries are now similarly not explored when other injuries are resolved and observation is recommended with operation reserved for ongoing bleeding or secondary complications. Again, an increased kidney salvage rate is seen and complications are not increased.

Gastric injuries are primarily repaired with grossly devitalized tissue resected. Duodeno-pancreatic complex injuries are treated with repair of the duodenum and drainage of the pancreatic head. Major injuries with devitalized tissue require damage control and selective drainage and/or bypass with rare need for formal Whipple procedures. Recent studies have shown that pancreaticoduodenectomy, if required, should be performed in a staged damaged control fashion with a significant reduction in mortality and complications. Isolated biliary tract injuries are treated with cholecystectomy, primary repair, preferably with ductal stent-

ing, if less than 50% of the circumference is transected or primary ductal to intestinal bypass if more complete transection is encountered. Intestinal injuries are primarily repaired with or without resection based on viability of adjacent tissue. Colonic injuries without extensive associated injuries are increasingly repaired primarily, if viable, and without extensive associated injuries. If significant blood loss, hypotension or requirement for vasopressors is present, diversion with colostomy is preferred. With distal rectal repairs or anastomosis, consideration for proximal diverting colostomy or ileostomy is highly recommended.

Laparoscopy is being used increasingly for many forms of trauma and acute care surgery. With penetrating abdominal trauma, diagnosis and repair of isolated diaphragm or intestinal stab wounds, or identification of isolated penetration of the peritoneum or liver, with or without drainage, are being performed. For the acute care surgeon, acute perforated duodenal ulcer or assessment of colonic diverticular perforations and placement of drains are feasible. Expertise and familiarity with the disease states and their natural history remain paramount and are required to avoid missed injuries and inadequate treatment.

MILITARY MEDICINE

The contributions of empiric observations and cohort studies involving the wounded warrior from a decade of military medical care during OEF and OIF are noteworthy, and similar to the major advances made during military campaigns in the past. Many of the advances in trauma care achieved during the decade of 2000 were in large part initiated or proven in military field and hospital care. Numerous improvements in care are derived specifically from the challenges of the extreme wounds seen in battle and subsequently adapted for civilian practice. Fortunately, the number of civilian injuries comparable to the extreme injuries from an IED explosion or battlefield injury are very limited but present the challenge of adopting the lessons learned in the military to the appropriate civilian patients to avoid potentially detrimental over treatment.

TOURNIQUETS

The lifesaving use of a simple tourniquet for devastating highly lethal major extremity injuries, primarily traumatic amputation, reintroduced this technique to the medical community. Use of tourniquets in civilian practice was long banned due to misuse and overuse in the past leading to unnecessary loss of viable tissue. Based on observations in OEF and OIF, where traumatic amputation was all too frequent from the use of improvised explosive devices (IEDs), the immediate appropriate use of this device produced a significant increase in survival from previously lethal injuries earlier in the conflicts. Medics and every warrior in active conflict were trained in the use of tourniquets and each carries his own for self-use or buddy use at all times. Again, integration into civilian practice is progressing slowly to ensure appropriate use in only life-threatening conditions.

HEMOSTATIC DRESSINGS

The ongoing challenge of developing a stable, safe, durable and effective hemostatic agent continues unresolved. In injuries that cannot be controlled by direct pressure or by tourniquet due to anatomic considerations, primarily proximal extremity and cavitory bleeding, development of a safe and effective hemostatic has long been sought. Multiple approaches have been attempted using an array of agents and applicants. Currently, products demonstrate only limited effectiveness, including factor concentrators such as mineral zeolite, and mucoadhesives such as chitosan and chitin. Unfortunately, many products have significant safety concerns for patient and/or caregiver, including deep burns from exothermic reactions. The development of a useable product without local or systemic risks remains an unmet challenge. Currently, only the traditional approaches of direct pressure and tourniquet control as appropriate are available for the civilian community.

TRAUMA-INDUCED COAGULOPATHY

Several of the seminal observations identifying the early pre-resuscitation coagulopathy associated with severe tissue injury and significant blood loss were made by military physicians in Iraq and Afghanistan during OIF and OEF. Wounded warriors with severe injuries and blood loss were noted to do better when coagulation components, primarily as FFP, were given immediately on arrival from the field and without waiting for clotting studies. These observations led to a series of retrospective cohort studies further associating early FFP with improved survival, predominantly by decreasing early hemorrhagic deaths from ongoing bleeding. These impressive results were confirmed in severe civilian injuries and have led to the large array of previously discussed studies completed and still in progress. The decade of TIC has begun.

BLOOD BANK UTILIZATION

Another observation of the early treatment of the severely injured military personnel supports parallel studies in civilian trauma. The age of the transfused blood appeared to directly affect the incidence of complications, in particular MOF and late infectious complications. In fact, due to shortages during mass casualty events, the necessity of using fresh whole blood from immediate donors demonstrated a clear beneficial effect in resuscitation of hemodynamics and reversal of coagulopathies. However, due to the ongoing threat of disease transmission, primarily hepatitis, even among a frequently-screened donor population, the routine use of fresh whole “warm” blood is not logistically feasible. However, the military experience and increasing number of civilian investigations, all support the concerns associated with use of “old blood” following prolonged blood bank storage and need to use “young,” preferably less than 14-day-old blood, at least in patients requiring massive transfusions.

TRAUMATIC BRAIN INJURY AND POST-TRAUMATIC STRESS DISORDER

A major complication of the last decade of military experiences during active engagement has

been the tremendous increase in TBIs and subsequent occurrence of prolonged post-traumatic stress disorder (PTSD). The current military conflicts pitting man and machine against an array of IED and other blast exposures have produced a scenario responsible for the vast number of injuries. Recognition of the problems by the military experience have been paralleled by an explosion in studies to enhance recognition and a major movement to identify ways to prevent the injury complex in the civilian setting. While focused on the professional and college football player with multiple concussions, the incidence of TBI in many forms of frequently minor trauma are being recognized and used to identify patients at risk for long-term disability. Several recent studies have shown early and even brief interventions have a major impact on long-term disability. However, the challenge in recognizing and diagnosing TBI continues. Many findings are subtle and no gold standards exist. Newly developed functional scans, primarily metabolic MR assessment of CNS function, have greatly increased accuracy and exposed the true extent of the problem. Regrettably, we are only now developing interventions with hopes of preventing the onset and persistence of PTSD and further deterioration.

PRE-HOSPITAL CARE AND TRAUMA SYSTEMS/OUTCOMES

PRE-HOSPITAL CARE

Built on the groundbreaking concepts of ATLS, these approaches to standardization of training and care in a practical application for the injured patient introduced the benefits of protocols and “bundles of care” 30 years before they became recognized throughout medicine. The military have confirmed the improvements in outcomes and survival in injured warriors transported by enhanced paramedic equivalent trained personnel using standardized protocols of care, compared to the traditional EMT equivalent helicopter personnel. Overall, there continues to be creative work in developing the evidence-based medicine and expert consensus protocols to standardize and optimize care for the most critically injured. Variation continues to decrease and patient outcomes continue to improve. In addition, expanded training using new lifelike simulators has enhanced competency in infrequently used techniques. Extension of cellular on-scene technology has also permitted transfer of data, such as EKG tracings and on line physiology tracings, directly to the ED to aid in preparation and immediate intervention as needed.

TRAUMA SYSTEMS/OUTCOMES

The endpoint of all improvements in care is optimal outcomes. Importantly, over the last decade, a number of studies performed using large available datasets, both retrospective and prospective, have finally conclusively proven a benefit to trauma system implementation. Prospective studies comparing outcomes for trauma patients treated in trauma centers compared to large community hospitals document a 25% reduction in overall mortality. Similarly comparing states with and without trauma systems reveals a significant reduction in overall trauma mortality, particularly blunt trauma from motor vehicle crash injuries. These studies also confirm the real challenges that exist, including a near decade-long lag from implemen-

tation of a system by state statute and documentation of improvement in patient outcomes. In addition, ongoing improvements in large national trauma data sets, such as the National Trauma Data Bank of the American College of Surgeons Committee on Trauma, after decades of development, have advanced to a quality level to permit true outcomes analyses with an increasing granularity to test specific components of the overall care provided. This documentation will become increasingly critical as health care reform and reimbursement are linked to a value based purchasing approach, the process will continue shifting the focus to outcomes as an ultimate goal.

MONITORING/DIAGNOSTICS

The ongoing challenges in identifying the appropriate patient for various potentially dangerous therapeutic interventions are paralleled by our inability to assess adequate resuscitation and organ perfusion in the individual patient. As a consequence ongoing development and innovative utilization of existing technology remains an active area of research in care of the injured. The two areas of most activity are innovative utilization of non-invasive ultrasound technology and newer point of care coagulation testing techniques.

THROMBELASTOGRAPHY

To better identify the critically ill patient with significant presenting coagulopathy and to avoid the delays of traditional testing, increasing utilization and assessment of thrombelastography (TEG) and the similar device, ROTEM (rotational thromboelastometry) is ongoing. These devices give potential point-of-care feedback on the coagulation status of the patient. However, there are logistic challenges and the process is extremely sensitive to motion of the device and operator dependent requiring significant commitment of resources, training and quality assurance. In addition, early reports have not been able to confirm an ability to define abnormalities adequately in the individual to effect therapy and outcomes in comparison to standard clinical criteria for treatment. Due to the recognized potential impact, continued work on improvements in technology will hopefully provide an approach to modify resuscitation approaches and outcome. An additional improvement in care may also come from subsequent analysis, ongoing monitoring of the patient post-acute resuscitation in the ICU setting, and may improve selection of optimal blood components for treatment of persistent coagulopathy or monitor dosing for prophylactic anticoagulation.

ULTRASONOGRAPHY

While well established as a screening tool for intra-abdominal and intra-pericardial fluid in the injured patient, non-invasive ultrasonography (US) holds great promise for innovative use as a resuscitation diagnostic and monitor. Increasing use of US in the ICU setting allows for non-invasive assessment without transfer of the patient and risk of complications. Acute cholecystitis, fluid collections, and retained hemothorax can be rapidly defined and quantified to determine the need for intervention or additional studies. The extended FAST (focused assess-

ment with sonography for trauma) exam, in addition to screening for intra-pericardial blood, is also being used to screen for pneumothorax by monitoring for pleural surface sliding during respiratory motions. Accuracy is as good as or better than chest X-ray and quickly performed during routine FAST exam. Again, the process is operator-dependent with a recognized learning curve. US is also being tested as a monitor of intravascular volume in the setting of acute resuscitation. Measurements of the diameter of the IVC function as a surrogate for intravascular volumes and surrounding pressure, such as increased intra-abdominal pressure (IAH). In a comparable fashion, US can be used to monitor optic vein diameter serially as a non-invasive approach to detect increased intracranial pressure.

NEAR-INFRARED SPECTROSCOPY

Similarly, near-infrared spectroscopy (NIRS) is FDA-approved technology that provides non-invasive continuous online monitoring of tissue perfusion with oxygenated blood. In the injured patient, NIRS minimal limits perform similar to base deficit in the prediction of multi-organ dysfunction syndrome development and death. The benefit is the online continuous read-out to monitor adequacy of resuscitation. A major obstacle to widespread adoption is the exquisite sensitivity of the technology, which alarms to minor brief alterations and can be dislodged easily, making use in the hectic period of acute resuscitation extremely difficult. Thus, while encouraging, due to logistic challenges, use of the technology has had limited implementation. Due to the current absence and critical need for an online low risk assessment of these critical parameters, it is expected that improvements to allow facile, reproducible applications will be achieved in the future.

TRAINING

Training remains a cornerstone for moving forward in trauma and acute care surgery. With reductions in work hours and limited empiric experiences, the challenges in producing competent, capable surgeons continue to grow. Failure rates for the oral examinations of the American Board of Surgery have nearly doubled despite efforts to optimize the process. To meet the challenges of this decreasing clinical experience, several groups during the first decade of 2000 have developed or increased propagation of several superb hands-on experiential programs to enhance resident and attending exposure to the technical aspects of advanced trauma care. Programs include Definitive Surgical Trauma Care (DSTC), Advanced Trauma Operative Management (ATOM) and Advanced Surgical Skills for Exposure in Trauma (ASSET) courses, being propagated nationally and globally for all economic environments, even the most austere. In addition, clinically relevant simulation models are being developed and employed to teach all members of the health care team to standardize and optimize our approach to the critically injured patient. The development of "Team Steps" and other proven programs to engage and optimize involvement of each member of the team and follow with reviews of successes and problems during difficult resuscitations and operations brings closure for the team members and builds cohesiveness and improvement in functioning going forward.

CONSORTIA AND MULTI-INSTITUTIONAL TRIALS

Due to significant improvements in care with a concomitant impressive decrease in overall mortality, clinical trials of new therapeutic approaches are increasingly challenging. Except for mortality, there are few acceptable objective outcome criteria to support implementation of new treatments, particularly expensive therapeutics. As a consequence of decreasing rates of mortality and complications, large populations of patients are required for adequate testing to detect a clinically relevant impact on outcomes. To meet this challenge, formation of consortia have occurred.

The trauma community has taken several approaches from implementation of comprehensive evidence-based meta-analyses to organizational multi-institutional trials groups to multi-specialty government funded consortia. The series of guidelines from EAST are noteworthy in their attempt to synthesize the vast array of frequently contradictory data available for treatment of a specific disease into accepted evidence-based medicine approaches for rational application to the injured patient, such as VTE prophylaxis. The AAST and Western Trauma Associations have active multi-institutional study committees bringing together the strength of many institutions to resolve difficult questions and to provide benchmarking and best practice protocols.

To deal with the challenges of increasing complexity of research questions requiring multiple specialty expertise, governmental funds have been obtained to support research consortia, such as the ARDSNet (focused on acute pulmonary failure), the Resuscitation Outcomes Consortium (ROC, focused on various resuscitation strategies), National Trauma Institute (NTI, focused on numerous acute care issues in resuscitation and care of the severely injured) and the Glue Grant (identifying potential therapeutic targets from serial genome-wide changes in gene expression following severe injury), to attempt answers to complex systems biology issues and test encouraging potential therapeutic advances. These efforts are excellent examples of the trauma community working together to optimize further improvements in care of the critically injured and ill patient.

ACUTE CARE SURGERY

Lastly, but by no means least, I would be remiss if I did not recognize the development of the new specialty of acute care surgery and its evolution into a partnership with trauma and critical care surgery. While there are no articles with major citation impact to reference, the recognition of the specialty of acute care surgery is indeed a major landmark of the decade of 2000. The development, evolution, and necessity for acute care surgery has been linked to many simultaneously occurring processes in the delivery of acute surgical care. But, as a consequence, a need arose for surgeons capable and willing to care for the urgent and emergent non-trauma surgical diseases.

With increasing surgical specialization and discomfort by surgical specialists asked to cover these emergencies, and the natural commingling, frequently in the middle of the night, with the trauma-related emergencies, a naturally occurring joint purpose became evident.

And, in recognition of this natural evolution, in 2002, the AAST appointed the initial ad hoc committee to study the potential avenues and propose a course best for our patients and how the AAST could support these patients and institutions.

The response from the AAST was a permanent committee dedicated to the new specialty, a curriculum for specialized training, sessions as a vehicle for education and discussion, oversight and verification of the training programs and even the renaming of the *Journal of Trauma* to the *Journal of Trauma and Acute Care Surgery*. Transition continues and the ultimate integration of trauma and acute care surgery awaits final definition. But the need of our patients exists and the AAST has the commitment to provide the leadership for the challenging care these critically ill patients require.

SUMMARY

Care for the injured patient continued to improve during the decade of 2000. Mortality due to trauma overall in the typical Level I trauma center has dropped to 3–4%. However, the main cause of death in those reaching the trauma center alive remains exsanguination. The major advancement of trauma care for the decade is recognition of a significant coagulopathy on presentation to the ED of the severely injured bleeding patient that contributes significantly to mortality. As, in the past, major advances in trauma care have been derived from military experiences during a decade-long involvement in OEF and OIF, and the lessons are rapidly being adapted to civilian practice. The first decade of the new millennium has thus become the Decade of Extended Damage Control Resuscitation. Already major advances have been made and survival is improving. Many questions remain unanswered, but the future is exciting and promising for continued success in advancing the care for the critical ill. .

Optimal diagnosis and monitoring for resuscitation, improvement of resuscitation fluids, and integration of post-resuscitation facets of ICU care are slowly improving. Individual organ injury management is being refined. Training of both trainers and trainees continues to evolve using modern simulation technology and team building tactics to integrate a diverse medical team into a better whole. Importantly, increased attention is focusing on improvements in recovery and return to optimal function. Avoidance of readmissions and loss of life in transition settings, such as extended care facilities have long been overlooked. And, lastly, the trauma community is reaching out to deal with the “flat world” of medicine with increasing global care, education and training.

SELECTED PAPERS

The core mission of the AAST is improvement of care for the injured patient. As the premier educational society for trauma in the world, it is not surprising that presentations at the annual meeting parallel and often precede the advances in care for the severely injured. Below is a selection of papers, presented at the AAST annual meeting and subsequently published in the *Journal of Trauma and Acute Care Surgery* over the initial decade of the new millennium. To aid in the selection of seminal presentations and publications, I have utilized peer

review in the form of top numbers of subsequent citations from which to make the selections:

HYPOTENSIVE RESUSCITATION DURING ACTIVE HEMORRHAGE: IMPACT ON IN-HOSPITAL MORTALITY

Richard P. Dutton, MD, MBA, Colin F. Mackenzie, MD, and Thomas M. Scalea, MD

In this study, presented at the sixtieth annual meeting of the AAST in 2000 by Dr. Dutton and colleagues, the potential beneficial impact of hypotensive resuscitation during active hemorrhage-induced shock on in-hospital mortality was examined.¹ Previously, the tradition has been to attempt maintenance of normal systolic blood pressure by aggressive volume resuscitation. In the current study, the authors utilize fluid resuscitation titrated to a lower-than-normal systolic blood pressure during active hemorrhage until definitive control of bleeding was achieved. In this prospective randomized trial, the two groups received resuscitation to either a target systolic blood pressure of greater than 100 mmHg (conventional), or a target systolic blood pressure of 70 mmHg (low). In these 110 patients enrolled over a two-year period, the authors achieved a significant difference in systolic blood pressure of 114 mmHg versus 100 mmHg. However, hypotensive resuscitation with a low SBP was not accomplished. The overall ISS and the duration of hemorrhage were similar. The survival rates were identical. They conclude that titrating to the lower-than-normal systolic blood pressure during active hemorrhage did not affect mortality. They postulated that this lack of difference may have been due to improvements in therapeutic technology, differences in the mechanisms of injury, and the imprecise ability of systolic blood pressure to discriminate oxygen delivery and outcome.

A concern repeatedly identified in the blunt injured patient is the frequent accompanying traumatic brain injury. Lack of an adequate mean arterial pressure may have a significant negative impact on CNS recovery, and negate any hemostatic benefit. The net effect of this overall approach could be significantly negative in the blunt injured patient population. Thus, the data presented support the literature and results of several studies confirming optimal outcomes with moderation in resuscitation, but still maintaining an adequate perfusing systolic blood pressure of approximately 90 mmHg. This goal-driven approach, while still avoiding over-aggressive resuscitation causing enhanced blood loss and subsequent further dilution of coagulation factors, appears to be a rational balance to seek. Avoidance of any significant hypotension or hypoxia in the brain injured patient, plus a controlled resuscitation approach, appears to be ideal in the severely injured patient population overall. The results of the current study could be interpreted that, while there was no improvement in the patient with a blood pressure of 100 mmHg systolic compared to the patients with a systolic of 114 mmHg, there also was no significant negative impact on outcome, supporting the relevance and safety of aiming for a systolic blood pressure of approximately 90 mmHg. As a consequence of this and other similar studies, along with recognition of the real risks in the multiply injured patient, the enthusiasm generated in the previous decade for no resuscitation in the pre-hospital phase has waned and a more moderate generalizable approach for all severely injured patients has been widely adopted. Again, avoidance of over-resuscitation and creation of multiple subsequent complications remains critical.

Research during the initial decade of the millennium continued a strong focus on the major remaining cause of mortality in the severely injured. Uncontrolled bleeding remains the leading cause of trauma-related death, in both the civilian and military setting, accounting for approximately 40% of the current mortality in the injured patient reaching the hospital alive. A major contributor is coagulopathy, even after achieving surgical control, and is aggravated by a frequent concomitant metabolic acidosis and hypothermia. At the beginning of the decade, the critical importance of trauma-induced coagulopathy was only becoming recognized, while an ongoing interest in treating the resuscitation-induced dilutional coagulopathy was being treated in clinical trials to potentially reduce blood loss, prevent exsanguination and decrease the risk of death.

RECOMBINANT ACTIVATED FACTOR VII FOR ADJUNCTIVE HEMORRHAGE CONTROL IN TRAUMA

Uri Martinowitz, MD, Gili Kenet, MD, Eran Segal, MD, Jacob Luboshitz, MD, Aharon Lubetzky, MD, Jorgen Ingerslev, MD, and Mauricio Lynn, MD

The first of this triad of papers selected from presentations at the AAST annual meetings was presented in 2000 by Dr. Martinowitz and colleagues and initiates a series of seminal clinical studies.² Recombinant activated factor VII (rFVIIa) was initially developed for the treatment of hemorrhage secondary to hemophilia. Thus, there was FDA approval and a clinical experience with the coagulation factor. Initially, conditions with an increased thromboembolic risk, such as trauma, were thought to be contraindications. However, the effect of the drug appears to be primarily focal at sites of injury, and thus concern for diffuse, unregulated thrombosis was thought small, and on balance appropriate to utilize in the severely injured, coagulopathic, and massively bleeding patient. In this preliminary study by Martinowitz from Israel, a small number of bleeding patients (n=7) were treated with rFVIIa after failure of conventional treatment, including replacement of coagulation components. The addition of rFVIIa caused a cessation in the diffuse coagulopathic bleeding, with significant decrease in blood requirements, shortening of elevated coagulation studies (both prothrombin time and partial thromboplastin time), and increase in measured FVIIa levels. There were no adverse thromboembolic events. Thus this early exploratory report supported that trauma patients may benefit from rFVIIa in control of exsanguination due to uncontrolled coagulopathy without detrimental side effects.

This early publication identified the potential benefits of controlling the coagulopathy present in the severely injured, massively transfused patient. The new use of an approved agent appeared safe, with no recognized excessive complications, and provided evidence of a potential significant beneficial impact on the coagulopathy, and the ultimate requirement for blood and other blood components in these critically ill patients. The final recommendation for further trials in animal and human studies appeared appropriate and led to an enormous enthusiasm for its utilization, primarily in the massively injured patient, including in the early stages of the OEF and OIF campaigns in Iraq and Afghanistan. Ultimately, several large clinical RCTs were performed to confirm the efficacy noted in the preliminary observational series.

FACTOR VIIa FOR CORRECTION OF TRAUMATIC COAGULOPATHY

Richard P. Dutton, MD, Maureen McCunn, MD, Mary Hyder, MD, Matthew D'Angelo, CRNA, James O'Connor, MD, John R. Hess, MD, and Thomas M. Scalea, MD

The second paper by Dutton et al. was presented at the sixty-second annual meeting of the AAST in 2003 and involved the first large cohort study of patients, including 81 coagulopathic trauma patients from 2001 to 2003, compared to an attempted matched historical control cohort of trauma patients from their trauma registry.³ The patients selected had active ongoing bleeding following surgical bleeding control with evidence of clinical coagulopathy and diffuse oozing. The results show that the causes of coagulopathy were from diverse causes. Most were from acute, trauma-induced hemorrhage but also included patients with bleeding caused by severe traumatic brain injury, warfarin use and other acquired and congenital hematologic defects. These authors noted that in 75% of the patients, the coagulopathy was reversed, with a reduction in prolonged prothrombin time, and 42% of patients survived to hospital discharge. Due to difficulty in truly matching patients from their registry, the Factor VIIa patients had a higher mortality than the coagulopathic controls matched on injuries, admission lactate value or predictability of survival. However, for patients with all three matched risks, the mortality was similar, although the numbers were small. The authors concluded that the numbers were too small to derive any firm conclusions, but there was no significant improvement in survival in the treatment group. Thus, the authors concluded that the Factor VIIa therapy led to a reduction in hemorrhage, with an improvement in laboratory measures. However, due to use of FVIIa as a last ditch approach, the ability to identify appropriate control patients is extremely difficult. The authors state that in patients whose surgical control of bleeding is accompanied by ongoing coagulopathic hemorrhage, that rFVIIa should be considered as a last resort, and the need for appropriate clinical trials to better identify and focus treatment on appropriate patient selection, along with defining the optimal dose and timing of therapy.

This prospective follow-up study in a group of 81 patients with diverse causes of coagulopathy, but primarily severe traumatic hemorrhage, confirmed the beneficial effect on coagulation parameters and decrease in blood requirement, although there was no improvement in overall outcome. The authors also addressed many confounding derangements in these critically ill patients known to affect the coagulopathy. Since the intervention functions through initiation of the coagulation pathway and subsequent clot formation, the agent is susceptible to factors known to impair normal processes. In these patients, this includes the negative impact of hypothermia on the coagulation cascade and impairment in clot formation due to severe acidosis, primarily less than pH 7.1. In addition, to be effective, all components of the coagulation cascade must be present and due to rapid wash out need to be infused just prior to treatment with rFVIIa. To form definitive clot, adequate platelet levels must also be present for effectiveness. Importantly, while several cases of bowel ischemia occurred, they were felt to be due to underlying injury and no thrombotic complications due to therapy were identified. Thus again, the intervention appeared to be appropriate for the patient with confirmed severe coagulopathy and ongoing hemorrhage, and the authors wisely stated that this approach should be one of last resort, and there was significant challenges remaining in selecting both

the ideal patient and the ideal dose and timing to avoid complications before moving forward with the utilization. The data were, however, encouraging, and led to numerous additional uncontrolled interventional trials all utilizing different entry criteria, and, eventually, a randomized control trial to confirm efficacy. The RCT became critical due to an increasing number of scattered reports of potentially significant thromboembolic complications that may have been linked to the aggressive utilization of Factor VIIa, particularly in more broadly chosen patients with less clearly defined severe coagulopathy.

RECOMBINANT FACTOR VIIa AS ADJUNCTIVE THERAPY FOR BLEEDING CONTROL IN SEVERELY INJURED TRAUMA PATIENTS: TWO PARALLEL RANDOMIZED, PLACEBO-CONTROLLED, DOUBLE-BLIND CLINICAL TRIALS

Kenneth D. Boffard, MD, Bruno Riou, MD, PhD, Brian Warren, MD, Philip I.T. Choong, MD, Sandro Rizoli, MD, Rolf Rossaint, MD, Mads Axelsen, MD, and Yoram Kluger, MD, for the NovoSeven Trauma Study Group

The third paper, based on a presentation by Dr. Boffard, and colleagues, at the sixty-third annual meeting of the AAST in 2004, reported the outcome of two parallel randomized, placebo-controlled, double-blind trials (one in blunt trauma, and one in penetrating trauma).⁴ The efficacy and safety of recombinant Factor VIIa (rFVIIa) for control of bleeding in patients with severe trauma and significant blood loss were analyzed. The severely bleeding injured patients were randomized to three doses of rFVIIa and compared to placebo. In this study, the first dose of Factor VIIa followed transfusion of the eighth red blood cell unit, with additional doses one and three hours later. The end point was for the number of units of blood transfused in those patients alive at 48 hours. In the patients suffering blunt trauma, the use of rFVIIa reduced RBC transfusion approximately 2.6 units, and the need for massive transfusion of greater than 20 units was reduced to 14% versus 33%. In the patients suffering penetrating trauma, pRBC transfusions were reduced by one unit, and massive transfusion was decreased to 7% from 19% in controls. There was a trend towards reduction in mortality and subsequent clinical complications. There was no significant increase in adverse thromboembolic events. Thus the authors concluded that the use of rFVIIa resulted in a significant reduction in transfusion requirements, and safety was confirmed in these trauma patient populations using the doses tested.

In this extremely difficult-to-control study, the authors were able to accumulate sufficient numbers of patients (301 randomized, 143 blunt, and 134 penetrating injured) using a high three-dose treatment schedule in patients, after receiving their eighth unit of transfusion, and were able to reduce the incidence of massive transfusion and the overall number of units of blood required in both penetrating and blunt trauma. Importantly, the authors showed no significant increase in complications due to thromboembolic disease in the treatment arm. Thus, the use of this agent appeared to be of benefit in a well-controlled RCT, although most parameters did not reach statistical significance. It is interesting that subsequently, due to the reported potential associated thromboembolic episodes in less controlled settings, and the high cost of the therapy, that the risk-benefit ratio (decreased, albeit small, amount of blood vs. thromboembolic complications and high cost) was insufficient to sustain enthusiasm for the

ongoing use of this agent. The agent continues to be used in highly selected phases of trauma as a last-resort attempt to prevent coagulopathic death in the critically ill patient. A major take-home message from this sequence is the difficulty in these critically ill patients (despite numerous retrospective cohort studies demonstrating benefit) to truly control the risk-benefit ratio in the individual patient. There is information supporting that, if the patient receives adequate coagulation components just prior to use of Factor VIIa, a dramatic improvement in coagulation parameters can be achieved. However, due to the difficulty in selecting both the patient and the optimal dosing and timing for delivery of the agent, the ability to demonstrate a significant overall net benefit on a population basis to support clinical usefulness has been unachievable.

EARLY COAGULOPATHY PREDICTS MORTALITY IN TRAUMA

Jany B.A. MacLeod, MD, MSc, Mauricio Lynn, MD, Mark G. McKenney, MD, Stephen M. Cohn, MD, and Mary Murtha, RN

This paper, presented by Dr. MacLeod and co-authors at the sixty-first annual meeting of the AAST in 2002, was one of the first to more clearly define the pathophysiology underlying the empiric observations of an apparent early coagulopathy in severely injured bleeding trauma patients, even prior to dilution from aggressive resuscitation efforts.⁵ This study and many to follow dealt with a major focus of trauma-related research during the entire decade. Coagulopathy has long been known to impact mortality, but traditionally, the impact was thought to be due primarily to a dilutional coagulopathy induced by aggressive crystalloid resuscitation and massive transfusion with pRBCs lacking normal coagulation components. However, the recent observations of an apparent severe coagulopathy on presentation to the hospital was lacking in details, even documentation of actual existence, including direct correlation and dose-effect of the altered coagulation profile to outcome had not yet been established. In this early paper investigating aspects of the coagulopathy seen in the severely injured patient, the authors collected data at a Level I trauma center and used a logistic regression analysis to correlate prothrombin time (PT), partial thromboplastin time (PTT), platelet count and other confounders to identify the correlation of coagulopathy as a predictor of mortality. Utilizing a single institutional trauma registry cohort of over 20,000 patients, containing 14,000 patients with initial coagulation parameters and over 7,600 with complete data (8.9% mortality), the authors demonstrated that a coagulopathy was prevalent in the early pre-resuscitation post-injury period in 28% of the patients with an abnormal PT and 8% with an abnormal PTT on arrival to the hospital. Their analysis showed the odds for an increased risk of death with abnormal PTT was 7.8, and 3.6 for an abnormal PT. The coagulation parameters proved to be independent predictors of mortality, with adjusted odds of increased mortality of 1.35 for PT, and 4.26 for PTT. In contrast, the platelet levels had no predictive value. In conclusion, the incidence of coagulation and abnormalities very early following arrival to the trauma center were excessive and highly independent predictors of subsequent mortality.

This early investigation dissecting a previously unrecognized coagulation profile of the severely injured patient was one of the first to document in a large dataset, of several

thousand patients, the strong contribution of early coagulopathy to ultimate mortality risk. While coagulopathy developing in a patient after significant blood loss requiring component blood transfusion and significant crystalloid resuscitation has long been known, and thought to be primarily dilutional, this study documented a frequent (28%) and very early significant coagulopathy occurring prior to resuscitation and dilution in the severely injured patient population. This paper was a major alert and driver for the subsequent focus and recognition of the enormous impact of coagulopathy on the severely injured patient, and the rapidity of the onset following severe injury with significant blood loss prior to resuscitation. Subsequently, throughout the entire decade, a major focus of trauma research has been on this high-risk cause of increased mortality in a subset of patients demonstrating this coagulation pattern.

As a consequence of these investigations and the increased recognition of the coagulopathy early following severe injury with significant blood loss, a series of retrospective cohort studies were reported. Though not unanimous, the majority of publications supported (i) the frequent occurrence of the coagulopathy in the critically injured bleeding patient, (ii) the major contribution and marked increase in risk of death in injured patients presenting with coagulopathy, and (iii) the rapidity of onset of hemorrhage related death (80–90% by 24 hours) and the extremely short window for treatment to have a measureable impact (less than approximately 6 hours). Based on these observations, studies continue to present attempting to refine and define the best therapeutic agents, timing and dosage to optimize survival. DAMAGE

CONTROL HEMATOLOGY: THE IMPACT OF A TRAUMA EXSANGUINATION PROTOCOL ON SURVIVAL AND BLOOD PRODUCT UTILIZATION

Bryan A. Cotton, MD, Oliver L. Gunter, MD, James Isbell, MD, Brigham K. Au, BS, Amy M. Robertson, MD, John A. Morris, Jr, MD, Paul St. Jacques, MD, and Pampee P. Young, MD, PhD

In response to the challenge to optimize treatment of the trauma-induced coagulopathy (TIC) in the critically injured, a series of presentations at the AAST dealt with various investigations to define the best approach. In this presentation, by Dr. Cotton and colleagues at the sixty-sixth annual meeting of the AAST in 2007, the authors tested the importance of early and aggressive management of TIC by implementing a massive transfusion protocol that provided specified amounts and types of blood components immediately for the resuscitation of the critically ill patient.⁶ They hypothesized that there would be a beneficial impact on survival and decrease overall utilization of blood products. The investigators' single institutional study compared the massive transfusion protocol producing an early intraoperative 1:2 ratio of FFP to pRBC and 1:8 for platelets to pRBC compared to approximately 1:3 and 1:11 in the traditional therapy arm. The control group was a historical cohort of patients who, prior to implementation of the protocol, received the majority of blood components later in the first 24 hours after the operative phase. This was a fairly large study with 94 massive transfusion (MT) protocol patients, and 117 in the control cohort. The patients in the MT protocol were matched to the control cohort by general criteria but had worse physiologic scores. The patients in the MT protocol also had an increased utilization of FFP and platelets early in the resuscitation, but overall had significantly lesser requirements in the first 24 hours. Importantly, after con-

trolling for confounding, there was a 74% reduction in odds for mortality in the MT protocol group. Thus, the authors conclude that implementation of a massive transfusion protocol with increased utilization of FFP and platelets early in the intraoperative phase of treatment significantly reduced the risk of mortality and overall component utilization compared to the historical control cohort.

The current investigation attempted to identify a benefit of a predetermined MT protocol on overall survival and blood product utilization in the approach to early care of the critically injured bleeding patient. The MT protocol increased the ratio of FFP and platelets to pRBCs early intraoperatively in the bleeding patient. This increased use of component therapy was associated with a 74% reduction in the risk for mortality in comparison to the historical control group, even though physiologic parameters were worse in the MT protocol group. Secondly, the MT protocol required more blood components early in the resuscitation but overall at 24 hours produced a significant reduction in blood components required. Interestingly, calculation of the ratios achieved appear to demonstrate an increase in the ratio of FFP to pRBCs from approximately 1:3 to 1:2 and platelets from approximately 1:11 to 1:8. These ratios are now thought to still be inadequate as the common goal is often 1:1:1 for presumed optimal effect. Thus, in this study, the major benefit to the MT protocol was not the ratio as much as the ability to initiate therapy very early in the course of care and simultaneous with control of surgical bleeding producing a dramatic improvement in outcomes. The authors were able to demonstrate that a standardized protocol, with blood-bank response providing an enhanced ratio of FFP to pRBC and additional platelets for supplementation of the early coagulopathy, in fact did have a beneficial impact on the subsequent development of massive transfusion and the overall amount of blood components required in the first 24 hours of resuscitation. Thus these early data support that of numerous subsequent studies, showing that an increased ratio of coagulation components in these patients is able to reverse the coagulopathy, decrease the incidence of developing massive transfusion requirements and overall reducing the number of blood products required to resuscitate. Simultaneously, the authors show a significant decrease in the risk of mortality in these critically ill patients receiving the massive transfusion protocol.

REVIEW OF CURRENT BLOOD TRANSFUSIONS STRATEGIES IN A MATURE LEVEL I TRAUMA CENTER: WERE WE WRONG FOR THE LAST 60 YEARS?

Juan C. Duchesne, MD, John P. Hunt, MD, MPH, Georgia Wahl, MD, NREMT-P, Alan B. Marr, MD, Yi-Zarn Wang, DDS, MD, Sharon E. Weintraub, MD, MPH, Mary J.O. Wright, MD, and Norman E. McSwain, Jr, MD

In this paper, presented by Dr. Duchesne and colleagues at the sixty-sixth annual meeting of the AAST in 2007, the authors hypothesized that, similar to the data being reported by military physicians, civilian trauma patients that require a massive transfusion will have an improvement in mortality when treated with a FFP to pRBC ratio closer to 1:1.⁷ Recent reports from OEF and OIF demonstrated a reduction in mortality from 65 % to 20% in severely injured bleeding wounded warriors when FFP to pRBC ratios were at 1:1 instead of 1:4, which has

been the traditional ratio in civilian practice. The study involved a four-year retrospective study of 2,746 trauma patients, using again a historical retrospective cohort study of patients in a single institution who required greater than 10 units of pRBC or less than 10 units during surgery and the initial post-op resuscitation. The impact of initial FFP to pRBC ratio on mortality was analyzed and multivariate analysis was performed. Of more than 700 patients that received transfusion 626 received less than 10 units of blood and 135 (5%) received greater than 10 units of blood. In patients who received greater than 10 units of pRBC there was a significant reduction in mortality (26% versus 87.5%) for those with FFP to pRBC ratio of 1:1 compared to 1:4. In patients who received less than 10 units of pRBC, there was a trend to increased mortality (21% versus 12%) for those with a FFP to pRBC ratio of 1:4 compared to 1:1. Overall, an FFP to pRBC ratio close to 1:1 is associated with a significant improvement in survival in injured patients requiring a massive transfusion.

As the authors point out, the basis of the current investigation was derived from findings presented by the military based on changes in resuscitation protocols implemented in OEF and OIF. In these critically ill wounded warriors with a high likelihood of early coagulopathy due to massive soft tissue injury and ongoing hemorrhage from frequent IED injuries, the application of an increased ratio of FFP and platelets to pRBC was demonstrated to significantly improve survival in several retrospective cohort analyses. This study, derived from a retrospective analysis of a single civilian trauma center experience in massively transfused patients testing a similar approach model, were able to replicate the findings of the military authors. Comparing patients who received an FFP to pRBC ratio of 1:1 or 1:2 compared to 1:4 in the past demonstrated an associated significant decrease in mortality. Similarly, even in patients who did not receive 10 units of pRBC, there was a trend toward an improved survival in patients with the ratio of FFP to pRBC close to 1:1. Two points must be remembered: This study was a historical cohort study with significant risk of bias and error, and again supports the need for prospective randomized controlled trials to answer the question of what ratios is optimal. Second, similar to the previous studies in print, the critical challenge of this study was the identification of the correct patients to submit to the aggressive resuscitation analysis. In this case, patients who underwent massive transfusion were entered retrospectively into the study. In the treatment of the injured patient, even the severely injured patient, the ability to predict which patients will require a massive transfusion is very difficult and makes the selection of patients to treat with high levels of FFP and platelets a significant challenge, not yet resolved.

THE RELATIONSHIP OF BLOOD PRODUCT RATIO TO MORTALITY: SURVIVAL BENEFIT OR SURVIVAL BIAS?

Christopher W. Snyder, MD, Jordan A. Weinberg, MD, Gerald McGwin, Jr, MD, PhD, Sherry M. Melton, MD, Richard L. George, MD, Donald A. Reiff, MD, James M. Cross, MD, Jennifer Hubbard-Brown, BS, Loring W. Rue, III, MD, and Jeffrey D. Kerby, MD, PhD

The paper by Dr. Snyder et al. at the sixty-seventh annual meeting of the AAST in 2008, investigated the relationship of blood product ratios to mortality.⁸ The authors analyzed a major

potential confounder of recent publications documenting an apparent survival advantage associated with the administration of higher cumulative ratios of FFP to packed red blood cells (pRBCs). A major concern with previous retrospective, historical cohort studies is that have poorly controlled data documenting the timing of the transfusions. A significant survival bias, whereas the patients who ultimately end up with a high ratio of FFP to pRBCs is merely identifying the patient with a survival advantage due to unrecognized and uncontrolled variables and thus remains alive long enough to receive increased amounts of FFP. In the current study, the authors studied 134 patients requiring massive transfusion of 10 units within 24 hours. They compared the outcome between patients receiving a high, greater than 1:2, versus low, less than 1:2, FFP to pRBC ratios using regression analysis with the ratio as a fixed value at 24 hours or as a time-varying co-variate. The results in their population demonstrated that the ratio was low in virtually all early patients, and increased over time following resuscitation. Using the raw data, the patients with a high FFP to pRBC ratio by 24 hours had a lower risk of death (63% reduction in mortality). However, when the timing of transfusion was taken into account, the statistical advantage to the increased ratio was lost (16% reduction in risk of mortality). Thus, testing for a potential survival bias eliminated any statistical improvement in overall survival. Conclusive evidence of benefit requires prospective collection of timed transfusion data to confirm a survival benefit of early FFP transfusion.

This study demonstrates one of many concerns with conclusions derived from historical data sets with incomplete data to completely analyze the clinical relevance. While an appropriate consideration, the dataset used was a retrospective historical cohort study with few patients receiving an early high ratio of FFP to pRBC, to enable a statistically conclusive dissection of the impact of ratio of FFP to pRBC versus timing of blood component therapy, and potential impact on survival following severe hemorrhage. Interestingly, similar to numerous other studies, the authors showed a greater than 50% incidence of death in this high-risk group within six hours, documenting the extremely narrow window available to intervention to impact outcome. Due to this small window, there were few patients in the high ratio group within the time frame and, thus, inexact ability to document the time varying covariate impact. Using these limited numbers, the authors were unable to show a statistical benefit, albeit a trend toward improved survival persisted. Subsequent analyses using prospectively collected historical data with more complete capture of the relevant timing of transfusions from the Glue Grant dataset and a large prospective cohort study of timing of blood component transfusions (PROMMTT trial) both show a benefit of early increased ratios of FFP:pRBCs in critically injured patients and support the now commonly accepted benefit to early FFP transfusion in the severely injured patient with significant hemorrhage.

POSTINJURY LIFE THREATENING COAGULOPATHY: IS 1:1 FRESH FROZEN PLASMA: PACKED RED BLOOD CELLS THE ANSWER?

Jeffry L. Kashuk, MD, Ernest E. Moore, MD, Jeffrey L. Johnson, MD, James Haenel, RRT, Michael Wilson, MD, John B. Moore, MD, C. Clay Cothren, MD, Walter L. Biffl, MD, Anirban Banerjee, PhD, and Angela Sauaia, MD, PhD

In an attempt to better define the optimal dose and timing for early coagulation component treatment of life-threatening coagulopathy, Dr. Kashuk et al. in a paper presented at the sixty-sixth annual meeting of the AAST in 2007, utilized their extensive single institution registry to further define these criteria.⁹ Again, association of variables to outcome utilized a historical cohort approach due to the absence of prospective clinical trials to specifically address these issues. The authors focused on the effect of approaching the ratio of 1:1 for FFP to pRBC within the early first 6 hours in the setting of life-threatening coagulopathy in the injured patient. The effect of ratio of FFP to pRBC was tested in a logistic regression model using 133 patients who received greater than 10 units of pRBC in 6 hours. The impact of the ratio on coagulopathy, as measured by international normalized ratio (INR), and death as outcomes was controlled utilizing standard confounders predictive of coagulopathy and mortality, as well as the use of pRBC, FFP and platelets. The authors show that this population of patients with massive transfusion within 6 hours of arrival had high mortality (overall 56%) and confirm that the transfusions, to be successful, must be completed early, with over 80% of the pRBC transfusions occurring in the first 6 hours. Similar to previous military and civilian studies, the FFP to pRBC in survivors was 1:2, and in non-survivors 1:4. An INR of greater than 1.5 at 6 hours occurred in 23% of the patients overall, 81% of whom died. Again, the data support the significant impact of the early coagulopathy on subsequent survival. The logistic regression analysis showed that the significant associated variables included number of pRBC per 6 hours, INR or coagulopathy at 6 hours, the emergency department patient temperature and age greater than 55. Interestingly, while the increasing ratio showed a linear decrease in mortality as the FFP to pRBC ratio approached 1:1, using a quadratic term to isolate each ratio independently, produced a U-shaped curve demonstrating the minimal mortality was between 1:2 and 1:3 for the optimal ratio. In fact with a 1:1 FFP to pRBC ratio, the mortality increased. The authors conclude that while a 1:1 ratio of FFP to pRBC reduces coagulopathy, it did not translate into a survival benefit beyond a 1:2 ratio. They recommend a formal, prospective randomized clinical trial controlling for these variables will be necessary to answer this concern.

In this study, based in a single institution with a detailed trauma registry, the authors were able to interrogate the impact of changes in FFP to pRBC ratios at a significantly earlier time point than the majority of previous studies. The patients are critically ill, with a 50% overall mortality. The authors show, in this critically ill coagulopathic injured population, the window for therapeutic intervention is small, with 80% of the required resuscitation of blood components being accomplished within the first 6 hours of treatment. Similarly, the associated impact of the coagulopathy on mortality was 81% in those developing an INR greater than 1.5. The authors demonstrate that as the ratio approaches 1:1, there is a linear decrease in mortality. However, using a quadratic approach to identify the impact of each ratio individually,

a U-shaped curve was produced with an increased mortality at 1:1, and the optimal survival being achieved at a 1:2 to 1:3 ratio of FFP:pRBC.

Due to the use of a historical cohort analysis to define this correlation, the data require confirmation in a prospective clinical trial. However, it would not be unexpected for the impact of a potent therapeutic with potential detrimental effects to produce a U-shaped survival curve, as excess drug beyond optimal effectiveness leads to a decrease in survival. Similar to well-studied ethanol consumption, chronic low level intake produces a reduction in base-line mortality, but with increasing daily doses forms a U-shaped curve with increasing mortality linearly related to the excessive amount of alcohol consumed. Thus, a U-shaped curve for survival benefit, based on repletion of coagulation components, would not be physiologically or biologically unexpected due to their known potential significant deleterious impact. In summary, the study confirms the presence of coagulopathy in the critically ill, the small window of time for treatment and the ability to improve survival with utilization of component coagulation products. In response to the recurring recognition of need for a prospective randomized trial to define the optimal ratio, PROPPR (Pragmatic, Randomized Optimal Platelet and Plasma Ratios), a multi-center, prospective, randomized trial was initiated to test the impact of a 1:1 ratio of FFP to pRBC to a 1:2 ratio in patients with severe injury and evidence of hypoperfusion and ongoing hemorrhage at the time of study entry. Due to concerns for lack of equipoise, a control group without coagulation component therapy could not be modeled. It is hoped that this prospective trial will provide definitive support for both the positive impact on outcome, and to delineate the optimal dose to impact outcome.

FRESH FROZEN PLASMA IS INDEPENDENTLY ASSOCIATED WITH A HIGHER RISK OF MULTIPLE ORGAN FAILURE AND ACUTE RESPIRATORY DISTRESS SYNDROME

Gregory A. Watson, MD, Jerry L. Sperry, MD, MPH, Matthew R. Rosengart, MD, MPH, Joseph P. Minei, MD, Brian G. Harbrecht, MD, Ernest E. Moore, MD, Joseph Cuschieri, MD, Ronald V. Maier, MD, Timothy R. Billiar, MD, and Andrew B. Peitzman, MD, and the Inflammation and the Host Response to Injury Investigators

In a paper presented by Dr. Watson and colleagues at the sixty-seventh annual meeting of the AAST in 2008, the potential for detrimental impact of fresh-frozen plasma used in the resuscitation of the injured patient was investigated.¹⁰ The authors utilize the epidemiologic database generated by the Glue Grant, a multi-center consortium, over the previous seven years. The development of component therapy several decades ago has led to an enormous increase in the use of pRBC and other blood components for optimal use of a scarce resource. However, it is now recognized that unnecessarily liberal bank blood transfusion is known to be an independent risk factor for multiple organ failure, acute respiratory distress syndrome, nosocomial infection, and mortality after injury. What is less clearly defined is whether it is the pRBCs or the accompanying plasma, or if the utilization of FFP alone will have a similar negative impact on the subsequent outcome in the injured patient. With the recognition of a need for coagulation component therapy early, within 6 hours of arrival following severe injury to improve survival, the concern arises that an unnecessarily broad population of injured patients will be

subjected to early FFP therapy. While the benefit in the critically ill coagulopathic patient is increasingly confirmed, the potential negative impact in the patient without coagulopathy has not been investigated. In this dataset, for each unit given, FFP was independently associated with a 2.1% and 2.5% increased risk for MOF and ARDS respectively. When transfused early in the course of treatment, FFP was associated with a decreased risk of mortality. While the authors demonstrate no significant association with plasma-rich transfusions on the mortality or nosocomial infection rate in this severely injured population, other investigators have shown detrimental impact on infection risk and mortality in less severely injured patients. The beneficial impact of early treatment for coagulopathic patients must be balanced against the potential negative impacts of FFP in the less severely injured, similar to current transfusion criteria.

This study adds a warning in the rush to treat the injured patient with increased ratios of FFP to pRBC or, as has been proposed, to use FFP as the primary resuscitation fluid for damage control resuscitation. As repeatedly demonstrated in the critically ill patient undergoing unnecessary blood transfusions, early reports of major detrimental impacts on nosocomial infections, multiple organ failure and, even, mortality are occurring in the literature. As frequently occurs, when it is difficult to identify the individual patient at risk for a disease, the tendency for the care giver is to overtreat by utilizing FFP and other plasma-rich components in patients who are unlikely to have a coagulopathy, just to be sure. This extrapolation of treatment to patients not requiring intervention will encounter any negative consequences of treatment without the counterbalancing benefits initially demonstrated. This scenario is very similar to the frequent over-transfusion of banked blood in the critically ill ICU patient to raise the hematocrit to an arbitrary level “to be safe.” After several decades of use of this indiscriminate practice, it was demonstrated there was a significant negative impact on survival, organ dysfunction, and infectious complications in the patients who received pRBC unnecessarily. To prevent this scenario from being repeated, it is critical for cautionary notes such as this study to be remembered, and we overcome the challenge of identifying the patient with significant coagulopathy-induced hemorrhage to permit optimal and safe therapeutic intervention.

RAPID THROMBELASTOGRAPHY DELIVERS REAL-TIME RESULTS THAT PREDICT TRANSFUSION WITHIN 1 HOUR OF ADMISSION

Bryan A. Cotton, MD, MPH, Gabriel Faz, MD, Quinton M. Hatch, MD, Zayde A. Radwan, BS, Jeanette Podbielski, BSN, Charles Wade, PhD, Rosemary A. Kozar, MD, PhD, and John B. Holcomb, MD

A major ongoing challenge to improving survival from injury continues to be our inability to accurately define the individual patient pathophysiology to guide optimal treatment. During the first decade of the 2000s, this challenge was focused on identifying the patient and defining the early severe coagulopathy associated with critical injury and ongoing hemorrhage. Awaiting return of traditional coagulation assays, such as PT and PTT, not only produce unacceptable delay, but also are not adequately informative as to the overall capability of the patient's

blood to rapidly create a cross-linked firm clot. In response to these challenges, various approaches have been tried.

One of the most encouraging is addressed in the paper by Dr. Cotton and colleagues, which was presented at the sixty-ninth annual meeting of the AAST in 2010.¹¹ Faced with the challenge of quickly identifying trauma-induced coagulopathy, rapid thrombelastography (rTEG) has been adapted from previous indications, primarily in the operating room to monitor reversal of anti-coagulation following cardiac procedures and transplantation. Rapid thrombelastography provides a comprehensive assessment of the coagulation process and several components of the coagulation system. The use of r-TEG in trauma patients has been poorly defined, but is actively being pursued for the near-online assessment in the emergency department setting. The authors studied 272 patients, who met injury criteria, with r-TEG and conventional coagulation tests (PT, INR, PTT, and platelet count). The r-TEG results were displayed “real time” within the emergency department, and compared to the conventional coagulation tests. Early r-TEG values (activated clotting time, r-value, and k-time) denoting the activation of the coagulation process, were available within 5 minutes. The later r-TEG values, of maximal amplitude and alpha angle, relate to the cross-linking of the clot, and those subsequently, up to 50 minutes, demonstrated stability and rate of clot lysis. Conventional coagulation tests required 45–50 minutes for return. The activated clotting time (ACT), r-value, and k-value showed strong correlation with PT, INR, and PTT. Similarly, maximal amplitude and alpha-angle correlated with platelet count and function plus fibrinogen activity. Using regression modeling, and accounting for numerous confounders, the authors demonstrated that an ACT greater than 128 seconds predicted massive transfusion in the first 6 hours post admission. In addition, ACT less than 105 seconds predicted patients who would not require transfusion in the first 24 hours. The authors conclude that the graphical display of r-TEG results are available within 5–15 minutes, correlate with conventional coagulation tests that are not rapidly available, and are predictive of early transfusion requirements for packed red blood cells, plasma, and platelets.

The enthusiasm for use of r-TEG technology comes from our inability to identify patients likely to have a significant early coagulopathy in a timely-enough fashion to permit appropriate interventions. Rapid thrombelastography has been utilized in the OR setting to monitor anti-coagulation in cardiac surgery and transplantation operations for years. The technology is increasingly standardized and rapid, based on the resistance generated in a spinning cuvette of blood allowed to clot, with the timing, strength due to crosslinking, and stability or lack of lysis of the clot being recorded. As the authors demonstrate, within 5 minutes, the activated clotting time clearly correlates with the early components of the coagulation cascade, PT, PTT and INR. These are the traditionally monitored coagulation parameters to identify early coagulopathy in the injured patient. An additional benefit of r-TEG is the slope of increase in the resistance as clot formation and cross-linking occurs correlates with platelet function and number and adequacy of fibrinogen. Lastly, with the known excessive fibrinolysis in trauma-induced coagulopathy, the ability to follow the stability and strength of the clot assesses the presence of hyperfibrinolysis and may identify a potential benefit to use

of anti-fibrinolytics such as tranexamic acid to aid in clot stability and decrease in ongoing hemorrhage. These parameters are not only returned rapidly, compared to the average 40–50 minutes required for laboratory assessments, but also assess the complete coagulation process and clot formation, including stability and lysis rates.

The results of this study, along with others, are encouraging. The major problems that remain are the logistics of implementing this point-of-care testing. The process requires dedicated, trained personnel to perform the procedure. The results are noted to be operator dependent, and can be quite variable. In addition, the technology platform is not consistent and in evolution, requiring frequent standardization to ensure accuracy. Due to lack of consistency and concern over ability to monitor platelet function and fibrinolysis and fibrinogen deficiency separately, the European community utilizes a similar technology of measuring increasing resistance during clotting of a blood sample using a technology called ROTEM. This technology is necessary for selective identification of the need for specific replacement therapy with fibrinogen. Overall, the technology will be expected to improve, and become more reproducible, consistent, and convenient to provide point-of-care near-online results to improve selection of patients to optimize intervention with potentially toxic resuscitation protocols. Ideally, as the technology improves, the specific dysfunctional components of the coagulation cascade will be identified, and therapy can also be further individualized based on the specific needs required by the individual patient.

VACUUM PACK TECHNIQUE OF TEMPORARY ABDOMINAL CLOSURE: A 7-YEAR EXPERIENCE WITH 112 PATIENTS

Donald E. Barker, MD, Henry J. Kaufman, MD, Lisa A. Smith, MD, David L. Ciraulo, DO, MPH, Charles L. Richart, MD, and R. Phillip Burns, MD

The major improvements in survival generated by temporary abdominal wound closure (e.g. DCL) for severe injury have been well defined during the decades of the '80s and '90s. While the concept of a damage control procedure, or damage control surgery, is well established globally, the optimal technical approaches for care of the open abdomen to implement this procedure continue to evolve. Many techniques have been proposed. To provide coverage and yet close rapidly and still permit decompression of the abdominal contents, the skin alone was frequently closed using towel clips, large running sutures or other devices. Others urged rapid complete versus partial closure of the fascia to avoid loss of domain and future ease in definitive closure using fascial sutures or clamps. Unfortunately, even when significant space is permitted, an incidence of secondary abdominal compartment syndrome (ACS) and other pressure induced organ dysfunction occurs. Currently, these approaches have been largely abandoned due to the damage to the tissues needed for ultimate closing, leading to significant complications, including increased incidence of hernias and fistulas. To preserve optimal tissue perfusion and tissue quality to optimize future closure, most approaches have evolved to one of leaving the abdomen "totally open" with minimal damage to the fascia.

This approach has led to the challenge of how to control the open abdomen, to avoid damage to tissues needed later for closure and also to prevent loss of domain due to retraction

of the abdominal wall edges. Maintenance of abdominal wall flexibility will optimize subsequent delayed primary closure, and prevent the need for delayed skin grafting and subsequent giant hernia repair. Dr. Barker and colleagues presented their approach to the fifty-ninth annual meeting of the AAST.¹² The approach provided rapid temporary closure, easy wound maintenance, and allowed re-exploration and wound repair with minimal tissue damage. Delayed primary closure was achieved in 55%, while 22% required split-thickness skin graft and subsequent hernia development, and 26% overall died, although none due to the vacuum dressing. Fistulas and delayed abscesses were uncommon. Currently, with ongoing modifications of the technique and improved overall ICU care, including volume management and nutritional support, upwards of 90% of patients with open abdomen undergo delayed primary closure.

The technique proposed by the authors addresses the major components of the challenge in achieving ultimate closure. Prevention of adherence between the intestinal contents and, particularly the anterior and lateral abdominal walls, is critical. To prevent this, a non-reactive material should be used, either as the authors described or using a simple, thin “bowel bag” to cover the viscera, which should extend from gutter to gutter for optimal coverage. The cover is perforated to allow drainage and removal of peritoneal fluid collections. Thin pliable material is important to prevent trauma to the underlying intestine and possible fistula formation. The second layer is a compressible, absorbent material. Most surgeons have moved away from using the surgical towel to retain the intestinal contents due to the stiffness and potential for injury. The use of an underlying plastic material and second layer of soft absorbent material is virtually always capable of preventing evisceration. Again, use of soft pliant material is preferable to prevent any risk of damage to the underlying bowel. We prefer using burn dressing material or more simply one to two Kerlex rolls distributed in the open wound. The suction catheters are placed within the absorbent material, which will become saturated, but then shrink with suction. The collapse of the material, similar to a sponge, helps maintain a vacuum-induced tension on the edges of the open abdominal wound to prevent loss of domain as the edges retract laterally. The suction drains are placed through the upper aspect of the open abdomen rather than damage the tissue by bringing them out subcutaneously. Non-permeable Ioban (3M, St. Paul, MN) or other adherent plasticized drape is placed to allow for a vacuum-tight seal. When suction is applied, there is removal of excess of fluid while simultaneously protecting the intestines and using a negative pressure gradient to minimize retraction of the lateral edges of the abdominal wall until delayed primary closure can be achieved. Using this technique, minimizing resuscitation volumes and aggressively diuresing, if indicated, has achieved delayed primary closure in 85–95% of these wounds. This greatly decreases the long-term morbidity, mortality and need for major future operation.

EFFECTIVENESS OF STATE TRAUMA SYSTEMS IN REDUCING INJURY-RELATED MORTALITY: A NATIONAL EVALUATION

Avery B. Nathens, MD, PhD, Gregory J. Jurkovich, MD, Frederick P. Rivara, MD, MPH, and Ronald V. Maier, MD

While trauma system development and standardization of care in individual trauma centers

advanced over the last three decades, there was a presumed benefit in outcome and common-held belief that the improvement in care was self-evident. However, due to inadequate data to evaluate outcomes and methodologic flaws in many studies, it was difficult to truly assess the impact of trauma system development on the healthcare of the nation. In their presentation at the fifty-ninth annual meeting of the AAST, Dr. Nathens and colleagues attempted to overcome many of the difficulties in evaluating effectiveness to assess any relevant benefits of establishing an organized system of trauma care.¹³ The data utilized were obtained from a survey of state emergency medical directors, review of state statutes, and a previously published trauma system inventory. Utilizing this dataset of the current status of trauma systems throughout the country that was matched against the mortality rates obtained from national vital statistics, inventories, injury mortality rates, and motor vehicle crash mortality rates obtained from the Fatality Analysis Reporting System (FARS), the mortality rates were compared between states with and without trauma systems. Twenty-two states were found to have trauma systems, with the remainder of states in development or without trauma system employment currently. States with trauma systems were shown to have a 9% lower crude injury mortality rate than those without systems, and when the mortality related to motor vehicle crashes was analyzed, there was a 17% reduction in death in those states with a trauma system. When controlled for confounders, such as age, speed laws and restraint initiatives, there still remained a 9% reduction in the motor vehicle crash-related mortality in states with a trauma system. This is one of the first investigations based on national data that was able to demonstrate a significant beneficial impact on mortality of implementation of statewide trauma systems. The conclusion of the study is obvious. Hopefully, the data will help support the political process, assisting the remaining states to implement state statutes for the development of verified or state-approved trauma systems to deliver the injured patient to the right hospital at the right time for optimal outcomes.

A major unresolved issue for many years during the development of trauma centers and trauma systems in the United States was proof that they had a beneficial impact on survival and outcomes for the injured patient. There was an insufficient database to assess that the implementation of a trauma system, with the goal of delivering the right patient to the right hospital for optimal outcome was indeed effective. With the ongoing development of national and statewide trauma systems and databases, the ability to track the outcome of injured populations from vital statistics and direct motor vehicle crash-tracking data, such as FARS, has become feasible. This study is one of the first to conclusively demonstrate that the efforts in developing a trauma system are indeed beneficial, with a significant decrease in mortality, both across the board for all trauma and particularly in patients sustaining blunt motor vehicle-crash trauma. The development of trauma systems is a significant effort and cost to the states, and therefore it is critical to move forward that we provide worthy data to support the discussion and to stimulate the political process regarding the need for statute-driven creation of state trauma systems. The authors note that, in addition to implementation, ongoing dedication and persistence is required, with an average lag of up to 10 years required before the political and medical processes mature to the level necessary to achieve the mortality and

outcomes benefits of a state system.

With great enthusiasm, we look forward as active research, from the molecular to systems of care, is translated to clinical practice in the care of the injured patient. Outcomes continue to improve with decreasing mortality, morbidity and long-term dysfunction. The AAST, through its educational activities and annual assembly, will continue to be at the forefront in education, assessment and validation of potential improvements in the care of the injured patient in the U.S. and globally.

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BASIL A. PRUITT, JR, MD
PRESIDENT 1982–1983

DR. FREDERICK A. LUCHETTE

When was it that you decided you wanted to pursue a career in surgery and specifically, in trauma and burns?

DR. BASIL A. PRUITT, JR.

As a medical student I thought I wanted to be whatever rotation I was on. There was a professor of radiology, Dr. Alice Ettinger, who had introduced spot film technology to the United States when she moved to the U.S. from Germany. She had become one of the leaders in American radiology and impressed me as a radiologist who could relate X-ray images to clinical findings. Consequently, on that elective rotation I thought I would be a radiologist. Before that I had a summer job and a weekend job throughout the third and fourth years as a diener with Dr. H. Edward MacMahon, the chairman of pathology who was a superb teacher. The first medical paper I ever wrote was on basal cell carcinoma. I had participated in the processing and histologic examination of a basal cell carcinoma in a surgical specimen sent from a local hospital in Boston to the medical school for Dr. MacMahon to examine and diagnose. Dr. MacMahon's comments about the causative factors and characteristics of basal cell carcinoma captured my interest and prompted me to undertake a review of basal cell carcinoma. That review was published in the *Bulletin of Tufts-New England Medical Center*. At that point I was fully convinced of the historical importance of Virchow and was going to be a pathologist.

After that I took an elective rotation with Dr. William Schwartz, a pioneer in the field

of nephrology whose ability to explain acid-based physiology to a medical student (me) and global knowledge of renal function and dysfunction convinced me that nephrology was my specialty destination.

Finally I had my surgery rotation where I met Dr. Charles Gardner Child, III, the chairman of surgery and a very impressive figure in his double-breasted, below-knee-length white coat. I had never seen one of those before and haven't seen anyone else wearing one since. Apparently that was the style of coat worn by attending surgeons at the New York Hospital where Dr. Child had been before coming to Boston. Dr. Child gave the opening welcoming talk on the first day of the surgery rotation and made it sound really exciting until he closed the talk by enthusiastically saying "...and you will be able to participate in the laboratory evaluation of the patient." In those days that meant that the medical student did a stool guaiac, urinalysis, hematocrit and a white blood cell count on every admission to the Tufts Surgical Service at the Boston City Hospital. I thought that anyone who could make that sound exciting must have something to offer. That and my experience while on the surgical rotation, where I saw how knowledge of pathophysiology could be applied to address clinical problems and restore the patient's health, persuaded me to become a surgeon.

That decision was reinforced early in my residency when I had a rotation on Dr. Dwight Harken's (Alden's father) cardiothoracic service, at the Mount Auburn Hospital. What an exciting month that was! Dr. Harken, a master surgeon and surgical showman, made every operation and even post-op visits with his patients a dramatic occasion. Dr. Harry Soroff, Dr. Harken's senior fellow, had been assigned to the Army Burn Center when he was drafted and had been able to do some of the earliest research characterizing the hypermetabolic response to burn injury. When Dr. Soroff learned that I was about to be drafted into the Army, he recounted his experience at the Burn Center and encouraged me to request assignment to that unit, which I promptly did.

When I reported to Fort Sam Houston in San Antonio, two representatives from the Burn Center came to interview me and, after a brief discussion, they informed me that I would be assigned to the Burn Center as a staff surgeon. That assignment, which allowed me to carry out both clinical and laboratory research, actually set the compass of my surgical career on burn and trauma care.

After I spent my two years as a drafted doctor at the Burn Center, I returned to Boston to complete my surgical residency with the intention of becoming a burn and trauma surgeon. My experience as a burn surgeon had convinced me that the burn patient was a good model for severe injury in general with such florid departures from the normal in terms of organ function that those changes were easily studied and were often of such duration that they could be definitively characterized and one could readily validate therapeutic interventions.

While in the Army I had written Dr. Child, who had moved to take the chair of surgery at the University of Michigan, seeking to complete my residency under his direction. Dr. Child informed me that since his predecessor, Dr. Fred Collier, had taken on many more residents than allowed by the Board of Surgery, I would have to restart residency as an intern if I wished to complete my residency at Michigan. Even though I considered Dr. Child to be a great

surgeon and superb role model, the prospect of being an intern and then a first-year resident again was too daunting and I returned to the Boston City Hospital.

Unfortunately Dr. Childs' replacement was but a pale shadow of his predecessor. In light of that and because I had such a good experience at the Army Burn Center, which I considered to have been intellectually stimulating, I called the Army and asked them if I came back and finished my residency at the Brooke Army Medical Center in San Antonio, could I be reassigned to the Burn Center for a duty assignment when I completed my residency. The Army agreed to that plan, which charted my professional life for the next 33 years.

LUCHETTE

You mentioned a couple of names in there that were mentors, but were there any other mentors that helped you throughout your career as you look back?

PRUITT

There were several beginning with Gardner Child, the chairman of surgery at Tufts University School of Medicine and surgeon-in-chief of the Tufts Surgical Service at the Boston City Hospital where I began my residency. During my residency, Dr. Arthur Donovan, who was an assistant professor of surgery and Dr. Child's right hand man at the Boston City Hospital (ultimately chairman of surgery at the University of Southern California), introduced me to the delights of laboratory research, served as an academic surgeon role model, and has since then provided me with wise counsel and sage advice. As you know I completed my residency at Brooke Army Medical Center where Colonel Edward Vogel, who was the chief of surgery, tutored me on the unique aspects of military surgery and gave me an abundance of good advice about a career as a military surgeon. After completing my residency, I was reassigned to the Institute of Surgical Research where Colonel Jack Moncrief and Dr. Curtis Artz became my burn surgeon mentors. Colonel Moncrief furthered my academic progress by volunteering me to author a two-issue review of burn care for *Current Problems in Surgery* which was well received by the surgical community.

Others who in various ways have provided support and furthered my surgical career have included Francis D. Moore, Ben Eiseman, Sam Wells and George Sheldon. In the military surgical community, supporters have included General Leonard Heaton, General Thomas Whelan, General Richard Taylor, General Hal Jennings, General Kenneth Orr and the commanding generals of the Army Medical Research and Development Command.

Particularly important to my career was Frannie Moore's advice to take a one-year assignment as chief of surgery at an evacuation hospital in Vietnam rather than take a three-year assignment as the chief of a burn holding unit in Japan, which he felt would be "the death of my academic career." Prompted by that advice I took an assignment as chief of surgery at the 12th Evacuation Hospital in Cu Chi, Vietnam. That assignment at the busiest evacuation hospital in Vietnam firmly established my credentials as a military trauma surgeon and secured my assignment as commander and director of the U.S. Army Institute of Surgical Research upon my return to the U.S., a position which I held for the subsequent 27 years. Lastly

throughout my career Dr. Harry Soroff, who as noted above first recommended that I seek assignment at the Army Burn Center when I was about to be drafted, and Dr. Arthur D. Mason (senior scientist at the Burn Center) provided strong support and sound advice that enhanced my research efficiency and productivity.

LUCHETTE

How did your peers and your colleagues view your decision to go into burns and trauma back then, at a time when there were a lot of specialties beginning to be established?

PRUITT

In the mid-sixties, aside from the Maryland Institute of Emergency Medical Services, there were few trauma centers as such, but there were established burn centers at the Brooke Army Hospital in San Antonio, Cook County Hospital in Chicago, and the Medical College of Virginia in Richmond. The first Shriners of North America Burn Center opened in Galveston in the early 1960s, and since then three others have been established in Boston, Cincinnati, and Sacramento. In addition to those few centers, there were burn or trauma services at the Massachusetts General Hospital, Grady Hospital, Charity Hospital, and Parkland Hospital among others.

There wasn't a trauma or burn or even surgical oncology specialty as such at that time. A general surgeon could establish a presence in an area of special interest and by experience become expert in that field. He was then considered to be a "specialist" in that area of general surgery and recognized as having special capability as a trauma surgeon, burn surgeon or a cancer surgeon. Consequently, it was accepted without raised eyebrows that I was intending to be a general surgeon with a special interest in burn and trauma care and that career path was fully compatible with being a military surgeon. Even so it was unusual, actually unprecedented, to return to active duty in the Army Medical Corps to be a full-time burn surgeon. Any dismay about a career in burn surgery was perhaps, in part, due to the fact that in those days when you walked into the hospital you could locate the burn service by the odors emanating from the infected burn wounds. Of course modern burn care has eliminated that "aroma" and the burn center smells just like any other ward or floor in the hospital.

LUCHETTE

As you started early in your career, and the specialties like vascular surgery, pediatric surgery and cardiothoracic surgery were viewed as the place to be, how did your colleagues view your decision to commit your career to burns and trauma?

PRUITT

At that time there were relatively few of those "super specialists" and they were fully occupied with what were termed "index cases," with general surgeons doing less complex thoracic and pediatric cases, which maintained a broad scope of practice for the general surgeon with a special interest in trauma. As specialization intensified and proliferated, the general surgeon's

scope of practice narrowed, but the development of burn and trauma centers enabled the burn and trauma surgeons to maintain adequate operative practice. In fact the surgeons at burn and trauma centers were well respected because of the volume of their operative experience and their research activities, which were recognized as the means by which care was improved.

The operative experience of trauma surgeons was subsequently diminished by the progressive increase in non-operative management of a variety of injuries in trauma patients. The development of closed intensive care units, directed by internists and anesthesiologists, led directly to the development of the certificate of added qualifications in surgical critical care. Historically, new specialties were defined by technological advances, e.g. cardiothoracic surgery, or development of a special body of knowledge, e.g. transplantation. But now we have specialties defined by the location of the patient, i.e. emergency medicine and critical care. There is not a unique body of knowledge associated with either of those specialties in the traditional sense. In the case of added qualifications in surgical critical care, as noted previously, this certification was developed to maintain the general surgeons' access to the ICU where they could deliver non-operative care to their patients.

LUCHETTE

What are the two or three contributions you are most proud of and actually influenced the field of burn surgery and trauma?

PRUITT

Well, development of topical antimicrobial chemotherapy to prevent invasive burn wound infection was a major step forward in burn care. I was a participant in the development of Sulfamylon® burn cream at the Army Burn Center, a project directed by Dr. John Moncrief. As a staff surgeon at that time, I was involved in the clinical introduction of Sulfamylon® burn cream. Not only did that topical agent reduce the incidence of invasive burn wound sepsis as an autopsy cause of death, but by controlling the microbial density in the burn wound, it permitted burn wound excision to be carried out with less risk of inducing intraoperative endotoxemia.

When Dr. Bruce McMillan, who became the first surgeon-in-chief of the Cincinnati Shriners Burn Center, was at the Army Burn Center with Dr. Artz, he evaluated burn wound excision in a small group of patients. The survival of those patients—as I recall there were less than 20—was just what one would anticipate based on age and burn size without excision, i.e. excision conferred no benefit. The troublesome fact was that sometimes when a burn patient had invasive infection, excision was performed in desperation to remove the infected tissue, and some of those patients would develop systemic endotoxemia, have difficulty recovering from the anesthesia, and very shortly afterwards die. With control of the microbial density in the burn wound, by use of antimicrobial chemotherapy, one could excise the eschars in a scheduled manner and not induce endotoxemia. In fact the combination of topical chemotherapy and early excision reduced the incidence of invasive burn wound infection as the cause of death from 60% to 6% in burn patients who expired.

Before touching on the other contributions that deserve mention, I want to emphasize that these aren't personal accomplishments of any one person but the result of teamwork involving a succession of bright young surgeons, physicians and other scientists. In those days many of the leaders of American surgery would call seeking an assignment at the Burn Center for a bright, young resident interested in an academic career. Doug Wilmore, Bill Curreri, James Long, and Cleon Goodwin were referred by Jonathan Rhoads; Jerry Shuck, Wes Alexander, and John Hunt by Bill Altemeier; Andrew Munster and Gary Welch by Frannie Moore; Bob Flemma and David Herndon by David Sabiston; Joe Moylan by John Schilling; Bill McManus by Merle Musselman; and Bill Cioffi by John Davis. There were also a few U.S. Army surgeons and military surgeons from other countries such as Carl Tidemann, who later became the surgeon general of the Norwegian Armed Forces, who sought an assignment at the Burn Center and participated in the research program. Lastly there were numerous civilian surgeons from other countries such as the many who came from the University of Osaka's Department of Acute Care Medicine. All of those physicians and our laboratory scientists comprised a multidisciplinary critical intellectual mass that conducted a program of integrated clinical and laboratory research to address clinically important problems in burn patients and develop solutions to those problems.

Fluid resuscitation was improved after it was recognized that success in preventing early post-burn renal failure had led to excessive fluid resuscitation and its associated complications. The goal of resuscitation became "infusion of the least volume of crystalloid fluid" (colloid-containing fluids were reserved until there was some evidence of restoration of capillary integrity) needed to maintain vital organ function. Resuscitation guided by that goal decreased the incidence of compartment syndromes and pulmonary compromise.

With the control of invasive burn wound infection it became apparent that inhalation injury was the most important comorbid factor in burn patients. Evaluations of diagnostic modalities identified fiberoptic bronchoscopy as the most useful means of identifying the presence of inhalation injury. Other studies revealed that inhalation injury resulted in intrapulmonary mismatching of airflow and blood flow and paved the way to the use of high frequency interrupted flow positive pressure ventilation to decrease the occurrence of pneumonia and reduce the comorbid effects of inhalation injury.

The fourth major contribution resulted from the program of metabolic studies conducted by Curreri, Wilmore, Mason, Long, Aulick, Herndon, Becker, Vaughan, McDougal, Cioffi and others. Those investigations revealed that the burn patient was internally warm, not externally cold as previously believed, and identified the neuro-hormonal changes that orchestrated post-burn hyper-metabolism revolutionized metabolic support regimens. The information generated led to the development of multifaceted nutritional and metabolic support regimens that minimize erosion of lean body mass and accelerate convalescence.

In addition to those four major advances, other studies documented the effectiveness of biologic dressings for temporary coverage of excised burn wounds, the effects of burn injury on the coagulation system, and changes in the cellular and humoral components of the immune system induced by burn injury. The pathogenesis of stress ulcers in burn patients was

described and effective prophylaxis identified. Still other studies revealed that a bilaminate construction with both dermal and epidermal analogues was necessary for optimum function of a skin substitute. Improvement in burn patient outcomes resulting from all of these advances has been documented by changes in burn center- specific predicting equations.

As an aside, many if not most of the pathophysiologic changes that occur in burn patients also occur in mechanical trauma patients. To my mind that makes the burn patient the universal trauma model and, indeed, many of the improvements in burn patient management have benefitted other trauma patients.

It was a great experience to be the commander and director of the Army Burn Center during that time of investigative ferment that expanded our knowledge of the pathophysiology of severe injury and improved the outcomes of the critically injured burn patient. In the mid-1950s, a young adult, age 16 to 40, with a 43% total body surface area burn, had a 50/50 chance of living or dying. Right now a patient in that same age group with a 75% burn has a 50/50 chance of living or dying-that is a statistically significant improvement.

The other thing that I am particularly pleased with is the success of the surgeons with whom I had the privilege to work at the Burn Center. An impressive number have become chairs of departments of surgery, pediatric surgery, urology, plastic surgery or anesthesia. Others have become directors of other burn centers. Alumni who have become chairs of surgery departments include Jerry Shuck, Bill Curreri, Joe Moylan, Doug Wilmore, Jim O'Neill and Bill Cioffi. Another example of alumnus success is David Herndon, who came to the Burn Center from the Duke surgical residency, finished his residency at New York Hospital and directed that hospital's burn center until he became surgeon-in-chief of the Shriners Burn Center in Galveston, where he has been an impressively productive surgical clinician and investigator. Those individuals have all amplified the success of the U.S. Army Institute of Surgical Research as an incubator of academic surgeons.

LUCHETTE

As you look back on your career, are there any one or two things that at one time you were passionate about and now you have the advantage of the retrospectroscope and say, "Boy, that was really not the right thing for improving patient care?"

PRUITT

Well, I can't recall anything that we passionately championed that has been or should be withdrawn. We looked at aerosolizing antibiotics in patients with inhalation injury, which seemed to be a possible way to reduce the occurrence of pneumonia, but that came to nothing. That sort of study could be viewed as a false start, but it actually prevented such treatment from being adopted as a standard of care. In similar fashion, our studies of cultured keratinocytes identified their limitations and tempered clinical enthusiasm for their use.

Early on we evaluated freezing of the stomach for massive and/or persistent stress ulcer bleeding as advocated by University of Minnesota investigators. It was not effective in our hands so we continued to advocate early operative intervention instead. In the past, I treated

a few patients who had profound alkalosis with intravenous hydrochloric acid. That treatment was tough on the veins that were used but it did correct the alkalosis. Even so it was never advocated as a standard treatment.

Contrary to advocating a treatment or technique that had to be withdrawn or abandoned, my clinical experience with synthetic monolayer skin substitutes was so unsatisfactory that we took the problem to the laboratory. In the lab we demonstrated that for effective function the membrane had to be bi-laminate in structure to actually simulate skin with a dermal analog and an epidermal analog. The results of those studies defined many of the criteria that guided the subsequent construction and development by others of membranes such as Bio-brane® and Integra®.

LUCHETTE

What you feel are the top two or three advances in burn care throughout your career?

PRUITT

Well, we've already mentioned the revolutionary change in terms of effective topical antimicrobial chemotherapy combined with burn wound excision.

The second one would be the capability of diagnosing inhalation injury and treating the patient with high-frequency positive pressure ventilation to reduce the occurrence of pneumonia and increase survival.

The third, in terms of not just burns but all surgical patients, would be the identification and characterization of post-injury hyper-metabolism and the development of programs of metabolic support. We were early investigators in the field of parenteral nutrition and of feeding through surgery using the GI tract.

Those would be the three most important burn specific advances: topical therapy and excision, inhalation injury, and the characterization of hyper-metabolism with development of means to preserve lean body mass and accelerate convalescence.

LUCHETTE

What were the major changes during your career in practice patterns?

PRUITT

Well, I think recognition of the complexity and intensity of the pathophysiologic changes that occur in patients with burns of more than 25% or 30% of the total body surface and the regionalization of burn care in a hierarchical system. Today it's common for a local hospital to refer burn patients to a regional facility capable of doing a little bit more and then ultimately directing the larger burns, defined by the American Burn Association as those patients benefiting from center care, to a burn center. I think that burn care in the United States was the first example of regionalized hierarchical organization of surgical care, which is now being emulated by the trauma care system.

LUCHETTE

At the end of the day, what brings you the greatest joy as you look back over your half century career as both a military and academic surgeon?

PRUITT

My greatest satisfaction is the fact that one can document that what we've done in the field of burn care has benefited innumerable patients. First of all, many more severely burned patients survive, as documented by a significant increase in the LA₅₀ for burn patients and well-illustrated by the use of three-dimensional graphics. Additionally many more of the survivors resume their lives as functioning members of society.

Another great joy is the success of those with whom I have worked. I have always viewed such departures as recognition of the individual's accomplishments and also recognition of the leadership and environment of the Institute of Surgical Research which made that individual a productive investigator. In short their career advancement actually magnifies and does not diminish the reputation of the Institute, which may also receive some credit for future productivity of that individual. Consequently, I relish the success of everyone with whom I have worked to advance the field of burn and trauma care.

LUCHETTE

As you look back over the 50 years of your career, and you've watched health care and burn care evolve, what keeps you up at night? What makes you worried about the future of American medicine?

PRUITT

Well, the fact that everything is so compartmentalized now is very troublesome. There are so many specialists who don't want to take night call that there are now surgical hospitalists who may have a shiftwork approach and little sense of patient "ownership." I am also troubled by what I perceive as a marginalization of physicians.

Others have written about this, and several years ago there was a graph in a letter to the editor of the *New England Journal of Medicine* predicated that, in this decade, administrators would outnumber patients in U.S. hospitals. That hasn't happened yet but it may be only a matter of time. The way in which administrators amplify their position is to have more clerical people to supervise. They do that by designing forms for doctors to fill out so they need more clerks to analyze these forms. The doctors are kept from patient care, i.e., marginalized by having to fill out the forms. The administrators then hire less expensive caregivers to fill in for the doctors who are busy filling out the forms. The administrators are further aggrandized with salary increases based on their activities to evaluate and analyze the data generated by the forms they designed and savings generated by hiring the non-physician caregivers rather than physicians. That may sound fanciful and simplistic but I really think it's not too far from the truth.

It is also a concern that health care was supposed to get cheaper with all the HMOs,

PPOs and preapproval for operations and diagnostic procedures, but I fear that not a penny has been saved. Those changes have just allowed the group of people to whom the profits flow to change from the physicians to the MBAs in hospitals, hospital corporations and health insurance companies. We have let MBAs take over what used to be a cottage industry and turn it into a cash cow for the administrators.

LUCHETTE

What are your words of wisdom for young surgeons entering a career in trauma, acute care surgery and burn surgery? What would you tell them to do in their lives outside the hospital?

PRUITT

I think each young surgeon should find something that is not directly related to medicine and develop a special interest in that topic. My wife, Molly, and I collect modern Japanese art. The walls of our home are filled with artwork we have acquired on many visits to Japan. We were just in Japan a few weeks ago and acquired additional works so we are going to have to take some of those on the wall down to find room for the new. That may make us like a museum in which works are displayed on a rotational basis. In essence, it is good to have an interest outside of medicine which one enjoys and in which one can develop some expertise. An athletic interest can also be enjoyable. There was a time before my recent back surgery when I enjoyed skiing. Our entire family likes to ski, so ski trips at Christmas and Spring Break provided an eagerly anticipated change of pace.

In terms of advice for someone entering a career in trauma surgery, acute care surgery, and burn surgery, I think that if they're going to narrow their general surgery to those areas and not have a practice including hepato-biliary, surgical oncology, or endocrine surgery, it pretty much defines a hospital-based if not an academic practice. Within that scope of practice, I think you need to pick some subtopic, like resuscitation, coagulopathy, or pulmonary dysfunction, focus on that as a topic about which you develop expertise, and carry out either clinical, or laboratory, or an integrated program of laboratory and clinical research. You will thereby develop expertise in that area which will give you stature as an authority on that topic and support your academic advancement.

That expertise will open up opportunities to lecture at national meetings and to be a visiting professor, which will lead to regional and even national and international recognition. I think that's a pathway to a satisfying, effective academic career in any aspect of surgery.

If you're contemplating an academic career, it is important when picking something that interests you that it also be of clinical importance. You should then concentrate your investigative activities, and as much as possible your clinical activities, on that topic to develop expertise and recognition as an authoritative voice in that particular aspect of surgery.

LUCHETTE

What do you perceive are the challenges and opportunities for the future of the acute care surgery model?

PRUITT

Well, I think that it has a bright future. One could be a little cynical and ask how does acute care surgery differ from what we used to call general surgery? But today, there is a lot of emphasis on disease-specific or organ-specific centers of excellence. For example a center of excellence for gastrointestinal disease will have GI surgeons working with gastroenterologists as well as interventional radiologists.

The Acute Care Surgery Center of Excellence will house the trauma and burn centers and have the necessary facilities to provide care for a wide variety of acute care surgery problems. That will include patients with acute GI and other problems which because of their acute nature would disrupt the elective schedule of the specialists who would ordinarily care for patients with such problems.

In a sense, acute care surgery is a hospital-based practice that deals with acute surgical problems on a 24/7 basis. Since the disinterest of the elective specialist surgeons seems to increase after 5:00 p.m., the acute care surgeons have been called the “master surgeon of the night” and the label “nocturnist” has been applied by some. I will predict that acute care surgery is going to become even more prominent as more surgeons complete the acute care surgery fellowships that are being developed and verified by the AAST.

As elective surgery is increasingly concentrated at disease-specific centers of excellence, there will be more patients who will initially present to the critical care surgery center just as burn and trauma patients now present at burn and trauma centers, respectively. Other acute care surgeons with expertise in trauma may fill the void in rural surgical care. The acute care surgeon who has completed a fellowship which included experience with external fixation of fractures, placement of burr holes, and even craniectomies, would answer a need in the rural areas of the United States.

On the other hand, there may be challenges if it is perceived that the title of “acute care surgeon” defines a surgeon who is deemed to be lesser than a surgeon at other disease-specific centers. Also, it may be a hard sell to get the acute care surgeon who is “allowed” to do GI surgery at night to accept daytime restrictions on his/her practice.

LUCHETTE

What changes, if you could sit in front of a crystal ball and look 20 years into the future, what do you think practices in trauma, burn surgery, and acute care surgery will look like?

PRUITT

Oh, I think that it will be more and more regionalized, but at the same time the Level II centers will increase in capability as people are trained to a higher degree and as the tertiary centers focus on that smaller subset of patients who have pervasive, extensive, and intense pathophysiologic changes that are best addressed at the tertiary center, where all the resources and all the investigative activity that will lead to improved care can be carried out.

LUCHETTE

As you look back over your career is there anything that you would change regarding your professional career?

PRUITT

Well, you know, you always wonder, could you have done more doing something else? I was tempted two or three times to accept appointment as a chair of surgery, but ultimately resisted those opportunities. We had such an effective program of integrated clinical and laboratory research going on at the Institute of Surgical Research with adequate, dependable funding and a steady supply of patients with large burns causing pansystemic effects which generated problems of clinical importance that I made the choice to remain here in San Antonio each time.

It's been very satisfying to have done what we accomplished at the Institute of Surgical Research, but, there is always the question, "Could you have done more, had a bigger influence on more young surgeons as a chair?" And of course I will never know that.

LUCHETTE

It's hard to imagine that you could have made more contributions as a chair than you have. You have touched on just about everybody's career that's related to trauma and burns.

PRUITT

Well, that's, of course, a great satisfaction and it's very kind of you to say that. What we did at the Institute of Surgical Research here in San Antonio has materially benefited literally thousands of patients and advanced our understanding of the pathophysiologic response to severe injury.

LUCHETTE

Is there anything you would change in your personal life outside the hospital?

PRUITT

I might have skied more and spent more time with the family, but I can't think of anything else. My wife, Molly, has had a very active career in educational administration. She was an elected member of our school board for 24 years, and when she retired they named a combined City of San Antonio/Public School Library for her. As you know, our older son, Scott, is a surgeon on the faculty at Duke; and Jeff, our younger son, is a radiologist at Parkland Hospital in Dallas. I tease our daughter, Laura, who is a lawyer, by accusing her of "having gone over to the dark side." She doesn't sue doctors and is a securities lawyer in Washington, D.C. She has been quoted by the *Wall Street Journal*, so she must be doing well in her field.

LUCHETTE

Your career spans 50 years and you don't seem to be slowing down. What are you going to do for the next 5–10 years, both personally as well as academically?

PRUITT

Well, my almost 18-year tenure as the editor of the *Journal of Trauma*, which certainly kept me on my toes, has now ended. I hasten to assure you that as editor emeritus, I still read the *Journal*. I am still presenting invited lectures and still writing papers and chapters. Richard Gamelli and I did a chapter for L.D. Britt's new book on acute care surgery just this last year. I remain half-time at the medical school and I go back to the burn center one day a week, for which they pay the medical school. That arrangement makes me really "cheap help" which the Department of Surgery at the medical school greatly appreciates. I plan to slowly decrease the intensity of certain of these activities but will try to keep informed and keep out of the younger guys' way.

I do believe that if you try to orchestrate things for which others have responsibility or if you resist change, you may be quickly viewed as an obstacle rather than a helpful source of informed counsel. So I am very careful not to infringe on anyone else's prerogatives. I think that it serves the occupant of an emeritus position best not to become a roadblock but to give reasoned advice when consulted.

LUCHETTE

Are there any other comments you want to make for the readership that we haven't touched on in our discussion?

PRUITT

I think that the AAST has been a very vital organization. By vital, I mean it has adapted to changes in the organization of trauma care and has accepted evidence-based changes of medical practice. Moreover, its members have provided evidence that has improved medical and surgical care.

In 1991, the AAST established a Critical Care Committee to give a greater voice to those trauma surgeons with a primary focus on the ICU, and in 1995 "critical care" appeared in the title of the new front cover of the *Journal of Trauma*. Recently the AAST has assumed the leadership role in defining acute care surgery, developing the fellowship curriculum, and verifying fellowship programs. So I think that acute care surgery is going to be a successful means of addressing existing needs in the health care system that will further amplify the American Association for the Surgery of Trauma.

The first AAST meeting I attended was in 1963 and a story about that meeting will illustrate how clinical research has changed over the past half century. At that time, Dr. Moncrief said we're going to have lunch with Carl Moyer, chief of surgery at Washington University. We went to lunch at the Jack Tar Hotel in San Francisco.

The first thing Dr. Moyer said was, "Well, we're going to start this lunch with a double martini." I almost fell out of my chair. I didn't particularly care for martinis. Dr. Moyer then outlined the first fluid resuscitation study that I was going to do with volunteers by bleeding them either 10% or 20% of their blood volume and either let them spontaneously refill or give them Lactated Ringer's according to a formula Dr. Moyer had developed. I obtained all

the necessary approvals and recruited the requisite number of volunteers. I bled those young volunteers and followed the blood volumes in those who received no intravenous resuscitation fluid and those who received Lactated Ringer's given according to Dr. Moyer's formula. The results of that study were the basis of a paper that I presented before the National Research Council and published in 1967 and literally launched my academic career. The way in which trauma research is organized, conducted, and presented has become much more formal and regimented since those days, but perhaps is less innovative and spontaneous.

After that introduction to the AAST, I became a member in 1966 at which time the membership was limited to 250 individuals. I was really proud to be one of the 250 trauma surgeons recognized by their peers.

Thereafter I became the recorder and in due time, John Davis designated me an associate editor of the *Journal of Trauma*. After serving as the recorder, I was elected president of the AAST in 1989. In 1994 I was chosen to be John's successor when he retired. I assumed the editor's responsibility in May 1994 and became editor of the *Journal of Trauma* in January 1995. What I was able to do during my almost 18-year tenure as the editor of the *Journal of Trauma* has been another major satisfaction of my professional life. The *Journal of Trauma's* publication reach, both electronic and hard copy, the royalty that provides important support for AAST fellowships, the editorial page allowance, and the impact factor have all increased.

Clearly, much of my professional and academic success has been intimately related to the AAST. I would encourage all young trauma surgeons to be active participants in AAST activities by presenting papers at the annual meeting and most importantly, by serving on one or more of the association's committees.



GEORGE F. SHELDON, MD
PRESIDENT 1983–1984

DR. DAVID H. LIVINGSTON

Dr. Sheldon, thank you very much for taking the time to do this interview. The past presidents are really giants in American surgery and in trauma care and often viewed by junior faculty and residents mythical iconic creatures. These informal interviews are about how you got into trauma, some of the things about your career and history of AAST.

DR. GEORGE F. SHELDON

I was a really transitional figure in the AAST in about 1973 or '74. The organization was almost ready to collapse. The original bylaws, if you ever had a chance to look at them, were modeled after the American Surgical Association. What that really meant was that it restricted the membership to 250 members a year and these were mainly senior academicians. At the first meetings I went to, most of the discussions on the papers were about World War II with a few about Korea.

The other thing happening at the time was there was little bit of tension with the American College of Surgeons Committee on Trauma (ACS - COT) because the AAST was “supposedly more academic.” Well, it was.

The real issue during that time-period was that trauma and trauma care was literally exploding. The Vietnam War was in still in full swing. The cities were on fire. I did 40 penetrating injuries to the abdomen in one weekend in San Francisco in that time.

At that time we explored all of it until after a while we got to where we would observe

some. The point being the organization (AAST) had been under John Boswick who was secretary for 12 or 13 years. It was run out of his office and there was a lot of discontent. A group of us met at the Homestead that year, many in fact who would later rise to presidency in the organization. There was Frank Lewis, Don Trunkey, Don Gann, and a couple of other people whose names would also be well known. We talked about starting another organization, feeling that the AAST was not one that we could mature into a specialty.

The longer we talked and discussed things, we decided that since the AAST had a journal, a better and more constructive path was to access membership and try to change it from within. That started to happen and a couple of years later—the exact year I don’t remember—the bylaws were completely re-written by John Davis, Bill Blaisdell and a couple of other people at a meeting in Washington. That created a huge change in the organization. A big one was the limitation on the number of years you could be in offices. I was elected the first secretary under this arrangement. The length of time for a secretary was three years. When I finished my three years they asked me if I would stay on for another two and I said no. I was very immunized to that. They really, really tried very hard to try to get me to do a full five years but that wasn’t the way the new bylaws were written. Again, I said, “No, I can’t do it.” So instead they made me president!

That they did but we all believe the organization was basically saved. During my time as secretary, Dr. Leonard Peltier—and this is getting down to your mentor question—was president. He had actually been my thesis advisor in medical school at Kansas and was now head of orthopedics at Arizona. He was a very creative thinking person, and between us we expanded the membership. Tommy Thompson had breakfast at my house in California. We kind of mended the fences with the COT because many of us wound up serving with that anyway and opened the membership up.

We also did something that I think is very important. We changed the definition of “corresponding fellow” so that we could open the membership up internationally, which has really had a lot to do with I think how successful and how global the organization has become in the last 15 years. It was fun to be part of it because it was such an obvious thing to do.

The funny thing about this was I was the first member of our county group (San Francisco General) to be a member of the AAST. The organization wasn’t even regarded well enough or active in trauma at the time; not like our front-line, hands-on, center in San Francisco. There also was an older rule that a member could only nominate one person a year. So the first person I nominated was Bill [Blaisdell] and pretty soon everybody was involved in it. Out of our group at the time in San Francisco, Bill and I and Don Trunkey and Frank Lewis have all been presidents.

LIVINGSTON

How did you decide to get into trauma surgery?

SHELDON

Well, I grew up in a small Kansas town. My father was a surgeon. When World War II began, I

was seven years old and in fact we were going to the hospital the morning we heard the bombing of Pearl Harbor announced over the radio. I used to hold people for my father. Sometimes I even gave a little bit of drip anesthesia in the emergency room for fractures or something.

I went to medical school at Kansas [University of Kansas, KU] and I always wanted to do surgery but I had kind of a circuitous route. Medicine was very powerful at Kansas.

But Dr. Mahlon Delp was a great mentor of mine. He had actually driven out to the middle of Kansas to see my father. He was the chairman of medicine at KU at the time. He was a real hands-on doctor who was a great role model.

Another great role model was Dr. Paul Schloerb who still is a member and still comes to the AAST meetings. And Paul was a Frannie Moore trainee in 1947 who did a lot of the original heavy water type of isotope metabolic compartments with Frannie. I already mentioned Leonard Peltier who was head of orthopedics at Kansas. I was going to go into medicine at KU and had actually been accepted into a residency there.

Then all of a sudden an event happened which was the Berlin Wall went up. I've actually got a little piece of the Berlin Wall in my office. While that might not raise any hackles now, when it went up we all got drafted. National emergency call, people called back from leaves. World War III was expected, etc. What happened was everybody tried to see if you were set up to go into the service. I was in intern at the time and interns didn't fare very well in the assignments so I went to our head of public health. The long and short of it is I applied for and got an appointment in the Commission Corps of the Public Health Service, which at that time had 16 hospitals.

I was in Galveston, Texas. The Commissioned Corps of the Public Health Service is the medical corps of the Coast Guard. So I was in the Coast Guard for two years. When I got out I had decided I wanted to do surgery because at the little hospital where I was in Galveston—it's closed now along with all the rest of the marine hospitals—the head of surgery was such a butthead that nobody wanted to be on the service. So being low man, it fell to me and I had two years of surgery in the service. I was accepted in a couple of residencies, including Mike DeBakey's, but I wanted to go work with Burt Dunphy. Well, Burt Dunphy turned me down, he was at Oregon at the time.

The reason he turned down—at least what he always told me—was because he was moving to California that year as chairman. So I was just getting out of the service and without a residency, so I went to Mayo and took another year of internal medicine making me board eligible in internal medicine. I've had four years because my service time counted. I never realized it, since in the interim Burt Dunphy's office called and offered me a job. I never even had an interview and I thought he must realize that I'm going to be pretty good. He had a 32 to 6 pyramid and wasn't taking any chances on anybody. Burt was very good to me. They let me have off a year of training and I finished in four years.

Of course that's where I met Bill Blaisdell, another one of my great mentors and trauma was just revving up like crazy out there. I did five emergency room thoracotomies when everybody was doing closed chest massage, all with survival.

Brent Eastman, the current president of the American College of Surgeons, was one of

my chief residents. Brent and I had a horrendous case we did that we actually published in the *Reader's Digest*, which is not your usual venue.

Dunphy was furious. You know that was at the time when doctors weren't supposed to let their names be out in public. Blaisdell pushed us to do that because we were trying to establish trauma and specifically San Francisco General as a city hospital as a viable entity. Medicare had come in and it wasn't clear if those hospitals were going to close. In fact, a lot of them did in California and other places.

LIVINGSTON

At the time you decided to go into trauma, were there any negative comments such as, "You're going into what?"

SHELDON

There was some of that. Trauma was still usually associated with a dirty county hospital, you know. But it was changing very quickly. Tom Shires was out all the time. Afterwards I went back and studied with Frannie Moore for two years and it was kind of a new field.

I came back to San Francisco after that and we had one of the first program project grants which Bill was the PI and I was a co-PI. Then we got one of the first NRSA [National Research Service Award] fellowships, one of the first 18 out there, just in trauma. We had a great, great bunch of colleagues out there that we all, we competed but we got along real well. If you had to be away, you could sign out to a colleague and knew they were going to get the same type of care you would have given.

LIVINGSTON

What do think was the best career or life advice you received?

SHELDON

I think one of them was not to be a dean.

I had a couple of chances to do that and I just finally accepted the advice of one of my heroes, Chancellor Murphy. Dr. Murphy was chancellor at Kansas and he turned down being HHS secretary with the answer, "I don't think I'd be very good at it." I had very good advice over my career.

I credit all the people, and the catalogue of mentors is much longer than the ones I have already mentioned. I think anybody that has an opportunity to participate and be successful in organizations receives a lot of help and I certainly had a lot. People like Basil Pruitt, John Davis—the list goes on. Basil appointed me to the first national committee that I was ever on.

LIVINGSTON

What is some of the worst advice that you ever got?

SHELDON

To go into pediatrics. I keep giving you stories, but the dean at KU Medical School was a pediatrician and he also was our family's pediatrician. He wanted me to be a pediatrician. He thought surgery was a horrible thing to do. Fast forward, when I came to North Carolina he was actually head of child programs for the school of public health here. We reunited.

He also always wanted me to be a medical historian so when I wrote my most recent book in medical history I sent him a copy of it. I told him, "I finally got there."

Seriously, I don't think I ever had real bad advice. I had people that offered opinions. When people ask for advice my answer is always, "It's worth what you pay for it. You need to factor it in to your overall decision making."

LIVINGSTON

With respect to your myriad of scientific contributions, what are you most proud of and how do you think it influenced trauma care?

SHELDON

I think we were the first group in Boston who described the low phosphate syndrome with hyperalimentation and its effect on the Embden-Meyerhof pathway. Because of that people thought I knew something about nutrition, and when I got to California I got referrals of every fistula on the West Coast.

In the lab we started working with people in Berkley and we developed this model of enteral versus parenteral feeding's effect on the immune function and we showed that the gut is an immune organ. Ken Kudsk, who is vice chairman at Wisconsin now, was a second-year research fellow from Bobby Zollinger's place who worked with me and we published about 30 papers together.

What was just remarkable was that rats will drink hyperalimentation solution almost exactly to the amount that you would give them by calculating body needs. It turned out if you hyperalimentated a rat they lost their immune function. If you let them drink the stuff by mouth, they retained it. It took a bit longer to prove that in humans but the same things seems to be coming out from some of Ken's clinical trials.

The other thing, while not as thoughtful, was to define the level category for retro-peritoneal hematoma, I, II and III, which was published in one of the first textbooks of trauma.

LIVINGSTON

During your career there have been many changes in trauma care, some you already mentioned. What do you think the top two or three changes are?

SHELDON

One of the two top hardest things that I was involved in, I didn't lead but I was just involved, was the trauma verification program of the College. While it seems obvious now, that had a

tough time getting through the board of regents. I was the secretary of the board of governors at the time and also on the ACS - COT so had a “foot in both camps,” if you will.

The other was ATLS, which was thought to be too simplistic. My presidential address to the AAST was on the need for education. Previously Red Cross-type basic care wasn’t even taught in medical schools. It really wasn’t. That was changing at the time that I did my paper. It all just seems so ludicrous now but do you know Deke Farrington?

Deke Farrington was a president of the AAST. He’s been dead a long time now. Deke was one of the real pioneers who came back from I guess the Korean War, maybe it was World War II, and started working in Wisconsin. He looked like Colonel Sanders—white haired, goatee, beard. Deke was the one that did a study showing that mortuary ambulances were conveying trauma patients at the time and so the title “Death in a Ditch” was one of his articles. The Institute of Medicine picked up on that and had the first of the series of updates on EMS in 1966, and “Death in a Ditch” was the subtitle of the first one.

LIVINGSTON

What aspect of your very varied career have you found most rewarding? What gives you the most joy in your career?

SHELDON

Well, I’ve enjoyed working with organizations and trying to make them more useful. I had a lot of opportunities to do that. And I’ve enjoyed all the people I’ve had a chance to work with as much as anything.

I’ve actually enjoyed being a department chairman. People complain, “Gee, all the administration”—yes, but that means you get to set things up the way you think they ought to be.

I think I’ve enjoyed just about all of it. I don’t have many downsides that I think of. The patient care, the research, working with young people, all this has been a lot of fun all the way through.

LIVINGSTON

Well, what’s been the greatest challenge?

SHELDON

I think one of the greatest challenges has been beating my head against the federal government over the years. I may have chipped it some. I first testified before Congress on graduate education funding in 1985 and it still hasn’t gotten fixed.

I was a charter member of the Council of Graduate Medical Education when it was started with 17 members. It’s turned into just a white paper for primary care. That’s really been disappointing. While we need primary care doctors, this idea that this somehow will solve our health system’s problem is so naïve.

LIVINGSTON

Any advice you would give to young surgeons on how to balance their life?

SHELDON

Yes, I think spend more time with your family. I think we ought to try to get all of the younger surgeons to do something I started doing many years ago. I would take one of my kids to meetings with me. Especially if we were going to a good place. I took my oldest daughter who is now 53 to a meeting in Montreal when she was a junior in high school. My youngest daughter has been to Japan, Thailand, Korea, and Hong Kong. If you're going to be active in your profession, you will be traveling—by all means take your family if you can. They will never forget it.

LIVINGSTON

What are the current challenges and opportunities for trauma and acute care surgery?

SHELDON

I think it's system-wise. I think the model, which was discussed in my address to the Excelsior Surgical Society two years ago, of trauma center verification can be built upon to regionalize a lot of high end and complex surgery. I think that that's going to be happening more and more. The lesson that was learned pretty early with the trauma verification program was that everybody with a broken finger doesn't need to come to the tertiary trauma center. In fact, if you don't allow the local hospitals and their practitioners to be involved, it creates an exclusive system and will defeat the real purpose of it. I've been to Washington about this and met with Secretary Sebelius once.

I've also tried to get the Commission Corps of the Public Health Service, the old group I was in, to expand its mission and develop a team based on the DMAT programs to where you could have loan forgiveness for your time in medical school and residency. Put two years in the public health service, then be deployed along with the Coast Guard to places like Haiti. During Katrina you could be deployed into New Orleans for a time until the local resources pick up. I hope we can get some traction on that. The number of positions they've funded is about 3,000 but all they talk about is primary care. The idea that you can send a primary care doctor in and that will fix everything is just so incredibly wrong that it doesn't even warrant discussion.

Lastly the split between rural and the under-served parts of the health system is what we've spent some time on in some of our publications. I am going to keep working on this and hope the ACS—Brent Eastman mentioned it in his presidential address—inserts it into the Washington dialogue in 2013, as soon as things settle down after the election.

LIVINGSTON

Predictions are always funny, but what do you think the next decade will bring in trauma care? What big things are on the horizon?

SHELDON

Well, as Yogi Berra and others say, "It's hard to predict, especially the future." But I think that there are a couple of things are on the horizon.

I think there will be more telemedicine. I think there will be a much more blending of the global spread of surgery and of people. We've seen that through the programs the College and the AAST have had with Landstuhl and some in the Afghan War. Something we're doing right now is we actually have a resident rotation to Malawi and we've had one resident spend a whole year there.

I have two things that I'm working on. First, I think the American College of Surgeons needs to have an associate membership, if you would like, that is available to underdeveloped countries.

As editor of *The Portal*, I've given the software, the teaching CDs, to people whenever they go into underdeveloped areas because there is more global access to the internet than they may have locally with a library.

I think globalizing all this and residents getting credit for the time spent is something that's not very far into the future or shouldn't be.

As far as the AAST, while I didn't get to the meetings very often, mainly because I was chairman of the AAMC [Association of American Medical Colleges]. I'm the first surgeon since Samuel Gross in 1879. But the AAST is still my favorite organization. I think that its global role is really something quite unique. It's the only place you can go where you can talk about trauma for 2.5 days.

LIVINGSTON

Would you have made any changes in your professional life?

SHELDON

I'm still a full-time professor. I'm 79 years old now. I still beat most people to work in the mornings but I'm doing a book right now, another biography. I teach a class in medical history that's been quite popular here. I still teach the residents. Actually my office is in the trauma and acute care group so they stick their heads in and ask for advice from time to time.

LIVINGSTON

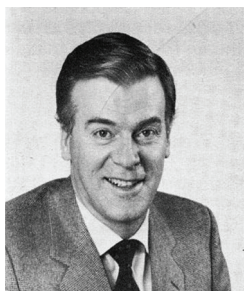
Anything else that we haven't covered, sir, that you would like to mention?

SHELDON

I think that you've given me an opportunity to talk quite a bit here. When you do get to interview Dr. Blaisdell, ask him a little more about the politics of redoing the constitution of the AAST. Especially in light to the 75th anniversary, I think that's a terribly important story.

Editor's note: George Sheldon died on June 14, 2013, having recorded this interview several months earlier. It is the last formal interview of his of which we are aware. Dr. Sheldon was a friend and a mentor to many and made enormous contributions to the field of surgery. He will be greatly missed. We feel fortunate to have captured his reflections on trauma, surgery, and the AAST in these pages.

ROBERT C. MACKERSIE, MD



DAVID S. MULDER, MD
PRESIDENT 1984–1985

DR. FREDERICK A. LUCHETTE

What made you decide to choose a career in surgery and then, secondly, your decision to be involved with trauma surgery?

DR. DAVID S. MULDER

Well, I guess my decision came during a general surgery residency at the Montreal General Hospital. I had never even thought about trauma. It probably wasn't even in existence then as a career choice.

I was recruited to come to Montreal for my residency by Dr. H. Rocke Robertson, who was a post-military surgeon. He served in the Second World War for the Canadian Armed Forces and while he was there became concerned about the care that injured soldiers were receiving. I guess when he wasn't busy patching people up, he wrote a treatise on what I would say is the concept of a Level I, Level II, Level III trauma centers, only as it relates to the military.

His big concern regarding trauma care was that there was one important variable and that was the time from injury to the time of definitive care. At that time they were going through optimal triage in the Army in terms of who saw them, when, where and how they got treated. A lot of his experience came from the combat scene in Italy during World War II. So, he had been newly appointed to the chair of surgery and he was changing the Montreal General from a community or a cottage hospital to an academic center at McGill. He recruited

people from all the medical schools in Canada and there were 18 of us started as junior residents on July 1, 1963. And he was our chairman.

He talked to us all about how he felt that the care of the trauma patient in Quebec was “atrocious” and it needed a system and it needed reorganization. He talked about his military experience and the good care the soldiers received.

That was my first introduction to trauma care and it literally occurred on one of those introductory talks that we’ve all had on the first day of our surgical residency. I was very young and impressionable in those days, and it sort of burned a hole in my brain! It was always at the forefront that we didn’t have a trauma program at Montreal General or in Quebec. The injured patient went to the nearest hospital and then often we got them later on or they never did make it to own hospital.

Much to my absolute dismay, Dr. Robertson got recruited to become principal at McGill University and left the chair of surgery about eight months into my first year. I was devastated, to say the least.

But, fortunately, Fraser N. Gurd took over from Dr. Robertson. His basic science interest was in hemorrhagic shock as it relates to injury or to surgery or anything else. He challenged us all in the research area. At that time there was no career opportunity in trauma, but he encouraged everybody in our program to spend one year in the surgical research lab.

Mine was scheduled to be in the second year of my residency. I started working in the lab looking at hemorrhagic shock. At that time I was clearly wanting to be a cardiothoracic surgeon so I chose to look at the impact of refractory shock on myocardial function. My goal was to see if the role of left atrial bypass would be beneficial. We did all of our experiments on dogs and we produced a lot of necrotizing enteritis in the dog and also hemorrhagic pancreatitis. Therefore, in addition to looking at the impact of it on myocardial function, we got enticed by the bowel injury.

We then began working with a researcher who was in the lab, a student of Fraser Gurd’s (Dr. Gustavo Bounous), on bowel hemorrhage and injury. That really was one of the most productive years and got us interested in the whole picture of shock and critical care.

We returned to the ward after writing a thesis and obtaining a master’s degree in experimental surgery. This year really stimulated my interest in critical care. We had what was then called sort of a roving “shock team” which was the beginning of a surgical intensive care unit. We went to see the sickest patients on all surgical wards. We actually did a cut-down on the radial artery, measured arterial pressure and oxygen saturations and put central lines in. We studied them in a central room which Dr. Gurd organized. It was called the “shock trauma” room.

Although I was doing a general surgical residency, trauma and critical care was always in my background. That experience produced several publications and had a two-fold stimulus in my mind. One was a basic interest in trauma, but the second was the important role of laboratory investigations in elucidating hemorrhagic shock.

I always wanted to have a career in cardiothoracic surgery on the basis of the rest of my experience. I got a residency at the University of Iowa with Dr. J.L. Ehrenhaft, and he was

very interested in thoracic trauma. He'd been heavily influenced by people like Paul Sampson (California), Tom Burford (St. Louis) and Mark Ravage (Baltimore). They served as visiting professors at one time or another. He encouraged me to look at the aspects of trauma care as it affected cardiothoracic surgery. It was a unique experience to be in Iowa. I'm sure you recall the Iowa experience where the university in Iowa City was the state referral center for everybody and they had these incredible vehicles that brought all these patients in on a daily basis. We would sometimes see multiple new carcinomas of the lung and we also saw an incredible number of trauma off the interstate and that led to my introduction in terms of thoracic trauma.

The other coincidental thing was that the University of Iowa then had a massive neuroscience unit with a special interest in myasthenia gravis, multiple sclerosis, amyotrophic lateral sclerosis, all of whom required a tracheostomy for long-term respiratory support. The first important paper I published in the area of thoracic trauma was on complications of tracheostomy. Thus began my interest in airway trauma. I presented this work at a trauma meeting which, coincidentally was held in Montreal. Those are my sort of three mentors and the stimulants towards a career in trauma, shock and hemorrhage.

LUCHETTE

How did your mentors and peers feel about your decision to pursue a career in trauma?

MULDER

I guess in answer to the other question in terms of my choice as reviewed by your peers, they all thought I was crazy and that trauma had no future. Many of the people, whether it was thoracic or general surgery, just felt that trauma was a non-starter and that I was wasting my time. But as it turned out, those were the major stimuli to what proved to be very valuable areas of investigation for me throughout my career, particularly airway trauma. The residency in Iowa was called the residency in Thoracic Surgery in contrast to Canada where it was Cardiovascular Thoracic. I did the full thoracic training at the University of Iowa with Dr. Ehrenhaft and we had an incredible number of airway problems but basically my training was in cardio-thoracic surgery.

LUCHETTE

But you have never lost your passion for trauma care.

MULDER

No. It's always been in the background. I guess it goes back to that very first question about mentors. You know, I often think of the value of a mentor and how they can impress you when you are most easily impressed. That was certainly the case with Dr. Rocke Robertson with his military experience and his writing. He had done diaries in the military every day of his military service during the whole of the Second World War. When you read his diary and what he postulated as what should be done in the civilian sector, it was very, very similar to the concept of a Level I, II and III trauma centers. He said, in spite of the Canadian Medicare

situation, he was totally opposed to the patient going to the nearest hospital. He thought they should go to the hospital where they had the best trained people and the special interests. That was my introduction to trauma system issues in the province of Quebec.

LUCHETTE

Which one of your scientific contributions are you most proud of, and how do you feel it influenced the field of trauma care?

MULDER

Well, I would think that the most important contributions have been in the area of airway, even dating back to my first publication on tracheostomy complications where I made the dramatic statement that there was a 50% complication rate with the procedure. I reviewed all the cases from the neuro unit who had longstanding trachs and respiratory support. When I said there was a 50% complication rate, they all said this could not be true and demanded to review all my data. I had them on data cards. In those days I didn't have a computer, but I put them on file cards with punch holes around the side, put a knitting needle through the various holes and see what fell out. That was interesting as a research technique. But it did confirm the high rate of complications. What we did was discourage any form of emergency tracheostomy. You know, when I was a general surgical resident, it was a bragging right that we could do a tracheostomy in the hallway with a flashlight. But what we didn't document was the high rate of complications.

The point that I made in that first paper was that we needed to do an endotracheal intubation and then a nice quiet, calm tracheostomy in the OR when things were stable. I remember the first discussion at the AAST meeting was related to the high rate of complications in Iowa and that you were admitting weakness if you couldn't do a hallway emergency tracheostomy.

The next paper related to bronchoscopy. We had just gotten our first fiber optic scope from Japan through Olympus. In Iowa, I had been educated by Brian McCabe who is a tiger of an otolaryngologist. There was a big turf battle over who would do rigid bronchoscopy. And Dr. Ehrenhaft was equally tough.

In fact, that leads to another interesting story. It probably relates more to Iowa politics than anything, but on an Iowa football day, which is a Saturday, there were up to 100,000 people in the stands in immediate proximity to the hospital. We got a man off the interstate who had a seatbelt injury with a transection of the trachea in the neck.

I phoned Dr. Ehrenhaft and he said, "Well, I can't get there, can you take care of it?" So I took the patient to the OR and we intubated and placed the tube across the defect. I was repairing the front wall of the trachea, very straightforward, and the chief of otolaryngology, Dr. McCabe, came into the operating room. He grabbed me by the throat and wrestled me out of the OR and asked me who I was. I told him and we had our battle. It was one of those things where your reflex is to grab him around the neck and retaliate. Just at that moment Dr. Ehrenhaft arrived and he rescued me and he continued the debate with McCabe. I went back and fin-

ished the case. That was probably my first significant airway case. And Dr. McCabe was very impressed that we got him intubated and got the defect closed. That led to Dr. McCabe and I becoming best of friends. He liked somebody who he could debate with or argue and stood up to him. And over the years we've remained the very best of friends, right up until his death.

When I got back to Montreal, the first thing we did was introduce fiber optic bronchoscopy and so the instructions came in Japanese and stated, to do a bronchoscopy you had to be intubated. That led to me doing all these bronchoscopies with the scope on an intubated patient, which was marvelous.

Then one day the concept came to me with one of our anesthesiologists that if we put an endotracheal tube over the fiber optic bronchoscope, we could maybe use it to facilitate the difficult airway. We wrote a one-page paper which got more citations than probably any paper I've ever written. It proved to me that sometimes the simple concepts are the best. It is a technique I have used in the disrupted tracheas and disrupted major bronchi to selectively intubate the trachea bronchial tree. Kent Trinkle, who was in Texas, and I often compared notes on how to do this and wrote several papers on the clinical use of the fiber optic scope.

I think the other concept in terms of contributions really relates to our work on shock and trauma and our work as a surgeon in the intensive care unit. This is probably more locally (MGH) than anything else, but we set up the surgical intensive care unit in the hospital and worked extensively with invasive monitoring. We applied it not only to the very sick surgical patient but to the patient with trauma. Just by natural sort of direction we got more and more trauma patients referred to us. But the most important thing that I did was when we reviewed the results of the trauma system in Quebec in the late '80s and we found that our mortality rate was considerably higher than that in the United States and other areas of Canada. Basically it was because patients were going to a smaller center, particularly in the rural areas, and then being referred late. I always remember back to Dr. Robertson's important variable about "time." This particularly stood out when we reviewed the results for neurosurgery. Whereas if they went to a small hospital before they came to a trauma center or to a tertiary care center, the results were at least 25 to 30 percent poorer in terms of neurologic outcome. This resulted in efforts outside the operating room and ventures into politics trying to influence health ministers to emulate what had been done in Orange County. I got people like John West and Don Trunkey to come up and help me. It took me five health ministers and 12-15 years to get through the concept that we needed to reorganize trauma care in the province.

We had a situation where a cabinet minister had a roll over motor vehicle accident and was trapped in his car overnight and died. At autopsy, all he had was a simple airway problem which could have been easily resolved. So the health minister then agreed with us and we introduced a trauma system in Quebec. The most important point that I am proud of here is the fact that as a surgeon working outside the operating room you can often have a major input in changing the health care system. Quebec was early to introduce a province-wide trauma system in Canada.

In the United States, there was a concept that there should be one Level I center per million people. Here in Quebec, we have a little over seven million people so we talked about

seven trauma centers, seven Level I trauma centers. After a lot of debate—and this was all happening in French, and my French wasn't perfect and still isn't—I made a compromise suggestion that we should start with four and the minister said, “Why four?” I said, “Well, there are four universities in Quebec, three French and one English. And each university should have a Level I trauma center to start with.”

Then we set up a series of Level II, Level III and we even had some Level IV which were sometimes in the far north in our native population with the Inuit and the Cree. That has been fully implemented now. Maybe the thing that I'm most proud of is that this has reduced the mortality for injured patients by more than 50 percent and mortality and morbidity rate in spinal cord injuries and neurotrauma by a huge percentage simply by bypassing the first hospital and coming directly to a designated trauma center. Thus, the most important impact that I've made was outside the operating room and outside direct trauma care and in the development of the trauma systems for the province. This didn't happen overnight, let me tell you! I probably started in the mid-70s and we didn't get this in place until 1993. I had great co-operation from my colleagues at the University of Montreal led by Dr. Leon Dontigny.

Just as an aside, my big love outside of medicine has been hockey, specifically National Hockey League hockey. I've been able to work for the Montreal Canadiens now for almost 50 years. There have been several airway injuries which were life-threatening and I developed a protocol for the whole league in terms of airway trauma and system issues so that we have optimal guidelines across the league. If you read them carefully, they are very much related to ATLS principles.

Now they are instituted across the entire league. We have a hockey-specific ATLS program that we put on for the NHL team physicians. I've applied some of my trauma career principles to looking after the seriously-injured hockey player.

LUCHETTE

Is there anything when you look back over your career, David, that you championed, but now, in 2013, you say that probably wasn't the right thing to be advocating for?

MULDER

Yes. I think I probably have two issues, and one of these is something that my wife reminds me about all the time.

I was one of those on the wrong side of the issue about resident work hours and time on call. I was a great advocate of being on call all the time or every second night for your hospital. I got up and pounded the desk, locally, about the need for continuity of care. I guess deep down I probably still am on the wrong side of the issue in that I think we have gone way too far in terms of reduced work hours and have recently had some amazing support from surgical residents who are worried about the concept of the volume of care that they're getting and the way the surgical system works. They're making the same point that I have always made that I think work hours for the dermatology resident and the radiology resident and internal medicine should be different than work hours for a surgeon, particularly in the field of trauma

surgery. I guess I have softened my viewpoint somewhat.

I was always very aggressive about early surgery in thoracic trauma related to penetrating injury and hemothorax. Now with the development of so much better imaging and the concept of minimally-invasive surgery I probably was too aggressive in terms of opening the chest for major chest trauma.

All of these things I think are—like Tennyson said, “I am a part of all that I have seen”—and I was probably influenced by mentors like Rocke Robertson and Dr. J.L. Ehrenhaft who never really went home. We started our day in Iowa at 5:00 a.m. and we had to have a typed report on every patient in his hands by six in the morning. One of the things he taught us outside the operating room was sort of defending your own turf.

In those days we had to do our own arteriograms. We did translumbar aortograms. We did all our own bronchoscopies, as I’ve already alluded to. He taught us about turf battles.

LUCHETTE

What do you think are the two or three greatest advances in trauma care, science and clinical practice?

MULDER

From my point of view, I think certainly the concept of trauma systems and obviously I am biased because of my influence from Rocke Robertson.

The next thing is the concept of critical care. And the third thing is the important role that ATLS has played, particularly in Canada. I think that’s universal but it has revolutionized not only trauma surgeons but as I go down to the emergency room now and I hear everybody using the ATLS language and the changes that it has produced both provincially and locally in our own hospital have been impressive.

I think minimally-invasive surgery has got to be another major advance. It has changed medicine and even to this day and particularly in thoracic surgery for traumatic hemothoraces and conservation of lung parenchyma.

I am very, very impressed now with the impact that trauma systems have had in Canada and Quebec. It’s nothing short of sensational. As we move to more sophisticated prehospital care and regionalization, every year as we benchmark with the U.S. or Germany or anywhere else where the trauma system thing has been a major advance.

We have a young man who is in Toronto training in thoracic surgery and will be coming back to join us. He’s got an MBA and is very interested in the economic side of medicine which I’ve never been smart enough to accomplish but I am hoping that he can now help us with putting a dollar value on the system and the system changes that have been made.

So I think trauma systems with regionalized care has had a major impact. It’s a model that we can use for all health care delivery.

LUCHETTE

As the only Canadian AAST past president that will be interviewed, what are the major

changes in practice patterns that have occurred during your career, in addition to the trauma systems?

MULDER

I think in Canada we're always going to be judged by the concept of universal health care and what that has meant. I have to be very right up-front. It has been enormously helpful in the field of trauma and in the trauma systems organizations.

I feel the single best things about universal health care is that no patient is left out, and no patient with an emergency problem, whether it is a cardiac arrest or a gunshot wound to the chest, is denied immediate access to care. The emergency medicine aspects of universal Medicare are most beneficial.

I have grave concerns now about waiting times and for elective surgery. I think our system is really going to have a hard time being sustained economically related to the trajectory of rising health care costs. We now have two new recruits with an MBA who will help address the effectiveness of our surgical care.

My other concern is the super-specialization that has occurred. Now when we need an orthopedic consult, we have five or six different specialty groups in orthopedics alone. In ophthalmology, a hockey player with an eye injury might have to see four different ophthalmologists to get it dealt with. Super-specialization has clearly been a major change.

I do have grave concerns how we can sustain the current universal health care system. The costs are going through the roof, as they are everywhere. What I am really worried about is the trajectory in terms of the rising costs of health care in Canada.

If you look at a graph, they are very similar to what is happening to the U.S. except they are a little bit lower in Canada. But the trajectory is the same. And this is a great worry to me.

LUCHETTE

What have you found to be the most rewarding or, in other words, what brings you the most joy at the end of the day?

MULDER

Well, I guess the biggest thing that I have always had is working as a team or working as a group. When people talk to me about surgical operations and being the captain of a ship I always remind them that any operation is a "team sport" and requires everybody to be onboard.

The single biggest thing that I have enjoyed, and that's particularly true in trauma, is that it doesn't matter what, if you have a success at the end of the day, it's usually because you have got a strong team working with you. That's been one of the most important things in my mind.

Clearly the other, and I'm sure you would echo this as well, is I've had enormous fun with being a member of the trauma club or the "trauma fraternity" and the camaraderie and the concept of a "band of brothers" that has always been present in the trauma field, whether it is the American Association or the Canadian Association or internationally.

Somehow we, as trauma surgeons, have an enormous *esprit de corps* that has been invaluable to me, whether you are talking about practice or science—it's perhaps the most pleasing thing in my mind.

LUCHETTE

What keeps you up at night and makes you worry about the future?

MULDER

My number one issue is the rising trajectory for the costs of health care in Canada. When we look at what our tax dollars do and when I think that as much as 70% goes into health and education, and how we are going to sustain that and the fact that it is growing faster than our gross national product.

My other concern is the regionalization not only of trauma care but of oncology care. In Canada we haven't figured it out yet in terms of how we can equate patient care to remuneration from the single payer but in terms of relative values, for instance of staying up all night with a ruptured aorta and a ruptured spleen and a closed head injury and then getting your reward or your fee schedule are nowhere related to the contribution that you have made.

Those are my two major worries. The other big thing that I have tried to work on, and it's a trauma system issue, is we still haven't gotten a province-wide helicopter system! We still have a problem with geography, weather and climate in the province of Quebec where sometimes a serious injury occurs 3,000 miles away and it is difficult to get in. That requires fixed wing transport of course.

But sometimes it occurs in our ski hills or areas within 25 miles or kilometers of Montreal and we don't have a helicopter nearby. So road ambulance can be incredible in our winters and weather.

LUCHETTE

What advice do you have for young readers and the surgeons interested in a career in trauma and acute care surgery? And, secondly, what advice would you give them about their life outside the hospital?

MULDER

That's a really important question in recruiting people to our specialty and particularly in Canada. The challenge of surgical education, the role of work hours, gender issues are all vital to today's surgical education. That's one of the greatest challenges in terms of opportunities for trauma.

I'm going to give a talk to the surgical residents in Quebec on Friday about career choices and, in addition to all the good things that you and I understand about trauma and a surgical career, I am going to talk to them about putting family first. If I have done anything wrong, it is probably that I've spent too much time away from home in terms of my career interests and necessities. So I'm going to suggest to the audience that in addition to surgery

being a very attractive career, trauma and especially thoracic trauma, I'm going to talk about the important thing is to have other interests and to have other roles outside of the operating room. I am going to tell them a little bit about my naïve experiences in politics and trying to influence and advocate for health care issues and the fact that they can be very discouraging, but also if you finally get through what you want to accomplish, they can be very rewarding.

LUCHETTE

As young surgeons enter this exciting specialty, what do you perceive are the greatest challenges for the future of acute care surgery?

MULDER

What I've thought about is the future of all surgical care and the role of acute care surgery in our department of surgery. In Canada, ACS [acute care surgery] has gone over very well. In fact, all the surgeons who were on call at night for appendectomy are delighted that the acute care trauma team are doing them. The other thing is the role of minimally invasive surgery in trauma. Those are things that are going to only grow in frequency. Finally, working towards a collaborative approach to all clinical activity.

The other big thing in Quebec and I am sure there are issues in other parts of Canada, is the whole concept of rural trauma care and how we deal with it. We aren't dealing with it as well as we should. If you have an injury 100 or 1,000 miles from Montreal, your care is not going to be as good as if it happened in Montreal. All of us involved in the American College of Surgeons and trauma care have an international responsibility and response. We've got a young man in our department now who is dedicated to bringing the principles of trauma care globally to Africa. We all have to recognize the need for trying to get the same high caliber of trauma care and make it as universal as possible.

LUCHETTE

Where do you think trauma, surgical critical care and acute care surgery will be in 20 years?

MULDER

I think trauma is always going to be there. There is always going to be a career for surgical activity and no more so than in trauma. When I first came to Montreal, Fred, we had very, very few penetrating trauma cases. Now with the concept of regionalization and community violence, our penetrating trauma is 30 to 40 cases per month which is dramatically higher. There is always going to be trauma, whether it is penetrating and interpersonal violence or whether it is motor vehicle trauma or whatever modes of transportation we have in 20 years.

There is always going to be a need for the trauma surgeon. What I tell the students is the specialty of trauma surgery is going to be preeminent in any department of surgery. So it has a great future.

LUCHETTE

As you now look back over your professional career, is there anything you would change about it?

MULDER

Yes. I'm not sure how I would have done it or how I could have done it any differently but I think I probably should have paid more attention to family issues. The important thing is to have a supportive wife and family.

For example, when I was younger and I wanted to be a hockey coach. Time and time again I left my wife to go to the operating room and left her trying to coach a hockey team. The only way we can do this is with collaborative medicine and teamwork. I should have spent more time, more quality time with the family. And that's perhaps one of my biggest regrets.

I don't know if you have read the book, you know the story that Bill Schwab's colleague wrote, *Let's Call It a Draw*. It's a great story about a trauma surgeon who died in Afghanistan. And the family conflicts that he talks about – I don't think I've ever seen expressed so well.

Often I've thought, gosh, I wish I had done better at that. That's maybe one of the things I would try to change. Otherwise, you know, I have to admit I've enjoyed being on the firing line and I never have minded call.

I still take call and enjoy it. And when I was chairman of the whole department of surgery here, I took a regular night on call and trauma call. The lesson I learned was if you're taking call at night you really learn how the system is working and what isn't working. And I would never give that up.

I do think there has to be some sort of re-organization. I overheard one of my sons recently. Someone asked him why he wasn't going into the medical profession. And he said, "Well, I don't think my dad ever slept." And that was their image.

LUCHETTE

Is there anything in your personal life you would have changed?

MULDER

I don't think so. I've enjoyed many other interests. That's what I would strongly encourage. I've had a strong interest in sports, primarily hockey. That's one of the things I've imparted to my children is a love for sports. They all play at a very reasonable level and enjoy it.

Looking after a professional hockey game everybody thinks is work. But I think it's a privilege! It's a great relief from what I do every day. As my mentor said, "It's better than taking antidepressants."

I've started writing down some of my experiences with the Montreal Canadiens. And I hope, as I have more time now, I hope I can produce a document, perhaps a book, about my professional experiences looking after a hockey team.

LUCHETTE

So tell us about your personal and professional plans for the future.

MULDER

As I get older I am clearly going to have to stop operating, probably in the next year or so. I'll soon be 75 and so I think people should stop operating when they're still capable and not be dragged out of the operating room. I'm going to be sure that that doesn't happen. I always think of professional hockey players, Jean Béliveau, to be specific. He says, you know, "You've got to go at the top of your game and not overstay your welcome."

We're going to stay in Montreal. I have a grain farm in Saskatchewan which I inherited from my family. I love to go out and help with the harvest and that sort of goes back to my roots. But I don't intend to live out there. I am going to stay in Montreal.

We enjoy the quality of life in the city and the French/English thing we think is great. The only problem is that none of our children live here so we have to travel to see our nine grandchildren and that's not so bad. One is in England, one in Toronto, one in Boston. So it gives us an opportunity to have some very pleasurable side trips.

LUCHETTE

I want to give you a chance to make a some final comments on the 75th anniversary of the AAST. Is there anything you would like to say that we haven't touched on?

MULDER

I think, Fred, we have covered most of them that I have thought of. I think everybody is looking forward to the 75th anniversary. It is going to be monumental. The AAST has meant the world to me.

And I think our goal is to encourage great young people, particularly females, to consider a career in surgery and specifically trauma surgery.



FRANCIS C. NANCE, MD
PRESIDENT 1985–1986

DR. DAVID H. LIVINGSTON

How and when did you decide upon a career in surgery? When did you decide to be involved in trauma?

DR. FRANCIS C. NANCE

I always wanted to be a surgeon. My father was a general surgeon and my admiration for him steered me in that direction—I think he had perhaps eight or ten months of surgical training at the public health hospital. He grew up in China and went back to China as a surgeon in Shanghai before the war.

He did a lot of surgery under wartime conditions in Shanghai. As you might know, Shanghai was invaded and occupied by the Japanese in 1937 until the end of World War II. He lived and practiced there during that time. He obviously got exposed to a lot of trauma although he was not a trauma surgeon. He got caught by the Japanese and spent four years as a civilian prisoner and operated on about 500 people in a prison camp, keeping people alive.

So his surgical training and experience was not classic, and he was almost essentially self-taught with exposure to a few mentors and many patients along the way. When he finally got back from the war, he ended up practicing in Oak Ridge, Tennessee, and that's where I passed my adolescence. I admired him and it never occurred to me not to want to go into surgery.

He grew up in Suzhou and came to the states for college and medical school and always

planned to go back. He had two brothers and they all wanted to be doctors and decided they would practice in Shanghai. All three of them, headed back and finally got together in the '30s in Shanghai. Of course the war came along and that ended that.

He came back to the states without anything, literally. No savings, no shirt on his back, nothing. The war was still on and he went to Knoxville. He had been there selling Bibles during the summer when he was going to college and liked Knoxville, which turned out not to be a very felicitous place for him. He was occasionally a drinker, actually more than occasionally, and Knoxville was a dry town. It was very conservative and he was not. So it was not a happy time.

That is how he ended up in Oak Ridge. They needed doctors. When Oak Ridge was still a "secret town," its medical care was obtained typically by the guy who ran the Manhattan Project. He went to the University of Chicago and drafted half of the faculty saying, "You're going to an undisclosed location." At the end of the war, obviously, those guys all wanted out and to go home. That opened spaces the need for doctors and that's where my dad moved.

LIVINGSTON

It is obvious that your father's life experienced made medicine and surgery an obvious pathway. How did you find your way into trauma?

NANCE

In a very roundabout way. My early interest focused on the physiology and surgery of the GI tract. As a student at the University of Tennessee [UT], I encountered a young academic surgeon, Ed Storer, who was one of the few people trained by the two preeminent GI surgical physiologists of that era: Henry Harkin and Lester Dragstedt. Of course, gastric physiology is dead now. Duodenal ulcers don't exist anymore, not in the surgery department, at any rate. But back then it was a big deal. I've forgotten how I hooked up with him, but I think I was a first- or second-year medical student. He had an ad out looking for a student to work in the lab. I applied for the job and we hit it off so he gave it to me. Storer encouraged me to apply there for a fellowship at UT that would allow me to obtain simultaneous degrees in medicine and physiology, and under his guidance I managed to accomplish that.

UT was ideal for that because they were still on their wartime schedule where they started a new class every quarter. So if you started in October, which is what I did, you keep taking a new quarter every quarter. I would have normally finished in December, which is a bad time to look for an internship so I added six months to my total time so that I graduated in June.

Well, I went and endowed a little fellowship at UT in his name for students, hoping somebody else would get a chance to do the same thing.

Dr. Storer trained at Chicago so I applied there for training. At the University of Chicago where I interned, I fully expected to continue my studies in the Dragstedt Lab with his successors. But, the chairman of the department died on my service a month after I started. I didn't think the department would recover very soon and I was correct. It took them ten years

to sort of straighten themselves out.

I was fortunate to obtain a slot at the University of Pennsylvania at the start of Dr. Jonathan Rhoads' great era. Dr. Rhoads had just been named chairman at Penn. During that kind of transition the recruiting is perhaps not as successful as it normally is, so there was a slot. This was around 1960.

At Penn I saw very little trauma except for fractures on William Fitts' service. Unlike my peers, I didn't even rotate to the Philadelphia General Hospital for what trauma experience was available.

LIVINGSTON

You and some of the other AAST past presidents trained in an era unregulated by the ACGME/RRC where residents seemed to bounce around a lot more than today. I mean you started at the University of Chicago and then ended up finishing at Penn.

NANCE

Even more than that, my college education was also interrupted by a couple of expulsions from Vanderbilt. Then I got drafted in the Korean War, unfortunately as an enlisted man, but fortunately in that I didn't have to go to Korea.

Yes, I was at Vanderbilt. Or I wasn't at Vanderbilt; I was at the University of Tennessee when I was not permitted to go to Vanderbilt.

The University of Tennessee accepted and took me as a medical student while I was overseas and with that kind of record, which is something that I have always been grateful. Taking a guy who has been thrown out twice shows some willingness to take a risk I guess.

By that time I think I had matured a little bit and UT medical school was great for me. It was a great school. I have taught medical students over the years that you don't need to go to Harvard or Yale to be able to do successful.

LIVINGSTON

Another one of those threads coming through these past president interviews—whether it is fate or whether it is knowing how to make the best of one's circumstances—people who are destined to do great things just seem to end up doing them. In your case, it seems despite the issues you had with your secondary education.

NANCE

Yes, I guess I was lucky and I don't know that people are that forgiving any more. But they were then. To get back to how I actually got into trauma. When I eventually arrived at Charity Hospital in 1965, my first academic job, I had not personally operated upon a single trauma patient (other than some fractures). Isidore Cohn was chairman at the time, had been a Penn man, which is how I ended up there. At that time Charity was still segregated and still un-air conditioned except for the resident quarters and the OR. The rest of it was New Orleans heat. The volume of trauma provided an opportunity to rapidly catch up with what I missed in res-

idency but I started slowly. When I met with Dr. Cohn for the first time he asked me whether I liked managing burns. After a stammered noncommittal response from me, he announced I would be in charge of the burn service. I soon discovered there was no burn service. Patients were treated with closed bulky dressings on the open un-air-conditioned wards. They were hated by the medical staff and the nurses because the stench of *Pseudomonas* infections was frequently over-powering. A crash course to self-educate myself ensued which included attendance at meetings of the American Burn Association. I became an officer of that organization early on when the Association's finances were in a desperate state and some enemy of mine suggested my name as a likely and unsuspecting candidate to be treasurer. My first inkling of trouble ahead came when I discovered that dues for the forthcoming year had already been collected and spent. It was a rocky six-year term, but I left the organization in solid financial condition.

LIVINGSTON

I would think that hardly doing any trauma during training and showing up as an attending at Charity was kind of an interesting baptism.

NANCE

It was, but it really was a good opportunity. I mean you obviously feel a little naked arriving and realizing that the residents had more experience in treating trauma than you did.

But you quickly realized they knew of only one way of treating trauma that had been passed on to them by the chief resident ahead of them who learned from their chief for whoever knows how long. They weren't contaminated or altered very much by the attending staff, at least in trauma. So I had this chance to insist that I participate in all of the patients who came in on my service. I was there. I managed to introduce myself into the practice without getting them mad. Slowly I was able to convince them that there was more than one way to "skin a cat."

It was incredibly helpful to be able to evaluate it from the outside and say, "Why are these guys doing this?" They weren't asking the questions, so I did. The questions didn't get answered at conference either because everybody was doing the same thing.

LIVINGSTON

There is a tremendous value of coming in with a whole fresh perspective and saying, "The emperor has no clothes."

NANCE

You're quoting an editorial of mine. In that dogma-ridden era, virtually every situation had a prescribed solution which was applied diligently. Initially, as a bystander uncontaminated by dogma because of my inexperience, I began to see some of the more egregious faults in the system. One night I discovered an entity known as "the Negative Lap." Under the protocol that the residents had established over the years, if an abdominal stab wound patient appeared to

be badly injured he would be sent up to the OR to be operated upon by a senior resident. However when a patient with a stab wound had no evident signs of internal injury, a junior resident would be called with the announcement "I have a Negative Lap for you". It was frequently the first laparotomy for that ecstatic junior resident. A xiphoid to pubis incision would be made and the protocol for searching every nook and cranny of the virginal abdomen followed to the letter. Occasionally a helpless appendix would be prophylactically removed. Needless to say, these cases were not free of complications and the occasional death.

Other similar egregious examples of harm to patients from the rigid application of unquestioned dogma began to be evident: unnecessary splenectomies, unnecessary and often harmful colostomies, meddlesome invasion of the common duct, heroic resections of the liver, unnecessary manipulations of the GI tract, over-aggressive kidney resections, and meddling into nonexpanding pelvic hematomas.

After a year and a half at Charity, I proposed to Isidore Cohn that we initiate a prospective study on selective management of penetrating abdominal wounds. I was encouraged by an early paper by Dr. Gerald Shaftan making such a suggestion. I had marshaled a large collection of statistics from the marvelous patient records housed in the basement of Charity Hospital lovingly protected by a dedicated staff of librarians. Dr. Cohn, after summarily removing gunshot wounds, was receptive. He warned me that the study would not be well received by the faculty, the residents, and even the rest of organized medicine. In this he was indeed prophetic. He approved the study with the proviso that I would personally examine every patient entered into the study.

Three years later the results were presented at the American Surgical Association and, like it or not, I had become a trauma surgeon.

LIVINGSTON

I am under the impression that you think that surgical care in that era was much more dogmatic, influenced and shaped by the huge figures in surgery of the day, compared to today with an emphasis on evidence based medicine?

NANCE

Indeed. Well, I think you know we all talk about World War II as being sort of the golden age of trauma where mortality rates went from about 50% to 15%. But really I think it set back civilian trauma for literally 50 years.

As I have thought about it over the years, the reason for it was that most of the surgeons operating in field hospitals in World War II were not trained surgeons. They were 90-day wonders, because there weren't enough surgeons.

In those circumstances you had to have a protocol because you couldn't trust a guy to do something that was just wrong. It was a court-martial offense to observe an injury in the colon and not treat it with a colostomy, no matter how trivial the injury was.

It was a court-martial offense not to take the spleen out if the spleen had any injury at all. Those things were set up because I think the guy operating on them didn't have enough

background to be able to evaluate that kind of thing. So they made these rigid rules.

Those rigid rules came home with those guys and never left. The civilian trauma community were saddled with all of these dogmatic things that may have been the safe thing to do in a war when you were cared for by less trained people but were not correct back home. You had to have been there to realize it.

LIVINGSTON

Any other mentors besides Dr. Storer and Dr. Rhoads?

NANCE

William T. Fitts was a great teacher of surgery and the most enthusiastic promoter of the art and science of trauma surgery I have ever known. He took me to my first meeting of the AAST. He was always supportive of my career as my interest in trauma developed, although he frequently disagreed with me. More than that, Bill Fitts was a wise and thoughtful advisor. Once, when I was a chief resident at Penn, he saved my bacon in a way I shall never forget: he was the attending on my ward service. We encountered a patient with massive bleeding from a duodenal ulcer. I wanted to treat the patient with a vagotomy and pyloroplasty—an operation which was anathema to the entire Penn faculty. Billy Fitts gave his reluctant “well just this once” approval. The patient did well. Three days later a second patient with a similar lesion showed up and, emboldened by our previous success, we performed the same operation. Fitts was not pleased. When the word began to circulate, there were rumblings about dealing with the insubordinate resident when the cases were presented at grand rounds. And in the event, the cases were presented and my excoriation by the unapproving faculty began. With that Fitts rose and said, “Dr. Nance was operating under my supervision. If you have criticisms to make, address them to me.” My conversation with him in the privacy of his office an hour later was also something I will never forget.

Isidore Cohn gave me my first job in academic surgery. For me he was a great leader. Supportive with the wisdom to stay out of the way or to intervene if he perceived I needed guidance. We were mentor and student and later colleagues and life-long friends. He advanced my career in dozens of small and large ways

LIVINGSTON

What was the best career (or life) advice you ever received? What was the worst?

NANCE

Ed Storer told me to become an academic surgeon and cleared the way for me. Until that point, I was headed for a small town clinical practice, probably with my father.

Jonathan Rhoads, whose skill-set included organizing and running an outstanding department of surgery, gave his residents remarkably little career advice. His only comment to me as I set off on my first job interview was that I might get a shoe shine before the interview.

LIVINGSTON

With respect to your scientific contributions, I would think that your selective management of penetrating trauma, which you spoke about earlier, is really one that was much ahead of its time. Could you extrapolate a little bit more?

NANCE

Thank you. I do think that my early work on the selective management of penetrating trauma has profoundly changed the way such patients are managed. First with stab wounds and then extended finally to include gunshot wounds. But it did not come easily. More broadly I think I have served as a general annoyance to those in our profession who substitute dogmatic protocol for individualized treatment. Thinking through a course of management requires more effort, but it's what doctors are for. I challenged dozens of time-honored but unproved dogmas (all spleens with an injury must be removed all colons with an injury, no matter how trivial in appearance, should be treated with colostomy). I wasn't always alone or even the most important critic, but the effort changed surgical practice.

I remember going to one of those conferences where you've got a little panel of three or four guys and they were talking about colon injury. One of the guys, who was a past president of the AAST, and I were there talking about colon injuries. I presented him with various scenarios of injury from minor injuries to ones where the colon that is divided.

I could not present a scenario where he would not do a colostomy. The colon has an injury and a little spilled stool. Colostomy. The colon is injured, no spilled stool. Colostomy. I finally got down to a patient having a needle aspiration of the abdomen and the needle went into the colon, no spill. That was a colostomy. We couldn't agree on that issue. But he was older and senior to me, so I was the guy who got ridiculed.

LIVINGSTON

How was that accepted when you presented it at the American Surgical?

NANCE

Not well. If you want to read Carlton Mathewson's discussion of that paper at the American Surgical, it wasn't very kind.

LIVINGSTON

That was a pretty big audience you took on. You presented that what year, sir?

NANCE

Sixty-eight. The paper came out in 1969 (*Ann Surg.* 1969;170:569–80). It was a big audience. I was pretty awed by all of the Pooh-Bahs there. It was not well received. I spent probably 25 or 30 years trying to convince people about it. I could go to a conference as a visiting guy and present a theoretical case to the residents and they were going to operate on that patient, even though there were no signs of symptoms of intraperitoneal injuries at least 25 or 30 years after

that.

With gunshot wounds, it wasn't until after the millennium before that was accepted as safe. Demetriades has done some pretty good work with gunshot wounds in recent years, but I was advocating that in the second paper I wrote which was to the *Southern Surgical* (*Ann Surg.* 1974; 179:639–46)

We included gunshot wounds because people were starting to say, well, it's okay with stabs but no, no, you can't do gunshots. Bill Schwab and I are good friends. I've harassed him over the last 10 years because he finally has said something that you might, if you got 14 CT scans and, that you might observe a patient with a gunshot wound.

My first one that I did prospectively I had this little gal who was about 18 or 19. She had put a pistol in her belly and fired it. The entrance wound of entrance was in the RUQ and the bullet didn't come out, but it was in the right scapula. So you could draw a line and it clearly had gone through the liver and maybe the stomach. But she was totally asymptomatic.

I said we'll watch this lady and, you know, nothing happened and she recovered. So I started doing that prospectively too, but I couldn't even get Cohn to go along with that.

One of my favorite stories in terms of this is how I found myself at a famous trauma institution, which will remain nameless. The chairman had this notorious Thursday conference where every patient on the service was discussed. All of the faculty except one had been trained by him at that institution.

They presented this patient with a .22 caliber bullet wound through the upper thigh. And there were no neurological injuries, no vascular, the pulses were intact.

They did a laparotomy on him because they had read about the blast effect thing where the bullet can injure surrounding tissue without actually going through it.

They did the laparotomy to get control of the iliac arteries so they could explore the artery. They then made a large incision on the leg and explored the wound and found nothing, no neurological injury, no vascular injury.

They finished presenting and there were no comments, so I raised my hand and I said, "You know, I think that at Charity Hospital we would have examined the patient and put a Band-Aid on the wound of entrance and a Band-Aid on the wound of exit and let him go home." That was not well received, either.

Colons took a little less time; spleens, even less, partly because the pediatric surgeons.

LIVINGSTON

You are from an era where you just trained as general surgeons with specialization just starting to emerge. Trauma was just something you just did as part of the whole package depending on where you were. How do you see the trend toward increasing specialization over the years?

NANCE

Trauma was a big part of the program at Charity Hospital and that carried weight. I always thought of myself as a gastrointestinal surgeon with continuing research and clinical interests

in that field who did trauma. I have mixed feelings about the changes that have occurred. I don't think there is any question that the improvement in outcomes going on now is due to the organizational changes that have occurred where you've got more full-time guys committed.

On the other hand, having the broad perspective of being more than just a trauma surgeon I think has its advantages, too. Like my son, Mike, is one of the few guys who can sort of be almost a full-time surgeon but do everything, I mean the pediatric surgeons still have access to most of the body.

LIVINGSTON

Do you think the move to acute care surgery is trying to reclaim some of that? Do you think that is a positive thing?

NANCE

I think it's a very positive thing. I think that the average guy practicing out there would love to get out of night call. I think that acute care surgery is the way to do that.

I hope that that goes further, a lot further, and that it becomes the norm because the three disciplines—acute care surgery, trauma, and emergency surgery—all sort of fit into a pattern. I hope that goes further.

LIVINGSTON

Is there anything specific that it should or should not include? Vascular, thoracic or only complex general surgery or just the whole ball of wax?

NANCE

I think it ought to include everything, but with the possible exception of the skull and possibly fractures. I mean I think that those two areas perhaps get a little bit beyond. But basically I think I hope that it will involve the entire body. I also mentioned the issue of continuity of care. I think shift work makes it possible to have a fresh guy on call when the emergency comes in. I mean I think that's important.

We all did it without question, but working all day and then getting up at midnight and doing a complex procedure and then getting up the next day and going back to work is probably not the best system. When you get to be age 55, that's almost more than most guys can do.

I think we have to re-look at that dogma, too. I mean I grew up believing that if you took a patient on, then it was your patient and you did it. I think we can learn how to adequately sign out to a colleague and go home. I think that that will make possible that specialty of emergency surgery which I hope will gradually take over. It is happening in some institutions and not happening in others.

LIVINGSTON

Some advances in medical care that were, in retrospect, not quite the "advances" we hoped.

Anything you thought was a great idea that didn't turn out quite the way you hoped?

NANCE

Total parenteral nutrition, essentially invented at Penn by Rhoads and Stan Dudrick, has not been as important as I once thought it would be. Other methods of feeding with enteral tubes have largely supplanted what seemed to me at the time to be a Nobel Prize-worthy advance.

LIVINGSTON

What aspects of your career have you found to be the most rewarding?

NANCE

Teaching residents, particularly at a senior level, has always been my greatest joy and perhaps my best skill. Taking a young surgeon who has acquired most of the basic mechanical skills of the profession through a difficult case, focusing on aspects of care that the resident may not have previously considered, can be deeply rewarding.

Raising questions at grand rounds which force a reconsideration of seemingly well-established protocols of therapy has been a favorite and occasionally productive tool. As an academic surgeon, I greatly valued the opportunity to interact and become friends with my peers at meetings and educational programs.

LIVINGSTON

What aspects have you found to be the most challenging or difficult?

NANCE

For me, the administration of a department and the constant need for maintaining discipline were difficult. I found the need for publishing and presenting onerous, partly as a result of a lack of self-discipline. My most recurrent nightmare was going before an audience with an unprepared talk.

Failures at the clinical level did not bother me. I am able to learn from errors of judgment, make adjustments and go on to the next adventure without dwelling on the past.

LIVINGSTON

What career advice would you give to young surgeons interested in a career in academic trauma/acute care surgery? What "life-coach" advice would offer them on their lives outside the hospital?

NANCE

I think surgery is the most satisfying career one can imagine. Surgeons of the future will be better able to rationalize their family commitments and their profession. I am gratified that some modifications in time commitments have occurred, sufficient to begin to attract women into the field. Their greater need for modifications in how a career in surgery is managed have

slowly been recognized and (incompletely) implemented.

LIVINGSTON

What do you perceive as the greatest challenges and opportunities for the future of trauma and ACS?

NANCE

I worry that we will no longer recruit the best and the brightest into surgery and into trauma surgery specifically. We are losing out to the more lucrative “life-style specialties”—no sick patients, no night call, high reimbursement for brief procedures. I hope we can continue to attract high-quality individuals who are challenged by the difficulty in managing the critically injured.

LIVINGSTON

What things, if any, would you change related to your professional career?

NANCE

I wish I had been more successful in persuading my CEO to develop trauma when I moved from LSU to Saint Barnabas Medical Center in New Jersey. Although the burn unit at Saint Barnabas has thrived, I missed the excitement of a busy, trauma-infested emergency room.

LIVINGSTON

Would you change anything related to your life outside the hospital?

NANCE

A failing I will always regret was the insufficient time I gave to my family in the early stages of my career. Fortunately, my children and my wife have been remarkably forgiving. I marvel at the development of my grandchildren who exhibit changes that I was never able to see when their parents were growing up.

LIVINGSTON

Are there any parting words of wisdom you would like to leave for this 75th AAST anniversary?

NANCE

Well, I would only pass on this quote from my mentor Billy Fitts spoken in his unapologetic deep Tennessee twang as we walked into the auditorium while attending my first AAST meeting: “Cahtah, this is the greatest organization, ever!” True then, true now.



DONALD D. TRUNKEY, MD
PRESIDENT 1986–1987

DR. FREDERICK A. LUCHETTE

How was it that you decided to choose a career in surgery and then, second, when did you decide to focus your career on trauma surgery?

DR. DONALD D. TRUNKEY

When I was in the seventh grade, I was tackled and hit a clothesline pole with an outstretched right hand, and it caused a dislocated epiphyseal plate fracture of my right wrist. It was quite painful. When my father got off work, he took me to the general practitioner and, over the next three hours, the general practitioner kept going in and reading the books and trying to reduce the fracture. He subsequently was successful, but it did not stay. He then went back to the books and found a clever way of keeping it in reduction, which was to put it in ulnar deviation. My dad held my arm every time he was reducing it, and this was without any anesthesia. Over the next eight weeks, I went back every Friday to have a new cast put on because I continued to play football. I made a decision at that time that I wanted to be a doctor. When I got to medical school I was told by the dean that being a general practitioner put me in the bottom ten percent of the class. I then gravitated towards internal medicine because all my heroes at the medical school at the University of Washington were internists, including Clem Finch and Robert Petersdorf. Surgery was a non-entity at that time and I decided to do a rotating internship at the University of Oregon where Dr. J. Dunphy was. My very first rotation was general surgery, and after three weeks I knew exactly what I wanted to do, and that was

to go into surgery. Dunphy was an incredible role model and I admired him greatly. I did not get the Berry Plan, so I was drafted after my internship. After two years in Germany, Dr. Dunphy called me and reinforced that I was to join his program. I did, and during the five years, my role models became Bill Blaisdell, Bob Lim and Jack Wiley. I then decided that I wanted to do trauma surgery and I talked to Dr. Dunphy. He picked up the phone, called Tom Shires in Dallas and asked him if he would take me on as a trauma NIH fellow. Tom agreed and I spent one year with him doing research. I also helped out with clinical care.

LUCHETTE

Tell us about the response that your peers and mentors had when you announced that you wanted to be a trauma surgeon.

TRUNKEY

Very few people were interested in trauma care. Most people wanted to go into more glamorous and well-paying surgical subspecialties. I never regretted taking the fellowship.

LUCHETTE

Tell us the two or three significant scientific contributions that you are most proud of and how these influenced the field of trauma care?

TRUNKEY

I would have to say the *Archives of Surgery* article (*Arch Surg*.1979 Apr;114:455–60) and The Scientific American article (*Sci Am*.1983 Aug;249:28–35) were most important in systems of care. The *Archives of Surgery* paper compared two counties in California. San Francisco had a Level I trauma center, although that didn't exactly exist at that time, that's what it was. Orange County had several hospitals that took care of trauma and, I might add, very poorly. John West called me and said he was very frustrated in trying to set up a trauma center in his county. I told him that he should look at 100 autopsies of patients who died from trauma and I would do the same with Bob Lim in San Francisco, and we would compare the outcomes. The data was overwhelmingly in favor of a trauma center. The surgeons in Orange County resisted this article and were told to do their own study. After they did so, they were overwhelmed with the evidence that they had too many preventable deaths in Orange County.

My contributions to research initially were with a primate model and I studied shock, resuscitation and the influence of the shock insult on various resuscitative measures. I showed the excitation contraction coupling within the heart was impaired. I also showed that excitation secretion coupling in the adrenal gland was disturbed, and all of these things contributed to the pathophysiology of the post-shock state. When I moved to Oregon to be chair of surgery, I continued my research in the pathophysiology of shock and some of our best papers were written at that time. They were summarized in the *British Journal of Surgery* several years ago.

LUCHETTE

There are always advances in medical care that in retrospect were not the “advances” we thought or hoped. If you had one thing you “championed or adopted” that you could change in your career what would it be?

TRUNKEY

I was suckered into believing the data that came out of the U.S. Naval Research Center in Da Nang, Vietnam, that stated you had to use saline resuscitation and, furthermore, you should have a central venous pressure of about 18 since that would “load the heart” and increase cardiac output. It was a terrible concept and simply contributed to some of the problems we saw at that period of time. It took much convincing and other data that salt water drowning was inappropriate and I hope that I contributed significantly to debunk this bad idea.

LUCHETTE

What do you consider to be the two to three greatest advances in trauma care/science that occurred during your career?

TRUNKEY

I think systems approach to trauma care has been a major concept. It has recently been shown that if patients are entered into a trauma system, they have a 25% better chance of survival and most all will have minimal disability. I think ATLS has been a major advance and more recently, mid-level providers (nurse practitioners and physician assistants) have increased our ability to provide excellent ICU and ward care. I also think that prehospital care has been markedly improved during my life.

LUCHETTE

What were the major changes in practice patterns that occurred during your career?

TRUNKEY

Trauma is now considered a viable pathway in medicine. More recently, there has been a “dumbing down” of general surgery and I think acute care surgery may solve some of the problems. Unfortunately, it is very difficult now for a surgeon to be a true general surgeon that does thoracic and abdominal surgery and critical care. During my training, we would do craniotomies and a fair amount of orthopedics. More recently, particularly at OHSU, we have fostered a one-year rural surgery program which goes back to our roots and these residents who do the year will do approximately 400–500 cases, including C-sections, ORIFs, prostatectomies, etc. This has been a major plus.

LUCHETTE

What aspects of your career have you found to be the most rewarding or are most satisfying to you?

TRUNKEY

In 1980, I went on to the American College of Surgeons Committee on Trauma. Within a few months, I was up to my ears in trying to make changes through the executive director's office and ultimately to the Board of Regents. The executive director was a tyrant and a high control freak. This made things very difficult. I met with him and was very blunt, then went back to San Francisco and wrote a letter highlighting the things the Committee on Trauma should do. This led to confrontation with the executive director and the executive committee of the regents. We were called together in February of that year and my hands were slapped. Following this meeting, I was told that I would never be an officer in the ACS, and that I would never serve on the Board of Governors. My reaction was to simply keep pushing, and over the next two years we were able to get all of the things that I had originally wanted. We were able to translate ATLS into different languages and we were able to eventually get some nurses through ATLS in a modified way. I certainly took advantage of it and when I went to Desert Storm, I taught all of the nurse/surgeon teams ATLS.

LUCHETTE

What aspects of care have you found to be the most challenging or difficult? What things keep you up at night?

TRUNKEY

I think the thing that gives me the most stress is when you fail on a patient, particularly a young male or female, when you have tried everything and yet they still die. It bugs me to figure out how we went wrong or what happened. Sometimes there just doesn't seem to be any answers.

LUCHETTE

What career advice would you give to young surgeons interested in a career in academic trauma/acute care surgery?

TRUNKEY

I am very positive about such a career. There is nothing more rewarding. Money is not the issue; it's the reward of getting somebody through an acute injury or acute surgery with a good outcome. What more could you want?

LUCHETTE

What "life-coach" advice would you offer them on their lives outside the hospital?

TRUNKEY

Live your life to the fullest. Take time out to have fun with your family and pursue hobbies that will make you better. I cannot think of many things that are more satisfying than to read a good book, listen to a classic symphony, and playing with my grandchildren. My wife and I

have been married 53 years, and I still love her very much.

LUCHETTE

I'd like to talk specifically about the greatest challenges and the opportunities for the future of trauma and ACS. What do you think they will be?

TRUNKEY

I believe that we must reinvigorate trauma training. I believe there should be six months of special training if it is possible. This would include six months of hepatobiliary surgery, six months of endovascular surgery, at least six months of thoracic surgery, and I strongly believe that if there was enough training (six months) there could be acute neurosurgical procedures such as craniotomies, evacuation of blood and certainly trained to be able to stick in monitors such as ventricular shunts, etc.

LUCHETTE

What do you think the practice of trauma, surgical critical and acute care surgery care will be in 10–20 years?

TRUNKEY

I would do everything to resist “dumbing down” trauma or acute care surgery. I think the future is bright if we truly provide comprehensive trauma care, surgical critical care, and acute care surgery in the best interest of patients.

LUCHETTE

As you reflect on your three decades in academic surgery, is there anything you would change?

TRUNKEY

First and foremost, I would probably, if I had to do it over again, have a stronger relationship with the military. I get incredible satisfaction taking care of soldiers. They are called upon to protect our country, and I think they deserve the very best in care.

I have never perceived my personality as being particularly abrasive, but I sure have pissed off a lot of people. I guess maybe I should be more warm and fuzzy, but then I wouldn't be myself.

LUCHETTE

What would you change related to your life outside the hospital?

TRUNKEY

I think I have been very fortunate. I have a great wife, two children, and six grandchildren. We see them as often as we can. I also have been able to travel extensively during my career.

I take my wife on as many of these trips that I can, provided it is safe. I do some things that are a little bit hazardous, but so far, I have been very fortunate. I have many hobbies including making wine, fishing, and I suppose the one thing that my wife would change if she could is that I would not have so many books.

LUCHETTE

What plans do you have in the future, both clinical/academic and personal?

TRUNKEY

I think most of my plans will focus on the personal, because I am 75 years of age and I expect to step down from clinical activity soon. This does not necessarily mean that my academic interests will change. I may write more and I have considered writing a biography.

LUCHETTE

What is the one thing in your career that you would do differently if you had the chance?

TRUNKEY

Nothing. I have enjoyed it very much. As I said earlier, taking care of soldiers that are terribly wounded has been so rewarding, it is hard to believe.

LUCHETTE

Is there anything that we didn't talk about in these questions that you'd like to add for the membership or the readers of the commemorative book during the 75th anniversary of the AAST?

TRUNKEY

Yes. I guess, you know, after I had my little accident in football, I wanted to be a doctor. When I got to medical school all of my heroes were surgeons and that's what I wanted to do. I can tell you that I feel, personally, that it's just one of the most gratifying careers you can pick and particularly when it comes to taking care of the injured, whether it be civilian or military. I am telling you, you just can't believe how rewarding it is. If I had to do it over again I would probably pay money to do it.

LUCHETTE

That's just amazing to me with, as busy as your career has been, you still don't lose that passion and love for just being at the bedside or in the clinic with the patients.

TRUNKEY

You know, when I was in San Francisco I had a case that summarized it all for me, at least. There was this 19-year-old kid and his girlfriend were walking home from the San Francisco Symphony and these two hoodlums, teenagers 16 and 17, jumped out from behind some

shrubby and wanted their purse and billfold. Nathan, the male, said, "No." And so they shot both of them. The police arrived within two minutes and Lisa, the girlfriend, said, "Please help him." The policeman said, "Ma'am, he is dead. He doesn't have a pulse." About that time the ambulance arrived and they started CPR. He had a gunshot wound right over his sternum. They brought him into San Francisco General. The city of San Francisco is seven by seven miles so it's pretty well covered by ambulances.

So I opened his chest and repaired his right ventricle and then the left ventricle. The bullet exited the chest and traveled into his abdomen. I opened his abdomen, and it got his spleen as well. I had to ligate his right profundus artery. We had a rule at that time that if the patient didn't wake up in 48 hours we would basically withdraw support. On the 47th hour, he opened his eyes. He opened his eyes and his mom and dad were there. His father was a minister from Montana. Lisa had sustained a gunshot wound through her rectum and she had a colostomy.

His family had prayed for him. I was really losing hope. And, by God, he opened his eyes. He has done very well. They got married and they have three kids. I get a Christmas card every year from his mom and dad.

So I think that kind of case that just makes it so rewarding. And then my more recent stuff, you know, with the military. I've been going to Landstuhl every summer since 2006, and I went to Afghanistan. Then, of course, I had been in Desert Storm before that.

These kids get told to go over there in defense but probably we would be better off not going. It's really rewarding to see them get back.



DONALD S. GANN, MD
PRESIDENT 1987–1988

DR. DAVID H. LIVINGSTON

The obvious first question is when did you decide on a career in surgery and specifically trauma?

DR. DONALD S. GANN

The surgery decision happened to me in medical school. I initially intended to be some variety of scientist. I was sort of groping around. I had a bit of a head start working with some pretty distinguished physiologists but didn't have any sense of what I was going to do. I actually did a fellowship in neurosurgery and knew I wasn't going to do that. That was probably about the easiest decision I have ever made. I prefer my patients to be able to talk back.

I enjoyed the complicated physiologic preparations I was performing for my mentor in the laboratory, Vernon Mountcastle. I also found I was dexterous enough to do some unusually complicated things. I began to see what the surgical patient population looked like and decided I would enjoy working in that arena. I really wanted to take care of people. I got interested in the metabolic response to surgery early on, and thought I would do endocrine surgery.

Johns Hopkins was very oriented towards cardiac surgery and Dr. Blalock thought that anybody that didn't want to do cardiac surgery was not very interested in academics. He was very blunt about that. In fact when I told him I wanted to work on an area that had more to do with injury and metabolism and he said, "Where did you get a crazy idea like that?" I said, "From reading your book." He said, "That's old stuff."

He said he would help me get a job. I was supposed to go to the lab the next year, but if I didn't want to go work with Dave Sabiston, he would help me get a job.

He didn't think I was destined to go through the whole residency if I didn't see the world the way he saw it. He is a lovely guy, not mean, just speaking plainly.

Dr. Blalock got me a position at the NIH, which was wonderful. It allowed me to move my research career a long way and got me more firmly interested in things endocrine and metabolic. I decided to go to Cleveland to complete my residency. William Holden was the chief there, and that turned out to be a wonderful move. In Cleveland, I fell under the spell of several mentors, the principals being John Davis and Bill Drucker, who both turned out to be future presidents of the AAST. That's how my introduction to trauma began. I still didn't really think I would do trauma as a career because I thought I was going to do nice, fancy elective parathyroids and adrenals.

Then some funny things happened at Hopkins and I ended up running a task force on how to run the emergency department. The president of Hopkins and I were good friends; and he said that he thought that I should be capable of making peace between medicine and surgery, who had been fighting over the emergency department for about 30 years.

We recommended a matrix management approach where nobody was the boss. I got to present that to the Hopkins Hospital Board of Trustees, who rejected it unanimously and dismissed me from the room. They told the hospital president that he should make me the head of the emergency department so they could target me if I didn't solve the budgetary problems.

So that's what they did. I suddenly became the head of a department that hadn't existed. At the same time they broke up the hospital budget and I got a big chunk of it. All of a sudden I was doing something I had no training for doing. It was more and more administration. I also saw that the junior residents were really being misused in the emergency department, doing stuff that probably could have been triaged out if we had nurse practitioners, which had just come on the scene. But we did have nursing aids who were of limited use, because nobody would let them even take a blood pressure. All they were doing was changing sheets and bed pans. I abolished those positions and hired five nurse practitioners who solved a lot of the problems by doing the triage in the emergency department. They took care of minor things and got a lot of people diverted from the ED to a walk-in clinic. We cut the number of visits down from 120,000 a year to 90,000 a year.

LIVINGSTON

Dr. Gann, what years were this so people can put it in context?

GANN

The early 1970s. When emergency medicine happened, Dr. George Zuidema decided to add an extra division, emergency medicine and trauma. I ran that until 1979, my last two-and-a-half or three years that I was at Hopkins. During that time I had been very active in organizing the trauma system here.

Although part of my job, not publicly announced, was to keep Dr. Cowley from getting

everything. I was a failure at that.

I subsequently got invited to come look at the surgery chairmanship at Brown at the same time that our four kids were about to go to college. They were pretty close together with twins in the middle. I didn't know how I was going to pay for that on what Hopkins was paying me, so Brown looked very attractive. It was a brand-new department.

I was at Brown for nine-and-a-half years and during that time we built the trauma center. We achieved a reasonable degree of organization in a very small state. I took trauma call every fifth night because nobody else would do it. I figured if I wanted a mostly volunteer staff to take trauma call I was going to have to do it too.

I took call up until almost six months before I left. I loved it. I would get up in the middle of the night with no problem and come home at around 4:30, knowing I was going to get back up at 5:30 or so. But instead of going back to sleep, I started to lie in bed trying to think what I could have missed and stuff like that. At that point I decided it was time to stop.

LIVINGSTON

So it sounds like you got into trauma in a sort of backwards way and not completely by design.

GANN

Yes. But once I got into it, I loved the challenge. I loved having to operate when you didn't know everything already, where ordering other tests was not one of the options.

My residents also got exposure to all what I was doing and that has turned out pretty well.

LIVINGSTON

It sounds like Dr. Blalock didn't consider trauma or anything but cardiac much of specialty.

GANN

Trauma wasn't anything that people did there. Usually the most junior person got stuck with running the emergency room and the residents really did the trauma surgery.

LIVINGSTON

What do you think was the best career advice you received?

GANN

I guess the way John Davis put it was, "Don't let anybody tell you what you can do or can't do." Useless advice for a junior faculty member dealing with a chair or division director. He said, "Know what your capacities are and do what you need to do." That's basically how I've lived, so it worked out very well.

LIVINGSTON

Any particular bad advice you got that thankfully you didn't take or maybe you did take some of it?

GANN

The advice I really needed, but either I wasn't able to hear it or didn't take was, "Don't do so much." I just kept adding things to what I had on my plate and figuring it would sort out in the long run. And it more or less it did.

LIVINGSTON

From a scientific perspective of all the things you've been involved what are you most proud? How do you think it improved trauma care?

GANN

Actually, I think I'm going to be proud of the work we're doing now. I hope we're going to get it published this year. As you probably know, in the history of shock everybody said "shock was the road to death." That was all that was known about it, from the one of the first descriptions by Celsus in about 40 A.D. all the way to the twentieth century. Suddenly biochemistry emerged on the scene and people began looking for a toxin in shock that was causing everything.

The first thing they discovered was histamine. But people typically didn't get hives. One after another a new molecule was considered as it came along. None of them was a satisfactory explanation. The technology to perform the separation or identification of really small quantities was not available.

At that point in time, Dr. Blalock was at Vanderbilt, and he showed that fluid accumulation in injured tissues could account for a lot of what happened, and that it was basically plasma that was leaking into wounds. He said you didn't need to postulate a toxin, and that's how fluid therapy came in as the principal treatment in shock. But, as everybody who is taking care of people in shock knows, while most of the time fluid works, sometimes it doesn't.

When it doesn't, we still don't know what has gone wrong. In the '60s, Dr. Tom Shires discovered that the sodium pump was paralyzed following shock at around the 25% hemorrhage mark. At that point I was studying cardiovascular stabilization after hemorrhage. We found that the reflex to raise blood pressure, was primarily hormonal and a little bit neural, was 100% effective up to about 25% hemorrhage. After that point it always failed.

We had a talk at a meeting about this 25%-thing. His son, Tom Shires III, gave a paper at the AAST when I was chairing the session in which he showed that red cells got this same problem. Red cells don't have nerves, obviously.

Something had to be telling the sodium pump to stop working and we figured it had to be something in the circulation. My laboratory was fairly large and made up of a lot of fearless people. I was very fortunate to have had NIH support pretty consistently from the time I was a resident. We decided to just see what we could learn. We made some mistakes and had some

detours. The biggest one was initially identifying it as a protein.

I must have been the author of a half-a-dozen papers or so talking about this protein that caused all these bad things and then we tried to purify it. We purified the protein and discovered it was a piece of albumin.

Ed Deitch had the same experience attempting to isolate a toxic factor, but he lost the active fraction completely. We used a little bit different technique and we captured active fraction. We've isolated it for hemorrhage. We've purified and identified it. Most important, we have a method now, for measuring it with mass spectroscopy.

So we're measuring down as little as 10^{-15} grams (femtograms) of this stuff and it's active. Its activity is maximal at about 10^{-9} . We've now shown that it's the same material in rats and pigs.

We're now collecting human samples, which is a problem because the substance is not stable, although we know what it is converted into. It's a messy kind of method if we can't get the samples quickly. We also have an antibody. We found a man in the National Institute of Aging who is interested in the same kind of compounds that block the sodium pump. He has an antibody which is not totally specific but turned out to cross-react with this substance that we have isolated.

We've shown that it can reverse shock even when the animals are within five minutes of dying, after the blood pressure has come down into the 20s. If we give half a milliliter of antiserum at that point, the rats just respond beautifully. They wake up. They chew on their restraints and try to get up.

LIVINGSTON

Anything in your career that you thought was really going to be really great that you wish you didn't think it was such great stuff? Something you championed or said at a meeting that in retrospect your thought, "I wish I didn't say that."

GANN

I think everybody has had a bit of that in their career. I gave my first paper at the American Surgical in the late '70s and advocating total thyroidectomy, among other things, as a way to handle people with previous irradiation. The president of the association at that time was a distinguished thyroid surgeon at the Mayo Clinic and really tore me apart in front of everybody. I knew he was wrong and I was right, but of course I kept my mouth shut.

But I think that's probably as bad as I got. I've been pretty careful and fortunate not to get too involved in stuff that was really wrong.

I've told you I was obviously wrong about there being a shock protein, but we had to just do more research to explain why I was wrong. We still had to separate the protein from the active stuff, so ultimately I think we're on the right track.

LIVINGSTON

What do you think the two or three big advances in trauma care has been in your career?

GANN

I think one of the really biggest things was the whole business of what has now turned into damage control surgery. Bill Drucker and I are writing a review that is almost finished the *Journal of Trauma* series for the 50th anniversary of the *Journal*. We probably have the last paper that hasn't come in. It's finished; the problem is that it is more than twice as long as the *Journal* will publish.

I think that one of the most exciting things is the whole concept of permissive hypotension started with Ken Mattox's group. Ken was influenced by the way you treat people with ruptured aortas, allowing them to be hypotensive. I think that that's really changed care a lot, particularly intraabdominal packing and getting out with liver injuries. This has led to a tremendous increase in survival.

I think I probably would say number two was the understanding that sepsis was not necessarily the same as infection.

It certainly has changed what we do and how we do it and sometimes with success. I got involved with a multi-institutional study for a drug company using an antibody to TNF, which was supposed to save everybody. Turns out it killed a certain number.

LIVINGSTON

The practice patterns of trauma and emergency surgery have changed considerably over your career. What strikes you as the significant changes?

GANN

Certainly the evolution of group practice has made a lot of things possible. I consider myself very lucky to have always been part of one. One of the things that set me free was that I decided early-on that I didn't want to see how many cases I could do so I could feed my family. I have always worked for a salary. So I liked the emergent structure before it emerged. That's the way I have worked and that's the way I set up the practice system at Brown when I was there. Bill Cioffi is still using that. I think that that certainly is a major change, the whole idea that nobody has got to be responsible for everything all the time. It makes it much easier to stay in the game longer.

LIVINGSTON

What's been the part of the career that has been most rewarding?

GANN

People. Teaching is absolutely the most rewarding thing I have ever done.

LIVINGSTON

What has been the most difficult?

GANN

I think everybody that has taken over a new department of surgery has had the experience of wrestling with the people who have been there for a while and are very concerned about the economic consequence of any changes. There is the potential for conflict that is not always avoidable.

I was fortunate for a while in the Providence situation to be able to design a system with the help of a friend of mine who did a lot of business organization, so that people's incomes were not being damaged with my plan. I put off the inevitable for a good while, but as we began to fill the faculty, we began to account for a greater proportion of the surgical admissions. The last several years I was there, the full-time staff admitted over 40% of the surgical patients, and that created a tension between the university and private groups.

LIVINGSTON

What advice do you give residents or junior faculty who want an academic career in trauma?

GANN

I feel that the whole acute care surgery thing is going to change what we're talking about. I think it solves the long-term problem of where are the cases going to come from. They don't need to do what I did, which is have another entire specialty. I would never have survived at Hopkins if I hadn't had my endocrine practice. I think that the emergency surgery is just a natural process.

LIVINGSTON

So you see this as a great opportunity?

GANN

I think it's a fabulous thing. I wish I had thought of it first. I thought of it as potentially hurting a residency, and I think it would if people couldn't figure out how to cooperate.

LIVINGSTON

But you changed your opinion on that?

GANN

Pretty much. Tom Scalea really started doing it at Maryland while I've been there. I was running the fellowship at Shock Trauma before he came. I thought it was going to really hurt the surgical residency at Maryland, but it hasn't. The Shock Trauma Center in Maryland is more separated from the department than anywhere else that I know in the U.S. However, they have evolved a system that preserves critical experience for the residents. I think that if they can make it work there, it will work anywhere.

LIVINGSTON

What do you think the next great things are going to be in trauma, critical care or acute care surgery in the next ten years? You get to predict the future.

GANN

Well, it should be obvious from our talk that I hope it is the stuff we've been working on. But I have no idea what the probability of that is. Some days I think it's zero and some days I think it's 100%.

LIVINGSTON

Would you make any changes in your career?

GANN

Well, since everything I have done has been so unintentional, I don't think so. What I mean to say is that I really feel I've been pretty opportunistic and I don't think that has hurt me.

I think that one good strategy is to make as few decisions that are irreversible as you can, and see what happens.

LIVINGSTON

Any changes outside the hospital?

GANN

It also helps if you happen to marry somebody you want to stay married to. I think that makes a very big difference. It was and is fundamental to my career. I couldn't have done it without the kind of support I've had, not to mention somebody who is willing to live anywhere, almost. I learned early on that I've married somebody that's smarter than I am, and I like it that way; but she feels the other way about it, and that makes it nice, too.

LIVINGSTON

Besides working on your lab projects, what are your future plans?

GANN

I'm hoping to retire. I'm barely keeping a hand into the laboratory, but I've been lucky I've to work with a physiologist, Dan Darlington, for 20 years and he is really carrying the project now. That's really, really good fortune.



H. DAVID ROOT, MD
PRESIDENT 1988–1989

DR. FREDERICK A. LUCHETTE

How did you decided on a career in surgery and, secondly, your interest in trauma surgery?
What were the factors that lead to these decisions?

DR. H. DAVID ROOT

My background is that of growing up on a farm and having to work with my hands and solve problems plus taking care of animals. I had a curiosity of how things work and being able to recognize and solve problems from childhood. Medical school sounded exciting and it was. When I was finishing medical school, I was wondering what would be the most fun and rewarding. Surgery seemed to me to answer those two requirements: the satisfaction of helping people by surgical means.

I was intrigued by a program at the University of Minnesota under Owen Wangenstein, who encouraged research and development of ideas and advances in surgery or physiology. It appeared to be an opportunity to pursue my own curiosity of issues and trying to solve problems. Surgery seemed to be gratifying wherein one could see the end results of one's work.

My interest in trauma surgery, in particular, came by serendipity. The only trauma we were exposed to in my residency at the University of Minnesota hospital was an occasional broken heart of a coed. And we didn't have anything to do with trauma there except when my wife and I were in a motor vehicle accident and the surgical faculty took care of us.

I rotated as a junior faculty member at a city county hospital in Saint Paul. Then it was

called the Anchor hospital, named for a former CEO. It is now called Regions Hospital, a Level I trauma center.

It was at Ramsey County/Saint Paul City hospital where we received a lot of experience intrauma. And that's where I was "pushed off the dock," so to speak, and I had to "swim" in trauma with John Perry, a close friend and mentor. He was the senior faculty member there.

And so I got involved with the injured patients and became intrigued by all the answers we needed. Thus, developed my interest in trauma, as well as interest in vascular surgery, through research and clinical demands.

LUCHETTE

Now, Dr. Perry and Dr. Wangenstein were obviously influential mentors. Any other mentors that you would like to mention?

ROOT

Well, yes I think Richard Varco who was a senior faculty member at the University of Minnesota had great influence on my development. He was an excellent technical surgeon and stimulated all of us to develop our skills, much needed in treating patients with complex injuries.

The emphasis at the University under Wangenstein was on research. I worked in his research lab for two years. We largely studied GI physiology. My PhD dissertation was in gastric physiology and the influence of temperature.

Dr. John Perry was my major mentor in trauma. However, once I was accepted by the COT and became associated with skilled surgeons like Drs. Tommy Thompson and Don Trunkley and all the other wonderful members, I realized that they all had an influence on stimulating my interest and enthusiasm and enjoyment of pursuing trauma surgery.

LUCHETTE

When you were in training, there were a lot of specialties being established such as vascular surgery and cardiothoracic surgery. How did your peers view your choice to go into trauma?

ROOT

Well, trauma at that time was a non-entity. It was the sort of something that happened, but nobody really looked at it as requiring special attention and a lot of people died from trauma. And so it was really kind of ignored.

I was there at Minnesota when Walt Lillehei developed cardiac surgery. I really got into vascular surgery there under him and Varco. Gastrointestinal and foregut issues were the big clinical and research emphasis under Wangenstein. Gastric cancer was still a very serious and common problem which has since decreased in incidence. We treated many people with cancer of the esophagus and I got involved early-on with GI surgery as well as in the lab.

The early emphasis was on GI surgery. Even at that time, short-circuiting the small bowel was being performed by Varco to help decrease weight and cholesterol levels.

So cardiothoracic surgery was young and exciting. Vascular surgery was just develop-

ing, but the emphasis was on GI surgery, and trauma was just an incidental problem kind of interrupting the normal schedule of life.

It wasn't until the late 1960s that more emphasis was shifted to trauma. More surgeons began to recognize the need for managing the injured, even though Dr. Scudder in Boston began his work in fracture care in the 1920s.

I finished training in 1960 and went over to the Anchor hospital in 1963. The first saphenous vein bypass of occlusion arterial disease in lower extremity vessels had been done in 1949, but it was some time later in the 1960s that vascular surgery began to develop. This diverted attention from the needs of the injured. It was early in the recognition of the importance of trauma to our population.

I saw, in 1953, the first cardiopulmonary bypass by cross-circulation. The mother was connected to the child providing its circulation while Walt Lillehei was correcting the Tetralogy of Fallot. Simultaneously, John Lewis was developing and using hypothermia cardiac arrest for correcting SD. It was a very exciting time.

LUCHETTE

You have made many scientific and clinical contributions to the field of surgery and in the treatment of injured patients over your career. Which contributions are you most proud of?

ROOT

I would have to say peritoneal lavage. That was an idea that we developed at the trauma center in Saint Paul and pursued it in the lab and did some interesting work in peritoneal response to various forms of injury or irritation.

Of course it has been superseded by CT scans for evaluating torso injuries. This has improved out care of injured patients a great deal which has helped us avoid non-therapeutic laparotomy, a disadvantage of DPL.

I think imaging has changed the relative importance of DPL. But it was fun. The pursuit of ideas is always fun and exciting.

LUCHETTE

Most would agree that DPL was a major advance in the evaluation of the severely injured patient, particularly when you didn't have a reliable physical exam. It really changed the practice of trauma surgery.

ROOT

I think it did at that time. However, in 1973, the use of CT scanning of injured patients was championed by Don Trunkey. This was a major advance.

I guess the DPL was part of the leapfrogging forward in the early recognition of injury. Then of course came the changes in understanding what must be done for the patient... injuries not requiring surgical intervention. The system is not perfect yet.

LUCHETTE

As you look back on your career, is there anything that you were a huge advocate for that today you say it was clearly wrong for patients?

ROOT

Yes, one area in particular: bleeding from peptic ulcer. Post-stress gastric bleeding was a major issue before the gastric secretory inhibitors and proton pumps were developed. Gastric cooling was developed in the laboratory and applied clinically.

In fact, I wrote my PhD thesis on the influence of gastric cooling on secretory activity of the stomach and production and activity of both pepsin and acid. Along with that, we were studying the influence of temperature on pepsin.

So people who came in with bleeding gastric or duodenal ulcers were treated with gastric cooling, putting a balloon on a long tube down into the stomach and circulating cooling fluid to slow down circulation in the mucosa and with the tamponade effect to stop bleeding. It was moderately successful.

But then Dr. Wangenstein pushed the envelope and decided that maybe with gastric freezing the mucosa could be damaged to the point where it would stop secreting, and that might be a long term solution for peptic ulcer.

That was not a good time in surgery. I wish that I hadn't been so involved with that idea, although some of my colleagues became more involved with the technique.

Unfortunately, it was not done under good, controlled conditions, and lacked monitoring of gastric pressure or temperature. So it was a shoot-from-the-hip kind of thing and not one I look back on fondly.

LUCHETTE

What do you feel are the two or three greatest advances in caring for injured patients in addition to DPL?

ROOT

I suppose recognition of the mortality of major torso and neurologic injury and recognition that pulmonary contusion and pulmonary injuries are of major importance. Prompt transportation by trained personnel to appropriate trauma centers is one. Detection and attention to early management of the patient in these designated trauma centers has been an advancement.

The evaluation and prompt support of the patient in the ED and appropriate intervention has been a major advance. Understanding the physiology of critical care management has been a major advancement.

The treatment of the patient with pulmonary contusion by ventilator support and appropriate bronchoscopy to minimize the development of VAP has reduced mortality.

The early detection and intervention for life threatening injuries and the better care in the critical care unit have been the major issues. Studying sepsis and appropriate management is still a work in progress.

LUCHETTE

What do you feel are the major changes that improved patient care?

ROOT

I would divide that into two areas. First, the education and training of surgical and emergency medicine residents to understand and manage injured patients has and is producing practitioners better able to treat injured patients than two decades ago. They expect to be involved and committed in their hospitals to taking calls for trauma.

Second, in the development of a surgical subspecialty of acute care surgery, so that surgeons interested in treating the acutely injured and ill gain recognition and hopefully appropriate compensation for the demands of taking call for trauma.

LUCHETTE

What are your comments regarding hospital-employed physicians' impact on the profession of medicine?

ROOT

This is a very demanding question and one which I cannot address adequately in short space. However, speaking from a surgical standpoint, I think surgeons are a different breed than other specialists. I think we all enjoy taking care of patients and being busy. I don't think it is going to change the practice patterns of surgeons as much as it may other non-surgical specialists.

From talking to some of my general surgery colleagues, many are not rebelling but rather seem to feel relieved from the complexities and headaches of running their office, their billing, the costs of the ever increasing complex computers and communication systems. Because reimbursement for their services by Medicare and Medicaid is continually threatened by annual regulations, and especially now that we are beginning another roller-coaster ride on Obamacare, most feel relieved with a more predictable fiscal life. Those specialties who enjoy very huge incomes at present—e.g., orthopedic, neurosurgeons, cardiologists, and interventionists—will need to negotiate rigorously to maintain their incomes and thus will rebel at the prospect of being salaried. The potential for reduced productivity by physicians in the absence of income incentives must be monitored by, as I said, surgeons enjoy being busy with patient care so I predict that we can accept being salaried if fairly compensated for our preparation/training and work we do.

LUCHETTE

You have enjoyed many rewards throughout your career, but at the end of the day, what brings you the greatest joys?

ROOT

In addition to the satisfaction of patient care, one of the satisfying aspects is having a young

person come in as a junior resident and seeing him/her blossom and become passionate about patient care and pursuit of ideas. One of the fun things in my life has been pursuing ideas and uncovering the wrappings of a problem and finding out what is “inside the box.”

It’s been very rewarding and I look for it in young people who go through the residency and in their senior year have developed into interested and devoted surgeons that are predictably going to do well and patients will do well under their care.

Of course, the other satisfying thing is my participating in the development of the trauma center verification program. It is so satisfying to travel to different centers and witness their starting with some problems in their system, and then coming back in a year and seeing how well they’ve resolved these issues, and see the accomplishments and the satisfaction and the passion of the trauma center director in having a smooth-running organization.

So, it’s been satisfying to think that in the verification program that we’ve made a difference in the care of the injured. And it’s been fun not only to see the program develop but to meet wonderful people all over the country who are interested in trauma care.

LUCHETTE

What are some things that keep you up at night as you watch the evolution of trauma care and acute care surgery?

ROOT

Well, I suppose realizing that trauma is a totally preventable disease keeps coming back to haunt me. You know, in the middle of the night when I’ve been struggling in the OR to salvage an injured patient and I think, “My God, we shouldn’t be here. This was totally preventable.”

And that’s what frustrated me over time, to realize that we haven’t done enough in trauma prevention. And maybe we can’t do any more because it takes education of the public and we haven’t done that well enough.

Of course the other is the unsolved issues of the profound effect of prolonged shock on capillary leak, development of multiple organ failure, and final pathway of “sepsis.”

It’s bothersome and tragic to see a 20-year-old with declining multiple organ function and realizing that the outlook is poor. So those are the things that bother me the most in trauma care.

LUCHETTE

I would like for you to offer the readers some life coach advice on how to balance their careers with their personal lives.

ROOT

Well, I think we should emphasize that they should get themselves the best possible clinical training they can in a program center, where there is opportunity in acute care surgery and they should seek training with productive research in evidence.

The resident should attach himself to a prominent productive staff member who has

some exciting research projects available.

Getting involved with research, learning research techniques, getting the excitement of pursuing ideas, and developing a passion for some particular direction of their own is something that will be exciting and arouse hidden interests. Finding a mentor in a department is important.

And taking some additional electives such as a rotation in physiology and biochemistry to broaden one's understanding of organ function and the current frontiers of biochemistry and physiology. Perhaps in that way, they can develop their own ideas of attacking the multiple problems such as sepsis.

So getting involved in a good department when there is active and exciting research in progress would be my advice.

Don't try to go through training in record time because you're really there to develop yourself and of course develop your clinical skills. But also to develop your curiosity and your passion for pursuing ideas.

So far as lifestyle, that's a personal and important one. I look back upon my own life and I realize that I wish I had taken more time to travel with the kids and develop their own individual interests.

We did a lot together and had a lot of fun, and we have a close relationship, but I could have done better. So my advice would be: take time for your wife who bears the burden of managing the house and the kids.

It is more difficult for her when you have to move your career from one city to another than it is on you because you go from one group of surgical colleagues to another and your life doesn't change that much, but it does for her. So respect your wife's input and take time for her.

LUCHETTE

What you think are the challenges and opportunities for the future of trauma and acute care surgery?

ROOT

Well, I think one of the major responsibilities and opportunities we have is to educate the public to take trauma seriously as a major health care issue and a tragic killer of the young.

We must take time to pull together studies of the longitudinal impact of trauma on the lives of the patient and their families. While head injury is the obvious example, injuries change patients forever. It may ruin them totally as productive happy individuals.

Even major fractures like pelvic fractures, long-bone fractures can change the lifestyle and comfort of patients. So I think we need to educate the public so that they will take trauma seriously and, therefore, support our efforts in prevention and developing trauma centers.

Thus, we need to emphasize prevention of injury. Perhaps the public will be willing to accept some limitation on their lifestyle, like texting and driving and drinking and driving, if we educate them to the dangers of both.

We have to continue to stimulate interest in careers in trauma and critical care. And the American College of Surgeons can help in lobbying for adequate compensation for acute care surgeons, recognizing its major importance in the overall healthcare industry.

The development of acute care surgery as a specialty should provide a base for surgeons who are willing to commit to the intensity of acute care. Developing the identity of acute care surgery should provide adequate compensation for the extra efforts required.

LUCHETTE

What do you see as the of trauma and surgical critical care and acute care surgery will look like in 20 years?

ROOT

Well, I'm not sure. You know you get so imprisoned by current thinking and activities and patterns that it is hard to break the bonds of that. A wish list can help.

I think some better circulatory support immediately in the emergency department would be something that we should be able to develop because it's so commonly utilized for elective cardiac surgery and for people with an acute PE.

So perhaps we can shorten the time when the patient is in shock. Rushing to the operating room is certainly important but sustaining a blood pressure of 90mm during transport and preparation for surgery could be helpful in preventing MOF.

We will develop better support of patients with multiple organ failure. Attempts at circulatory support with ectopic hepatic xenografts have been tried, but need refinement.

All the IL-6, IL-10 and IL-12 issues and TNF have not solved the mystery of sepsis. I predict that the mysteries of sepsis will be clarified through understanding the mechanism of cellular communications.

Trauma prevention should become more effective over the next couple of decades if we do our job right.

LUCHETTE

If there was anything you would change about your professional career, what would it be?

ROOT

Well, I suppose earlier involvement in surgical critical care, earlier understanding of the pathophysiology of hemorrhagic shock; I should have spent more time on that.

I wish I had spent less time in peptic ulcer studies. The antrum is important, but we spent so much time on that and the vagus nerve interactions that we didn't really have time to do anything else.

For example, I witnessed what happened in the physiology department at the University of Minnesota, where the pacemaker was developed. It was in the physiology lab of Jack Johnson. And then the cardiovascular residents took it over. Vince Gott and others developed it clinically.

I should have spent more time in physiology and gained a broader viewpoint on organ function, and the impact of trauma and circulatory problems.

LUCHETTE

You touched on how you wish you had spent more time with your family, but is there anything else outside the hospital that you would have changed?

ROOT

I think it really is centralized on taking time for those people who are closest to you and enjoying them with time together.

I have had no political ambitions such as a run for the senate. I can't think of other things other than family and time with them.

LUCHETTE

What are your future plans, clinically, academically, and personally?

ROOT

Well they are narrowing considerably. The "canyon" is growing narrow at this point. And you know I'd like to spend as much time as I can in departmental functions such as trauma M&M, grand rounds, research conferences, and things like that.

I haven't taken call in the ED for trauma in several years because of my wife and sister. I won't try to do surgery any more, which will be safer for patients. I will miss it.

But maintaining involvement with clinical issues and reviewing research projects and that kind of activity still stimulates me. I think I'd like to do that and mentor residents.

I'd like to publish some of the data that I've accumulated on our trauma site visits and trauma center verification. Now that my sisters and wife are gone and my kids are grown up, I've been thinking about returning to flying.

I've been reviewing the local ski slopes. And I travel some. My grandchildren are almost through college so I've got a little more time for me. And I always enjoyed flying so I might take that up and get my instrument rating.

But I want to maintain primarily my involvement with our department activities and enjoy the productivity of the young people in the department. We have some wonderful young people in our trauma division who are blossoming and I want to be around to see that.

LUCHETTE

Are there any last comment you want to leave for the readership on the 75th anniversary of the AAST that we haven't touched on? Any last closing comments?

ROOT

Well, trauma is a very important public health issue and it's killing a lot of young people that should have an opportunity in life. So trauma deserves the attention of all of us. And for those

who want to pursue it, it can be a wonderfully exciting life, frustrating, yet satisfying life.

If you can preserve the life of a 20-year-old, you have provided 60 years of life to him or her. So I would certainly encourage them and the development of acute care surgery which may help focus attention on the importance of trauma surgery and other acute care issues.

For the residents, don't consider the money issue as most important and thus aim for the best paid specialty. Go where your heart and interests take you and develop a passion and enjoy it because if it is fun to go to work, then life will be fulfilled.

So don't give up easily. You can have a major influence on people and on their lives. And do the best you can and learn how to manage your time so that you can get the most out of it and yet give time and attention to your family too.



P. WILLIAM CURRERI, MD
PRESIDENT 1989–1990

DR. FREDERICK A. LUCHETTE

How it is you became interested in surgery initially and then focused your career on trauma surgery?

DR. P. WILLIAM CURRERI

I attended Swarthmore College, just outside of Philadelphia. I was in the honors program there, which is kind of unique in that instead of organized classes we had student/professor seminars, and then were examined by outside faculty from other schools in regard to what we were majoring in. As part of that program, I had an opportunity to work with a PhD at the University of Wisconsin during the summer between my junior and senior year and became really enamored with doing research and science. As a result of that experience, I decided to apply to medical school and was admitted to the University of Pennsylvania where I was determined to get an MD and then follow that with a PhD.

I had the opportunity to work summers with Dr. Seymour Cohen in his laboratory as a biochemist and was really on course until I got to my clinical years at the medical school where I really fell in love with the ability to render treatment as a surgeon. So as a result of that I got an internship which was at the University of Pennsylvania which was a rotating internship, as most internships were in that day. During that rotation, I felt very strongly that my future was in general surgery.

As a resident for five years I had the opportunity to work with Dr. William Fitts who was one of the founders of the AAST and a past president as well.

Dr. Fitts had experience during World War II during his residency with trauma and he was very involved in trauma both at the University of Pennsylvania Hospital as well as the Philadelphia General Hospital, which received a great deal of injured patients. He was really a jack-of-all-trades as far as trauma goes. He did orthopedics. He did plastic surgery. He did most everything that was involved except for neurosurgery as it regarded trauma patients. He was a great inspiration to me.

When I finished my residency, I was recruited by Dr. Moncrief to the U. S. Army Institute of Surgical Research. As you know, that is the military's burn unit. There I ran into Dr. Basil Pruitt about a year after he returned from Vietnam. I spent almost three-and-a-half years at the institute where we had an opportunity to not only treat hundreds and hundreds of patients that were burned in Vietnam but also to do basic and clinical research.

Following my tour at the Institute, I went on to the University of Texas in Dallas and had the opportunity to work with Dr. Tom Shires where I continued to develop my interest in trauma while continuing to do general surgery.

So it was a long process but it was very worthwhile. I really decided during my stay at the Institute of Surgical Research at San Antonio that my interests in trauma were cemented.

LUCHETTE

Were there any other folks who were influential in guiding and assisting in the development of your career?

CURRERI

Well, of course I would have to say that Dr. Jonathan Rhoads and Dr. Isadore Ravdin were both influential as chairmen at the University of Pennsylvania. They were certainly very important in my development.

They also gave me the opportunity during my residency to pursue basic research in the laboratory. I did that for a whole year between the second half of my first year of residency and the first half of my second year of residency. I think those were the most important mentors that I had in addition to the ones I've already mentioned.

LUCHETTE

How was it viewed by your peers and mentors that you were going to go off and do burns and trauma?

CURRERI

Well, my peers were quite supportive. I must say that they encouraged me all the while. The non-trauma mentors were okay but they thought it was kind of a narrow interest at that time when most trauma was treated by general surgeons in community hospitals. It was before the development of trauma centers.

LUCHETTE

Which of your scientific contributions are you most proud of and how do you feel it influenced the field of trauma and burn care?

CURRERI

Well, I think that the most important clinical contribution I made was the realization of the hypermetabolic response to trauma and burns and to calculate the nutritional requirements during that period of hypermetabolism. That paper was reported in 1974 which subsequently resulted in a precise formula for nutritional requirements post-injury for burn patients.

LUCHETTE

Were there any topics that you championed early-on that, as you look back now, you say that probably wasn't the right thing to be up on the soapbox advocating for as good patient care?

CURRERI

You know, I really can't think of any. Obviously, there are things that initially look attractive but subsequently prove to be in error. I was fairly conservative as far as what I championed. For that reason I can't remember anything that I would change.

LUCHETTE

What would you view as the two or three greatest advances that you've observed during your career?

CURRERI

Well, first I would have to say that the development of surgical critical care and the construction of critical care units has been one of the greatest advances. At the time that I became interested in trauma, it was primarily done by individual practicing general surgeons. The development of critical care units brought in team members with various areas of expertise that allowed the best of care from experts all working together.

Secondly, I would say that the improvement of pre- and post-traumatic respiratory treatment improved substantially by the use of specialty instrumentation in the ICU as well as improved monitoring and improved measurement of respiratory difficulties that occurred either pre- or post-injury.

Thirdly, I would say that there was, has been great improvement in not only fluid resuscitation but also in terms of the parameters that are routinely measured today to optimize fluid resuscitation as well as what fluids to use.

So I would say those are probably the three most important advances in trauma, bringing together expertise to care for patients in a team environment that allows the best of all specialties to participate.

LUCHETTE

What changes have you noticed in practice patterns during your career regarding trauma, burns and surgical critical care?

CURRERI

Well, I really think there has been a gravitation from general surgery to sort of do everything in regard to the treatment of trauma to specialty practitioners working as a team to ensure the very best of treatment and I really believe that that practice pattern as well as the development of people that have a great empathy for the treatment of trauma and burn patients.

LUCHETTE

At the end of the day what activity brought you the greatest joy?

CURRERI

I would have to say without question the mentoring of surgical residents and the joy in watching their development as they advance through their residency and pursue their long-term vocational aspects.

LUCHETTE

In contrast to that, what keeps you up at night?

CURRERI

I think the thing that was most distressing to me was at the various universities where I worked there seemed to develop a posture of political infighting between the university administration and the chairmen and sub-chairmen of medical and surgical departments. I think that much of this was considered by the administration as losing power and much of it was due to the extraordinary success of the departments to initially have fairly large incomes which they could devote to research and development of laboratory investigations. That was the thing that most concerned me as these power struggles continued.

LUCHETTE

Now you mentioned the joy that mentoring young residents and faculty gave you. I'd like to give you another chance to offer advice to the young academic folks coming along now that will lead the future for us, what advice would you give them as they begin on their academic careers?

CURRERI

Well, I think that it's important for residents that are seeking academic careers to have a three-legged stool to stand on in the pursuit of clinical, teaching, and basic research. This combination is often neglected by some academic surgeons. They only have two legs to stand on or in some cases only one.

It's important to have a balance between these two because without a clinical practice you have no idea what the problems are; and thus, you can't develop a basic research program successfully. Secondly, if you don't participate in teaching, you will find yourself falling behind both clinically and from a research aspect.

LUCHETTE

I have heard some folks say in today's world it is difficult for one individual to be a triple threat, rather a department should be. And how would you respond to that?

CURRERI

Well, I think that it is not hard to participate in a department, but I do believe that if you're going to be an academician, if you pursue a clinical course you can always accompany that with clinical research. Teaching, I think, is what academics is all about. So I would say that as much as possible it's important to encourage a three-legged approach.

Now, it doesn't have to be equal-legged. It can be primarily clinical practice and teaching and a little bit of clinical research or basic research or it could be largely basic research with some teaching and some clinical interests.

Another thing I think is important to advise is that there has to be a devotion of time to spend with your family. Too often I see clinicians spend so much time at their clinical pursuits that they either lose contact with their family or they have an early burnout and abandon the academic life. So there has to be time that you may devote to outside activities and those should be valued.

LUCHETTE

What do you see are the greatest challenges and opportunities for this new specialty of acute care surgery?

CURRERI

Well, I think that the idea of trauma units and critical care units has only been around for about 20 to 30 years and that that was fairly limited for long periods of time. I had the good fortune of being able to work in some of those early developments but I think that they will continue to expand across the country. I think they are as important as the development of trauma systems.

Now, the one thing I see as a real challenge with the new health legislation that is currently being enacted and being discussed for the future is that it's going to result in low remuneration for awful long hours of toil. This really concerns me because it may push surgeons into non-trauma specialties that are primarily elective and do not require the treatment of a lot of low-income people who tend to get into traumatic situations more often than those who are better off from an income standpoint.

LUCHETTE

What do you think trauma, burns and acute care surgery will look like in 20 years, tell us what your vision is?

CURRERI

Well, my vision is dependent on the financing of medical care, in general, in the nation. I fear that there may become a time when patients with trauma or burns are not forwarded to specialized units with the greatest expertise because of the inability to accept such patients into the emergency rooms. So that is my greatest concern.

LUCHETTE

When you reflect on your professional career, is there anything that you would change and what would you change related to your life outside the hospital?

CURRERI

I couldn't think of one thing.

LUCHETTE

What are your plans for the future both professionally and personally?

CURRERI

Well, I've been president and chairman of the board of a company that has, for 24 years, administered to various surgical societies, both nationally and internationally. Our people were with me at the University of South Alabama, and we all are approaching retirement age. We are going to retire in 2015. I will be at the age of 79 and everybody else will be on Social Security. We pretty much have decided that at the expiration of our last contract we would close down.

LUCHETTE

Would you like to make any additional comments that we haven't covered in our conversation?

CURRERI

Yes. I would say this, that academic trauma and burn surgeons should enjoy every advancement that comes along and try to evaluate your own advancements in clinical care but also to participate in design and testing and sharing of such advancements with your cohorts via publication and/or forums. That will bring you great joy.



F. WILLIAM BLAISDELL, MD
PRESIDENT 1990–1991

DR. DAVID H. LIVINGSTON

Dr. Blaisdell, when you were a resident and junior attending, trauma was just thought of as part of general surgery. Is that a fair statement?

DR. F. WILLIAM BLAISDELL

Yes. That is correct.

LIVINGSTON

So how did it become such a large part of your career?

BLAISDELL

A substantial part of my training was at San Francisco General Hospital, and at that time the City of San Francisco had an emergency service which delivered all major emergencies in the city to San Francisco General. If they were later found to have private insurance and could be transferred, they were transferred to a private institution, but otherwise we received and took care of everything.

The city of San Francisco is only 49 square miles, and from about 1888, I think, it had its municipal ambulance service. The city ambulance service was the only one allowed to take care of casualties or serious sudden illness.

The city had five emergency hospitals and the ambulances were dispatched from those

facilities and if the injury was minor it was brought back there otherwise it was triaged to SF General.

San Francisco General at that time in my training was shared by UCSF and by Stanford. They alternated weeks taking all emergencies and during my training I was exposed to lots of emergencies. I was part of the Stanford residency.

LIVINGSTON

When did Stanford and San Francisco General part ways?

BLAISDELL

In 1960. Stanford Medical School was in San Francisco until 1959, when it moved to Palo Alto. A year later they severed their relationships with San Francisco General. I was raised on the Stanford service.

LIVINGSTON

Was trauma thought of as anything special?

BLAISDELL

Well, in days prior to the late '60s, San Francisco was a benign place and there were not much in the way of injuries. You couldn't drive a car very fast in the congested city, so there were no really major motor vehicular injuries. Local bar fights were the primary trauma and that involved assaults and stabbings far more than shootings. I'd say we might have had some kind of shooting once a week and a couple of stabbings a week.

But that was prior to all of the activism that occurred with the objections to the Vietnam War. We were the focal point for the regional protests against the Vietnam War. The interesting thing, of course, at that the same time it was discovered that one could treat psychotics with medications instead of institutionalization. It was about 1968–70 when all of the psychiatric hospitals were emptied and the patients were turned loose on the street with their illness supposedly "controlled" by medications. Both events happening at the same time suddenly changed the character of the city.

It seemed that violence quickly escalated and we had police departments being blown up. We had police officers being shot. There was an anti-establishment movement. The drug culture was introduced along with the insane being turned loose. People were taking these drugs and jumping off buildings thinking they could fly.

My tenure as a staff member started in 1956 at the General, and I came back as chief of surgery in 1966. That was also the introduction of Medicaid and Medicare, and it was thought that county hospitals were no longer necessary because of these federally funded insurance programs.

But within a year or two it was obvious that that was not true. With the increase in violence and the fact that SF General was the only emergency room in the city of San Francisco, it was clear that we were very much needed. Universities did not have ERs but had more

or less on-call places where someone could ring a bell and a sleepy nurse would come to the door and, if they had a doctor, the doctor would be called who might opt to see the patient in a little local facility, like Stanford Hospital. If not, they were referred to San Francisco General Hospital.

Emergency care didn't pay prior to the advent of Medicaid and Medicare. Emergencies were losing propositions and no private hospitals wanted them. It wasn't until the advent of federal insurance that the private sector began to realize that these patients could be charged and emergency rooms opened up all through the city. That was during the '70s.

I believe that over the course of, let's say 1968, the crimes of violence doubled. They doubled again the following year. They doubled the following year. We were confronted with such a mass of emergencies that we had no choice but to reorganize our surgical service to deal with casualties. That was the start of probably the first all city-wide trauma system in the country. The trauma, of course, came mostly at nights and on weekends, so you had to gear up and be sure you had 24-hour service for everything. We already had 24-hour laboratory, but we had to gear up our blood bank and we had to increase our anesthesia coverage to handle multiple casualties.

LIVINGSTON

Did you get any pushback from trying to do that from the private sector or the "powers that be" over the increased expense in covering the emergencies 24 hours a day?

BLAISDELL

Well, the private sector, once they discovered that emergencies could pay, a few administrators in the city made aborted efforts to try to break into the emergency systems, but it became apparent that the doctors in those hospitals were not at all interested in participating, so nothing really happened.

In one or two instances I can think of, one of our larger private hospitals kind of made an attempt to listen in on a police radio, and the thought was if an emergency happened near them, they would grab it. They got a few emergencies, but the care was disastrous. The threat of lawsuit and malpractice was so great that they folded their doors almost as soon as they opened them.

My biggest problem was getting adequate funds to support all these services. We very quickly got involved in all the politics of the city in order to improve our budgets. We were in the headlines all the time. We opened our doors to the press and explained what we were lacking and said, "We could have saved that life" if we had this or that. Those headlines and stories put pressure on the board of supervisors and the City of San Francisco to come up with the resources. They were constantly playing the politics.

LIVINGSTON

Who were your influences? Who were your mentors?

BLAISDELL

Well, from the standpoint of emergency or trauma care, my chiefs at San Francisco General, Carl Mathewson and in particular Roy Cohn, were my mentors.

Roy and Matty, as we called Dr. Mathewson, had come out of World War II with all the experience that World War II provided. Dr. Cohn himself covered our emergency week. For seven days, Dr. Cohn was always available on call for any emergency we had. When we had an emergency that required an operation, we had to locate him by phone and just tell him about the case—there was no paging system, no cell phones or anything. If he felt that we needed help, he would come in any hour of the day or night. He did that from the end of World War II until Stanford moved in 1959. So he was my inspiration from the standpoint of trauma care.

LIVINGSTON

What do you think is the best career advice you got?

BLAISDELL

Best career advice? Well, Richard Warren at Harvard—I rotated there for a year out of my five years of Stanford residency—opened up one of the first vascular services at the Boston VA. For various reasons, the local residents were not particularly enamored with the service because they didn't get to do much surgery. Dr. Warren did it all. Vascular was all brand-new, and I was fascinated by it, so I volunteered for several tours with Dr. Warren. Before I left I said, "Dr. Warren, I think I'd like to go into vascular surgery. What do you advise?" He said, "There is only one place to go. Go to Houston. Michael DeBakey and Denton Cooley are doing wondrous things there. I'll help you get a fellowship."

That was one of the first fellowships in cardio-vascular surgery in the country. With the help of Dr. Warren and my professors at Stanford, I obtained a fellowship there and trained in cardio-vascular surgery, which was excellent preparation for trauma care.

LIVINGSTON

What year was your fellowship, sir?

BLAISDELL

Nineteen fifty-nine to 1960. That was just the start of the real field. The first available plastic grafts just came in place. DeBakey introduced the Dacron graft just about that year.

It was an amazing place. DeBakey himself was doing something like eight major cases a day; five open hearts a day. I'm sure the next closest cardiac surgeon in the country was not seeing more than five a week at that time. They were amazing, very rapid surgeons, and the high volume experience was unique. I was very fortunate to be involved with that.

LIVINGSTON

What contributions are you most proud of and how do you think they influenced trauma care?

BLAISDELL

I think we were one of the first to recognize the acute respiratory distress syndrome. That was about 1964 in cardiovascular patients. Two years later when I went to the General, I saw the same thing in trauma patients. We started the first ICU in San Francisco at the VA Hospital to support our cardiovascular surgery, which was my first post after my training. None of the universities or even San Francisco General had a critical care unit at the time.

It gave us the opportunity to recognize this peculiar lung failure, and I think I published a paper saying these cardiac surgery patients are dying a respiratory death. Everyone assumed it was the stress of surgery. There was no direct ability to monitor blood gasses so you just prided yourself on observing patients. If the patient was blue, you recognized that they probably weren't oxygenating properly. The main thought of the day was that they were dying because the heart was failing. The reverse was actually true; their lungs were failing and that was affecting the heart function. We pounced on that.

LIVINGSTON

Wasn't that also the time that ventilators were becoming more available?

BLAISDELL

Our anesthesiologist absolutely refused to leave endotracheal tubes in patients even when we first established the critical care unit. It was a matter of personal pride to get the patient off the ventilator in the operating room. Getting that transferred to our ICU required a lot of convincing. In many instances, we had to hold on to the tube because we knew the patient was at risk for being in serious trouble. That was in 1960 and we managed to get access to a blood gas machine. It was a \$250,000 machine which was purchased to study gas exchange in emphysema. We showed that these patients were hypoxic and needed the ventilator. That was the advent of ventilator support, recognizing respiratory failure, and having a way to monitor blood gasses.

Some good stories came out of that. I advised one of my chief residents by the name of Frank Stuart, who became a famous transplant surgeon, to check the blood gas on a patient we had just finished a ruptured aneurysm. He did it and came back all out of breath and said, "Dr. Blaisdell, Dr. Blaisdell, the PaO_2 is 40." I said, "Stu, that's a venous PO_2 . You have poked a vein. Go back and do it again."

He repeated it and it came back with the same value. I said, "Stu, let me show you how to puncture an artery." I put a needle into the femoral artery and out came a few spurts of dark blood and the patient arrested. We posted that patient and described all his microemboli in the lung. That was the key to our recognition.

LIVINGSTON

Anything over your career that you thought was going to be a really good idea that didn't turn out that way?

BLAISDELL

Well, I can recall thinking that some of these patients might be better kept cold to lower their metabolic needs. Even when we put them on ventilators the patients still died. It wasn't until PEEP came along that we really made major inroads in saving these patients. So my thought initially was, if we could slow down their metabolism the need for oxygen would be less. We made a few aborted attempts to do that. I still think it wasn't that bad an idea, but the problem of cooling a patient was not very practical.

I can remember Frannie Moore coming to visit San Francisco. When I went to Harvard for the year, I trained with Frannie for eight months and four months with Richard Warren.

He came out to the VA and we were very proud of the critical care unit. We were trying to keep this one patient cool and Frannie lambasted us over this idea. I was embarrassed by that and that was probably the impetus to my giving up the idea.

LIVINGSTON

What do you see as two or three major changes that have occurred during your career?

BLAISDELL

The first was the organization and establishing standards for prehospital services and care.

The second was organization of appropriately staffed and equipped emergency rooms to deal with trauma. The backup of the emergency rooms with the ORs and so forth that were necessary.

It was about 1976, I think, that Don Trunkey talked to one of our former chief residents named John West in private practice in Southern California. John joined the staff of some of the big hospitals down there and immediately became critical of the lack of any organization for trauma care.

Anesthesiologists were not in the hospital. They had to be called when something critical came to the emergency room. There were no blood bank technicians available. Everything closed down in the evenings. He said, "This isn't right," and they, of course, said: "Kid don't bother us. We're the best hospitals in the country. Look, we've got all these outstanding surgeons and all these outstanding facilities."

So John talked to Don Trunkey and they said, "Why don't we look at coroners' cases in Orange County and compare them with coroners' cases in San Francisco and see how many preventable deaths there are in Orange County?" Immediately they found ruptured spleens, patients bleeding to death under observation with simple injuries like ruptured spleen. They described a 25% preventable death rate in Orange County and found, I think, a 1% rate in San Francisco County. They wrote that up in the *Archives of Surgery* (*Arch Surg.* 1979; 114:455-60). Orange County initially denied this difference existed and was forced to bring in consultants to verify the data. The consultants actually upped the preventable death to something like 30%. That one study was the stimulus for the development of trauma centers throughout the country.

So Don's contribution is something that I hope you are recognizing as part of all this.

Don we say is the “Saint Paul” of trauma by carrying the trauma message worldwide.

LIVINGSTON

What parts of your career were the most rewarding for you?

BLAISDELL

A little hard to say. From an academic point, I was most productive during my first six years when I was chief at the VA in San Francisco, but received great satisfaction with the development of the trauma center.

LIVINGSTON

What is your career advice for young surgeons who want to have a career in trauma?

BLAISDELL

I would say that it involves night work and weekend work. That’s the downside, but it is also the most exciting. My comments would be it’s the last bastion of general surgery. I mean trauma is a black box. You never know what you are going to be dealing with so that makes it extremely exciting and a chance to use all your talents. You have to encompass the whole field of surgery. You have to know neurosurgery. You have to know urology. You have to know orthopedics in order to triage, to bring in specialties at appropriate times.

My only concern is that general surgery itself, and trauma surgery specifically, is breaking down, so that I find that when I have gone to certain hospitals around the country, if a trauma patient comes in and has a thoracic injury, you’ve got to call the thoracic surgeon. If the patient has a colon injury, you’ve got to call a colorectal surgeon, and so forth.

I find that specialty breakdown much less satisfying than the ability to handle it yourself. Open the chest or open the abdomen and repair anything you find from vascular to bowel. It is those changes that oldsters like myself decry.

LIVINGSTON

Do you think that the reinvention of trauma as trauma and acute care surgery is a very positive step?

BLAISDELL

Yes, of course. That keeps the trauma surgeon involved in all aspects of emergency care which I think is a real positive thing. At San Francisco General it always was the way it ran.

LIVINGSTON

Where do you think trauma and acute care surgery is heading? You’ve already seen so many changes, what is going to happen next?

BLAISDELL

Boy, I don't know. I worry about reliance on evaluation with CT scanners and so forth and sitting at home looking at all the data on your computer and deciding whether this or that should be done without any direct hands-on intervention by the surgeon.

I can just recall a recent personal experience when my wife had colon perforation from diverticulitis. She has lots of allergies so she was on steroids. And we took her into the emergency room.. I expected them to call a surgeon and operate on her right away. But, no, the emergency physician saw her first and he said they were going to have to get a CT scan before they can call the surgeon. So they got a CT scan. Nothing happened. I said, "Well, where is the surgeon?" He said, "Well, the CT scan didn't show anything, Dr. Blaisdell." I said, "Call the surgeon."

A young surgeon came down. He said, "The CT scan is negative, Dr. Blaisdell." I said, "My wife is on steroids. She has generalized peritonitis. Operate on her." And reluctantly they agreed to do so. A number of hours had transpired and, by the time they operated on her, she had generalized peritonitis and necrotizing fasciitis and nearly died. That is an example of how reliance on something like a CT scan rather than examining the patient causes trouble. That is my chief concern.

One of the things that bothers me is that the kids, young women, get exposed to undue radiation. In appendicitis now, you can't do an appendectomy without a CT scan.

LIVINGSTON

Anything you would change in your career, sir?

BLAISDELL

No, I don't think so. I had a very, very great career. I had what I consider great training thanks to my exposure to three different hospital systems: Harvard, Stanford, and Baylor.

LIVINGSTON

What are your current and future plans?

BLAISDELL

I'm retired. I do a fair amount of writing but a lot of it is family history. Right now I'm doing a book with one of my sons who is an editor for one of the big publishing houses about the Civil War because my great-great-grandfather left a diary of his experience with the 12th New Hampshire Regiment.

LIVINGSTON

What battles were the 12th New Hampshire in?

BLAISDELL

Well, Fredericksburg, Chancellorsville, Vicksburg, Cold Harbor, Petersburg. And his regiment

was the first into Richmond near the end of the war.

So it was right on the top of everything. I have the regimental history and I have my grandfather's diary. It was extremely exciting to read all this history. We are basing the book on the nine guys from Pittsfield, New Hampshire, who were the same age and joined the 12th New Hampshire at the same time. The regimental history tells me what happened to all nine and my great-grandfather was the only one who emerged to retire with his regiment at the end. One died of disease. Three were mustered out because of disease. One was killed in action. Three others were so badly wounded that they couldn't come back.

The novel is following their careers. Of course we are making up the personal communications, but it is based on what we've learned about how men functioned at that time. I'm having fun with that.

LIVINGSTON

It's amazing that your great-great-grandfather kept a diary and that it survived intact all these years.

BLAISDELL

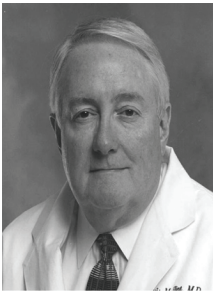
Well, better yet, it has a bullet hole in it. He was wounded severely at the Battle of Cold Harbor (May 31 to June 12, 1864). The family legend is that he was saved by the diary in his breast pocket. But examining it, it's clear the bullet went entirely through the diary and he suffered a chest wound but fortunately survived. I had fun following where he ended up. I got his retirement records and I could find out exact hospitals in sequence. He first ended up at Campbell Hospital in Washington, D.C. two days after the battle. It's kind of fun to imagine how he got there. We do know he was transferred by river steamer.

LIVINGSTON

Anything you would like to add about the 75th anniversary of the AAST?

BLAISDELL

No. I'll be there.



LEWIS FLINT, MD
PRESIDENT 1991–1992

DR. FREDERICK A. LUCHETTE

How was that you came to decide on a career in surgery and what was the motivation to pursue trauma surgery?

DR. LEWIS M. FLINT

Well, I actually started a residency in internal medicine in January of 1965. But it didn't take me long to figure out that all of the interesting medical patients were on the surgical service. So I changed to surgery in July of 1965.

And I guess the most important influence in that was Paul Ebert who was a brand-new faculty member. He had just finished his residency at Hopkins and was a brand-new faculty member at Duke. He really enjoyed teaching the residents and he was the single person that I think helped me decide to go into surgery. I decided to become a trauma surgeon when I was in Vietnam and taking care of injured soldiers.

LUCHETTE

And how many years was your tour of duty there?

FLINT

I was there for a year. I began my military service in August of 1967 and actually went to Vietnam in January of 1968 and I came back in January of 1969.

LUCHETTE

Was that at the conclusion of your residency or in the middle of it?

FLINT

In the middle. I had had two years of residency at the time. But I was really lucky. I got assigned to the 71st Evacuation Hospital. And the hospital commander was Dave Green. He had been the residency program director at Walter Reed. There were two other partially-trained surgeons assigned to the hospital and so he just said, "Okay, you guys are going to be residents and you will work under the supervision of the fully-trained surgeons who are here."

We had 11 general and thoracic surgeons, all except one of whom was within three years of finishing residency. So they had all trained in university hospitals or in military hospitals and they were all still used to teaching and they enjoyed it, so it was great for me.

I came back and finished my residency, and I told Dr. Sabiston that I wanted to be a trauma surgeon and he and I talked very frankly about it because there was not a lot of trauma experience at Duke and none of the faculty had any interest in trauma. So he suggested two or three places to me, and I chose the Medical University of South Carolina because Dr. Artz was a burn and trauma surgeon and he had just recruited Dr. John Moncrief, who had been commander of the burn unit at Fort Sam Houston. He also recruited a guy named Max Rittenbury from David Humes' program at Richmond who also was very interested in trauma.

And so I decided to go down there, and Dr. Artz and Dr. Moncrief and Dr. Rittenbury worked with me, helped me, and sort of guided me along and got me started in the lab. Because of their efforts, I was able to get an NIH special fellowship and I went down to the Department of Surgery at Parkland with Dr. Shires. Jim Carrico was my mentor there. I had the privilege of sharing a lab with Don Trunkey. And we started our friendship at that time in 1971. Don left in 1972, and I stayed until 1973.

Then I went back and finished my chief resident year and became a faculty member at MUSC. I was the first medical director for the Charleston County Emergency Medical Services System.

LUCHETTE

So you've mentioned a few names that I think were potential mentors early in your career, Lew. Is there anybody else you want to be specific about mentioning?

FLINT

No, I think they were the most influential. After I had been in Charleston for a year on the faculty, Dr. Polk invited me to come to the University of Louisville. As you probably know, the group that he put together there had Bob Fulton and Dave Richardson, who were the two with me who were the most interested in trauma. The three of us were working together and I think we taught each other a lot. It was a great time.

LUCHETTE

You recall that in the '60s and '70s, a lot of specialization was occurring in surgery. How did your mentors and peers feel about your decision to go into trauma rather than cardiac or vascular surgery?

FLINT

Well, at that time at Duke, you had to defend yourself if you were going to do anything other than cardiothoracic surgery. It was a combined residency.

At the time, you spent the legendary *Decade with Dave*. You spent five years in general surgery residency and then you spent—usually he wanted you to spend three years in the lab—and then you spent your last two years as a fellow in cardiothoracic. When you finished the Duke program, you were a general and thoracic surgeon. And if you wanted to do anything other than that, you had to defend your choice. I wanted to be a bread-and-butter general surgeon and do trauma surgery. At the time, there was not a lot of interest in trauma at Duke. Interest in trauma care was variable in other places. Inner city hospitals saw a lot of trauma.

Nationally, the level of interest changed with the increase in blunt injuries and the influence of people like Dr. Artz and others who had been in Korea and in Vietnam. They understood that if you were going to have effective trauma care, you had to have effective pre-hospital care and you had to have the care concentrated in a place where people were focused on taking care of trauma. So the Emergency Medical Services Systems Act was signed into law in 1973 and that provided money for municipalities and states to purchase ambulances and to train prehospital care personnel.

About that time, the Committee on Trauma got interested in setting standards for trauma care and then the Advanced Trauma Life Support [ATLS] came around in 1978 and the Trauma Center Verification Program started in 1982.

So I was fortunate to be the state chairman for the Committee on Trauma in Kentucky when the ATLS course got started. And I was a member of the main Committee on Trauma when the Trauma Center Verification Program got started.

But, I had plenty of help. It was guys like Dr. Polk and Trunkey and others who wanted some folks that they were familiar with to work with them.

LUCHETTE

From your perspective, what are your most proudest scientific contributions? And how do you feel it may have influenced the field of trauma care?

FLINT

Well, I think the stuff we did with pelvic fractures was pretty important. It allowed us to stop bleeding in a lot of patients who were bleeding heavily. And then that sort of opened the door to successful external fixation and early open reduction internal fixation. That work helped trauma surgeons focus on pelvic fracture not just as a problem of bleeding but as a problem causing significant disability. With a dependable protocol for stopping the bleeding, the impor-

tance of having a cooperative relationship with orthopedic surgeons who were willing to do the external fixation and then do the early open reduction internal fixation became evident. I think that focus was valuable.

One of the studies I was proudest to be associated with was the paper on vascular injuries where Dave Richardson and Gary Vitale were able to achieve 33% five-year follow-up for a group of patients with vascular injuries. I think that's been a long-term follow-up achievement that has so far not been surpassed. As you know, the National Trauma Data Bank and essentially all of the state trauma registries do 30-day follow-up and that's all.

What we've learned from the experiences in Iraq and Afghanistan is that a lot of the complications of traumatic brain injury, and particularly the psychological complications of TBI and of other major injury patterns, don't emerge until one, two, or three years after the injury event. We now know, based on the work that Mark Malangoni did and then Jerry Jurkovich did, that the risk of death two and three years after a serious injury is twice as high as a matched population of patients who had not been injured. The injury seems to accelerate some of the chronic diseases that people have. I think as the trauma population gets older, knowing that risk and understanding it and working to get the follow-up is going to become critical if we are going to learn how to minimize that mortality risk over the long-term in patients who are injured.

LUCHETTE

What are some of the things you championed over your career and, as you look back now, you say maybe that wasn't the right thing to be out there advocating for as optimal patient care?

FLINT

Well, I think we advocated some things that, like Dave and I and the guys at Louisville were among the first to agree with Charlie Lucas that you ought to do that triple-drain business for patients who had pancreas and duodenal injuries. I think, in retrospect, that obviously caused more problems than it solved. But I sort of look at it a little differently. Nobody does anything perfectly. And if foresight was as good as hindsight, then we'd have no need for historians.

When you do get out there and start talking about things that turn out not to work as good as you thought they were going to, getting out there and talking about them always stimulates people to look at it more closely. They hear me or somebody that I work with get up and talk about something in front of an audience and they think "Gee, that doesn't really fit with my experience. I'm going to go take a closer look at this." And those guys who take the closer look are likely to come up with a better answer. So I don't think that it's necessarily a bad thing that people get up and advocate something that turns out not to be as good as they thought, because it stimulates people to look at the data more closely.

LUCHETTE

What are the two to three greatest advances in trauma care and science that you have observed in your career?

FLINT

I think probably the thing that has contributed most to improved patient outcomes is from the secondary prevention side, that is making sure that the injury doesn't kill the patient. I think the biggest advance in that area has been the development of trauma systems. The development of trauma systems has required us to keep our data and look at it and find out where we are not doing as well as we ought to be doing and fix it. Getting cooperation between patient-care people and people who study crash characteristics and highway construction and public education and those sorts of things has accelerated advances in trauma care and, at the same time, has accelerated advances in highway design and vehicle design and other things that have resulted in substantial improvements in the outcomes for motor vehicle crash victims.

Trauma systems have also improved outcomes for patients with penetrating trauma. I don't know if you saw the article in the *Wall Street Journal* (Fields G. *WSJ*. 12/8/2012) where they interviewed Tom Scalea, Norm McSwain, and Bill Schwab about the fact that the frequency of gunshot wounds across the country is going up, but the mortality from gunshot wounds is going down, so the number of incidents that are classified as homicides are going down even though the number of gunshot wound events is going up. Part of that is because with good trauma systems, the patients are getting good care sooner after their injury than they used to.

The development of the specialty of surgical critical care was a huge advance for us because it forced us to focus on getting patients well in the ICU. I ran a 28-bed ICU in Vietnam that had one ventilator. The first volume-controlled ventilator would take up almost half of the modern ICU room. We had two of those in the ICU at Duke. So I think critical care helps us understand how to take care of patients. Pulmonary complications has helped us understand pain control. Having patients live long enough to spend time in the ICU has helped us to understand nutrition.

If I had to say what are the two most significant advances in my time I think it has been trauma systems and the development of the specialty of surgical critical care.

I talked about advocating something that worked pretty good but not as good as you thought it was going to. I think because of all of the interest in imaging, people have started to continue to take a look at it and now we understand that we probably get too many images. We could benefit from going back doing a physical examination before we just sort of reflexively order another CT scan. It has been good for patients. But, and rightfully so, there is a new consciousness of controlling radiation exposure. That's an important thing.

I think understanding how imaging has helped us do things like endovascular repair for ruptured aortas, that sort of thing, wouldn't be possible without advanced imaging. So it has done a lot for us.

LUCHETTE

What were the major changes in practice patterns that occurred in addition to the development of the trauma systems during your career?

FLINT

Well, I think the idea that a trauma surgeon ought to have a foundation as a general surgeon. Obviously the development of surgical specialties has impacted that. It is now pretty hard for somebody to do trauma and be a bread-and-butter general surgeon. I think the recognition of the effects of specialization on the practice of surgery is what stimulated the development of the acute care surgery initiative, which hasn't really gained the momentum we'd like it to have yet, but hopefully it is going to in the near future.

There are some things that I am concerned about. I don't know that the business of having surgeons employed by hospitals is going to always be all that good for the surgeon or the patients. It sort of sets up a situation where the hospital can tell you what you are going to do. And I'm not sure that is the best thing for patients. I am pretty sure it is not the best thing for surgeons. But we are going to have to see how it works.

LUCHETTE

What brings you the most joy about what you have accomplished in your many roles during your career?

FLINT

I had the honor to be the president of the Southern Surgical Association this year. The meeting was last week, and there were probably close to 20 people that I had trained who attended, either as members of the organization or guests at the meeting.

Training residents is what I enjoyed most, right behind taking care of patients. What brought me joy is taking care of patients and teaching residents.

LUCHETTE

What keeps you up at night and worried about the future of either general surgery, trauma surgery, or acute care surgery?

FLINT

Well, I don't think that the focus on trauma care is going to go away and I don't think the focus on surgical critical care is going to go away. I don't think nurturing acute care surgery is going to be easy. I am hopeful that, under the health reform laws, a lot of the people that we took care of and continue to take care of who don't have insurance are going to have insurance. Hopefully that will translate into some improved financial reward for surgeons who are working in the middle of the night.

I worry a little bit about the fact that the acute care surgery initiative doesn't seem to be picking up momentum as fast as people want it to. Trying to graft the acute care surgery training programs onto academic departments of surgery is not going to be a walk in the park. I think there are going to be a lot of surgery department chairs who are not trauma surgeons who are going to say: "Why should we do this? We've already got people who take call in the emergency room."

And most of the time they will not have checked to see how faithful those folks are being about coming to see patients. I don't think that developing those training programs is going to be easy. I think it is going to be a continuing challenge and it's just something we're going to have bow up your back and take one for the team.

LUCHETTE

It has been interesting to watch the evolution of acute care surgery. As you know, most academic departments today are made up of specialists. So where does general surgery fit in today?

FLINT

Well, I think if we're going to take care of all the patients and give them all an equal shot at having excellent outcomes, then we're going to have to have acute care surgery, especially in academic units. You are not going to be able to get your chief of breast surgery to come take somebody's appendix out in the middle of the night. And you are not going to be able to get your endocrine surgeon who is looking at doing six or seven parathyroids and thyroids the next day to come to the hospital in the middle of the night and spend the night trying to decide whether to operate on somebody with their third bout of intestinal obstruction. So you know we've got to have it, but getting it I don't think is going to be easy.

LUCHETTE

What advice would you give to the young folks interested in pursuing a career in academic trauma/acute care surgeon?

FLINT

Well, I'd tell them first of all that there has never been a better time to be a surgeon than right now. The stuff that the young people around today are going to be able to do for patients just blows my mind. You know the personalized care, the genomic care, the development of molecular diagnostics and stuff like that. I think we are in one of the most exciting times for surgery that there has ever been.

There are going to be new treatments that are going to make patients operable who were previously inoperable. And so we are going to have a chance to help people that we just didn't have in the past. So I would tell them that there has never been a better time to be a surgeon. I would also tell them that if you are looking to enjoy your surgical career, then you don't want to burn yourself out. You're going to have to balance your work with some things that are rewarding and line yourself up with a collegial group of people that, when you walk up to one of your colleagues and you say, "I'd really like to take this weekend off and I know you are on call on Saturday, would you be able to cover for me on Friday and Saturday and Sunday," and to have that colleague say, "Sure, not a problem."

You've got to choose your environment carefully so that you are working with a bunch of people who are not going to be engaged in this sort of cutthroat competition and isolation.

You want people to compete, but you want them to compete to see who can be the best patient care doctor and to see who can be the best academic surgeon. You don't want them to be competing to see who can make the most money or, you know, who can slough off the highest number of difficult patients to somebody else. So I'd say that you need to choose your environment where you are going to work very carefully. Other than that, I'd say you're not ever going to have as much fun as you will have being a surgeon.

LUCHETTE

You touched on a few of the challenges for acute care surgery, but can you speak to the opportunities for the future of acute care surgery?

FLINT

Well, I think that the challenge is going to be to create the people who are going to be the leaders in the future. And I think that we've got a really terrific group of people in the leadership of the AAST and in the leadership of the American College of Surgeons.

If you look at the people who are leading the American College of Surgeons now, there are more trauma surgeons doing that than there ever have been. And I think that's a good thing. We've got some real problems that will impact us if we aren't careful about how we react to things and formulate them.

I don't know if you have heard this or not, but the Accreditation Council of Graduate Medical Education [ACGME] announced last week that they were going to start accrediting osteopathic surgical residencies using the same approach that they use for allopathic surgical residencies. I think the huge question is that, based on what I know about osteopathic surgical residencies, there are probably relatively few of them that can provide a teaching environment that is equivalent to the average allopathic surgery residency. So I think the choice is going to be pretty difficult. What are you going to do if you find out that you are going to have to close half or more of the osteopathic surgical residencies? How are the osteopathic surgeons going to respond to that?

So, unfortunately, what the compromise might possibly be is to bend the rules. And I don't think we can accept that. I think that we need to seriously consider getting surgical education out of the ACGME and getting it put inside the American College of Surgeons so that we will be in charge of educating surgeons rather than having somebody else who is either not a surgeon or not interested in what is best for surgery dictate to us what is going to happen.

LUCHETTE

Where do you see trauma, surgical critical care, and acute care surgery in 10–20 years?

FLINT

Well, it's my hope that in 20 years, acute care surgery will be an accepted pathway for developing a practice focus for a young surgeon. If we fail to do that, we are not going to be in a very good position to help medical students who are interested in practicing surgery. So I

think we have a huge opportunity. We've just got to learn to take advantage of it.

I think we've got a huge opportunity to capitalize on the things that have been learned in the wars in Iraq and Afghanistan. So I think there has got to be a permanent relationship between the civilian trauma system and the military trauma system so that we don't forget the lessons that we've learned in those wars. The civilian trauma system has a huge opportunity to help with the long-term follow-up of people who have been injured during their military service.

I think the geographic distribution of trauma centers is such that we can take up the slack. There are very large geographic areas where there aren't advanced veterans healthcare facilities and there aren't these injured warrior centers. And so I think that's a huge opportunity for us.

I think the trauma systems are not going to go away. So we need to keep on making them better and better. We have a great opportunity there to really solidify trauma care and its offspring, acute care surgery, as an essential component of the practice of Medicine in the United States.

LUCHETTE

And don't you think the trauma systems will just be the backbone for regionalizing care?

FLINT

I think that will hopefully happen. Joe Tepas in our trauma research group from Florida presented a paper at the Southern that showed that in Florida, at least, the trauma system is providing excellent access to almost 99% percent of the patients who get injured (*J Am Coll Surg.* 2013; 216(4):687–95). But there is a segment of the patient population that has access to trauma centers but they don't take advantage of it, and those are patients over 70 years of age. We've got to figure out whether regionalization works with that patient group, because if we find out, for example, that there are certain kinds of elderly patients who get injured that we can't help, that we can't improve their outcome, then we probably ought to say that those folks don't need to go to a trauma center. In Oregon, they've tried to tackle that problem by requiring everybody who is admitted to a long-term care facility have an advanced directive so that if they fall and break their hip and they are a prohibitive risk for hip fracture surgery, then they have the advance directive and they don't need to go to a specialized center to get that taken care of. But there is a lot of work to be done there. We have a significant chance to have acute care surgery take its place as the specialty that is going to provide the advice for those vulnerable patient populations.

LUCHETTE

If there was anything you could change in your professional career as you look back over it, what would you change?

FLINT

I honestly can't think of anything. I've had the greatest time in the world. It has been the most fun that I could possibly have. There were times when I didn't think it was fun. But looking back on it, I should have thought it was fun. I don't regret any of the professional decisions I made. I got more out of it than I gave most of the time. So, you know, I don't think I would change anything.

LUCHETTE

Is there anything outside the hospital in your personal life you would change?

FLINT

I'd like to go fishing more often. I have four wonderful children and two grandchildren. I am married to my best friend. You know how that is.

LUCHETTE

What are your plans for the future regarding your role at the College as well as in your personal life?

FLINT

Well, my hope is that if I can get my two youngest out of college, then I will be able to retire. But, as you might already have had experience with, if you encourage them to go to a state college in the state where you live, they will undoubtedly go to college outside of the state where you live or they will go to a private college. My two youngest: one goes to a private college and the other one goes to a state college outside of the state where we live. So I think I would like to be able to retire when I get them out of school.

I have a great time doing what I am doing right now. Being the editor of *Selected Readings in General Surgery* is a lot of fun. We're getting started on a project to create practice guideline modules that surgeons can use at the point of care so they can call them up on their smart phone or on their iPad or computer work station and use it as a way to discuss care strategies with patients or with referring physicians or whatever they need to do. That's exciting.

LUCHETTE

Are there any other comments that you want to share with the readership that we haven't talked about? Any parting comments?

FLINT

Well, I would just encourage them to remember that if you want to be a trauma surgeon you have probably chosen one of the most rewarding practices available to surgeons. And you need to have fun. If you aren't having fun, then you need to reevaluate your directions. You can always find something in surgery that is rewarding and fun. So if you haven't found it, you need to keep looking.



ERNEST E. “GENE” MOORE, MD
PRESIDENT 1993–1994

DR. DAVID H. LIVINGSTON

Dr. Moore, especially now since you have taken over editorship of the *Journal of Trauma*, your career is truly synonymous with trauma, critical care and acute care surgery. When in your career did you decide to go down this pathway?

DR. ERNEST E. MOORE

I became interested in medicine as a career because of a family with many physicians, including my father, and surgery in particular largely due to the influence of an uncle who was a cardiac surgeon at UCLA. He was Blalock-trained at Hopkins, and had convinced me to pursue academic cardiac surgery. I was a medical student in Pittsburgh, but went to Vermont for surgical residency. As you can imagine, with John Davis as the chair, my interests were abruptly changed from cardiac surgery to trauma.

LIVINGSTON

So with training in Vermont with Dr. Davis at the helm, trauma was an accepted career path on its own?

MOORE

Yes, although Dr. Davis was a self-trained vascular surgeon, his true passion was trauma. He was clearly a leader in academic trauma groups and introduced me to many of my long-stand-

ing heroes in trauma. I remember as a resident going to the AAST and meeting inspirational leaders like Curtis Artz, Gerry Shafton, Don Gann, Basil Pruitt, Bill Curreri, and Dave Mulder.

LIVINGSTON

So Dr. Davis was obviously a mentor during your residency. Anyone else?

MOORE

I was hired at the Denver General by Dr. Ben Eiseman, who had insatiable scientific curiosity. One of his many gifts to me was a trauma research lab. Another exemplary mentor was Alden Harken who became chair at the University of Colorado in the early 1980s. Dr. Harken was a masterful surgical scientist with unending energy and enthusiasm. He melded his productive cardiac lab with our struggling trauma lab in ways that were remarkable and really synergistic. So those three individuals—Dr. Davis, Dr. Eiseman, Dr. Harken—were my trauma mentors.

LIVINGSTON

That was really the beginnings of what I think many would see as modern academic trauma care. To put it in perspective, what years were those?

MOORE

I started at the Denver General in 1976. Dr. Eiseman, in his typical fashion asked, “What do you want to do?” I said, “Trauma.” He said, “Okay, we’ll set up a trauma service.” They had never had a dedicated service like that before in Denver. He said, “What do you want this to look like?” I said, “Well, I want to do just what Don Trunkey is doing in San Francisco.” So that’s how it all started.

There are a number of pivotal events that occurred in the mid ’70s, but it was clear in the later 1970s that everyone suddenly realized that we needed dedicated trauma centers, and most of these were in the large urban county hospitals

LIVINGSTON

Do you think that’s when trauma began getting more “respect” as an appropriate career path compared to vascular and cardiac and foregut?

MOORE

Yes, the respected centers I remember were Bob Freeark at Cook County, Bill Blaisdell at San Francisco General, R Adams Cowley at Shock Trauma, Carter Nance at Charity, and Lucas and Ledgerwood at Detroit General. When you went to the AAST meetings, not only were these leaders articulate and innovative, but they were friendly and encouraging.

LIVINGSTON

Besides going to Denver, what’s the best career advice you ever got?

MOORE

Well, besides marrying Sarah, my best career advice was probably given by Dr. Eiseman. He said, "I think I understand you better than you understand yourself and I guarantee you that you need to have basic science as an integral part of your career or you won't be happy."

I actually developed basic research interests while in college. The University of Pittsburgh had a unique program where they were attempting to cultivate interest in medicine as a career by offering regional college students summer research positions. I began working in Henry Bahnson's lab developing the intra-aortic balloon device. The next summer I worked in Ted Drapanas's lab doing liver transplants in sheep. The third summer I worked in Larry Carey's lab studying the catecholamine response to acute blood loss. I was the lab tech who spent the night with the pigs in a sling, obtaining frequent blood samples. These surgical investigators clearly thrived on this aspect of their great careers. I did some research in Vermont, but I skipped a year of residency because my chief resident was killed in Vietnam so I was scrambling to survive surgical training. I did patent a retrohepatic balloon shunt with Dave Pilcher during this time.

LIVINGSTON

You forget about the timing and chronology of your residency. That was right at the middle to end of the Vietnam War.

MOORE

Exactly. In fact, I had my Berry Plan application in my pocket one day when visiting Dr. Davis for a reprimand. I was a frequent visitor to his office, about once a week, for some sort of political insensitivity. He saw the letter and asked, "What's that?" I told him and he said, "I just got back from Washington. The war is ending and they don't need you." So I tore it up.

LIVINGSTON

Did you receive any bad career advice?

MOORE

No, or perhaps I conveniently forgot. I think most advice was open-ended so I don't think I ever was steered in the wrong direction.

LIVINGSTON

If you had to pick out two or three, what are you most proud of and how do you think it influenced thinking in the field of trauma and critical care?

MOORE

I think that our early work in the mechanisms of multiple organ failure probably is the most enduring. We were the first to propose the concept of the two-hit model of multiple organ failure, focusing on the role of the gut in systemic neutrophil priming. While clearly the story has

become far more complex, I think the gratification in basic science is incremental, with many small individual contributions ultimately culminating in a conceptual revelation.

In the clinical arena, we made some early contributions in post-injury coagulopathy, describing the so-called “lethal triad” at the AAST in 1981. In fact, in that presentation we recommended a pre-emptive FFP to red cell ratio of 1:4, the first I am aware of. Another gratifying contribution was developing organ injury scaling. That was an interesting story—we were preparing our abstracts for the AAST with my brother John and Ernie Dunn. I was looking through the data and saying, this does not make sense. These patients are not adequately stratified by ISS.

So we developed this abdominal injury score [AIS] that night. It was about 11:30, the deadline was midnight, and I said, “I’m just going to submit this abstract in addition to our others.” Well, a lesson I have learned many times subsequently: Our other abstracts that we thought were shoe-ins—one of them was primary colon repair—didn’t get on the program, but the AIS did.

Alexander Walt was my discussant. He got up and was very eloquent. So he got up there and said, “This is clearly a love of labor and this boy who is a little wet behind his ears will change his mind in several years when he understands that it is all about experience.” The audience all laughed and then he continued. I closed the paper by acquiescing, “Well, thank you very much, Dr. Walt. I wouldn’t dare question your wisdom. I appreciate your time reading our manuscript.” That was it. I almost got a standing ovation.

I also want to acknowledge my satisfaction with co-editing the textbook *Trauma* through seven editions thus far with Ken Mattox and Dave Feliciano.

LIVINGSTON

During your career, anything you thought was a good idea or championed that over time or with more data you realized that maybe it wasn’t such a good idea?

MOORE

I do remember being enthralled with Leon Pachter’s tractotomy for liver injury concept. I probably hung on to being operatively aggressive with liver injuries a little longer than I should have.

LIVINGSTON

What do you think have been the big major advances in trauma care during your career?

MOORE

I don’t think there is any question that, in the early ’80s, CT scanning revolutionized how we managed injured patients. We lived through an era when we used to do 10–20 DPLs a night. As the CT technology became more sophisticated, of course, they could search for more.

I think the next major advance was damage control. I’m sad that many don’t recognize that it was Harlan Stone in 1983 who really came up with the idea of damage control in his

paper from Emory (*Ann Surg.* 1983 May;197(5):532-5), when I think Rich Mullins was a fellow. I think there have been more lives saved with damage control than any other concept I can recall during my career.

I just remember all those patients in the operating room for many hours with inexorable coagulopathy. As soon as we read the Stone paper in the *Annals* it changed our approach overnight.

I know that Gerry Shafton and Clarence Dennis from Brooklyn and others had been talking about damage control resuscitation in the '60s, and of course the classic Whipple was multi-staged. But I don't think as a group they ever connected the dots like Dr. Stone

LIVINGSTON

Is there anything else?

MOORE

I guess if you go back to the question of what I feel were important contributions at our institution, it would be the creation the acute care surgery concept in Denver over three decades ago. When I took over as chief of surgery I intentionally and progressively eliminated the cardiac, vascular, and transplant surgical contracts so that the "trauma surgeons" could do the acute care thoracic, vascular and hepatic procedures to enhance their trauma capabilities. Unfortunately many skeptics remain vocal at a national level. I just completed a high-risk carotid endarterectomy before this interview, one of my colleagues successfully repaired a ruptured large abdominal aortic aneurysm this weekend, and we continue to repair torn thoracic aortas with partial left heart bypass.

LIVINGSTON

What part of the career have you found the most rewarding?

MOORE

Well, I think deep down anyone would acknowledge that the best part of your career as a trauma surgeon is saving someone's life. Like many of you, every Christmas I am flooded with embarrassing gifts from patients I have managed over the last 35 years. Clearly when you go home at night and you believe you have literally saved someone's life, you never forget it. But I think our academic contributions have also been very gratifying. Our trauma research lab has been funded by the NIH for 25 consecutive years

LIVINGSTON

What's the most challenging part of the job? Well, maybe the job you just retired from?

MOORE

Yes, I was glad to give that one up. I think the most challenging thing for me today is trying to reconcile how trauma surgery has become such a second-class discipline. At the time that

I entered the field in the late 1970s, most of us went into trauma because we thought it was the greatest and most exciting field in surgery. Trauma surgeons were considered master surgeons. They were doing exciting mechanistic research. I think there was a period in the late 1980s when there were five trauma surgeons in a row who were president of SUS [Society of University Surgeons]. Everybody in the hospital respected the clinical expertise of trauma surgeons and when someone came in with a life-threatening problem or a VIP, they called the trauma surgeon.

Unfortunately that has changed, as you well know. My biggest frustration is to get us back on that track again because I think we are uniquely qualified. We're the physicians that can tolerate the stress and are available in the hospital 24 hours per day and on weekends. But it's frustrating because right now we don't have a common vision.

LIVINGSTON

What do you think the competing or disparate visions are?

MOORE

There are surgeons that spend the day in the ICU running ventilators and doing percutaneous tracheostomies with some appendectomies and cholecystectomies in the middle of the night who believe they are acute care surgeons. Why would any rational individual train intensely for seven or nine years—depending on whether you do the academic track as well—to be relegated to that kind of work? We're trained as surgeons. We want to do challenging surgery. We have to recognize our limitations, clearly, but we've got to figure out how to put us back in the arena of doing complex operative procedures.

There are signs that reassure me that we are on the right track. I did a recent tour with the Florida COT and visited a number of academic trauma centers. Every one of these trauma centers in Florida has a division of acute care surgery and a number of them now have "right of first refusal." When someone comes into the ED, if they want to do the procedure and believe they are capable, it is their prerogative.

LIVINGSTON

What advice do you give your residents and junior faculty who want to do academic trauma/critical care?

MOORE

First I would tell them it's phenomenally exciting. Two, I would encourage them to obtain specific training in vascular and thoracic in their fellowships. Third, I encourage them that if they're scientifically curious, basic science is a gratifying opportunity. In acute care surgery there are so many mechanisms that we simply don't understand. Additionally I predict endovascular work will become an integral part of our discipline. When we get the squeeze with Obamacare—if there is anything positive about it—I think that health care administrators are going to examine the financial realities and recognize acute care surgery as an invaluable

resource. But we must obtain the appropriate skills to be given some latitude.

LIVINGSTON

You mentioned endovascular technologies and opportunities. What other great things do you think are on the horizon for medicine or trauma care that will move us along in the next decade or two?

MOORE

I think what we desperately need a better way to resuscitate patients and a better understanding of coagulopathy. I can't imagine that in the next decade we won't come up with something better than what we're doing right now. Not to dismiss the potential benefits of crystalloid, but there has got to be a better way to start the process out in the field.

With coagulation, we're just starting to chip away at the tip of the iceberg in terms of mechanistic knowledge. I think in 10 years we will look back in astonishment that we didn't understand this better.

LIVINGSTON

Would you make any changes in your career?

MOORE

No. Looking back on it I'm not sure I would change anything. I guess I might have benefited from more basic science training after my residency in Vermont, but ultimately I was fortunate to work with the right individuals at the right time to learn the obligatory skills. On the other hand, I have climbed the Aconcagua with Hunter, run the Leadville 100, and completed the Coeur d'Alene Ironman.

LIVINGSTON

Anything outside the hospital you wanted to do? Didn't have the opportunity to do?

MOORE

I think we all have big ambitions and, to some degree, unrealistic dreams. One of my bigger ambitions was to climb Everest, but I was never exposed to climbing in the East and by the time I realized the opportunities in the West, I had family obligations. But a small price to pay for a great family.

LIVINGSTON

You have moved from chief of surgery at Denver to the editor of the *Journal of Trauma and Acute Care Surgery*. What are your plans after this?

MOORE

I don't think I have any major changes at this point, and plan to continue trauma call. I hope

to encourage and facilitate both my sons to pursue academic medicine. As you know, Hunter looks to be on track to be a trauma surgeon, while Peter is going to the dark side, probably interventional cardiology. But, nonetheless, we've got some common ground in coagulation.

LIVINGSTON

Any parting words for the 75th anniversary of the AAST?

MOORE

Well, I think I would just recap by saying that acute care surgery is the only chance we have to solidify our future academic career in trauma surgery. For all of us who have gone through the "Golden Age" and had so much fun, it's frustrating. I think we need to get ourselves back in the operating room, and acute care surgery is the path to get there. I think it's very unique that surgeons who can operate are dedicated to critical care and all the other stressful issues that are a part of trauma care.

I always say to Hunter when he bemoans the long hours of training: "You know, the fact is that acute care surgeons are going to be a valued commodity once we define ourselves appropriately because there aren't going to be many willing to be commit to these long hours and hard work."

I think one regrettable offshoot of all this 80-hour work week and emphasis on psychological stress is that it's permitting a lot of individuals to train as surgeons who just don't have the innate commitment. One of the greatest days in my life was when I got in medical school. And then the next greatest day is when I got into a surgical residency.

Every day in that residency, I was anxious that I wasn't going to make it and probably appropriately so. I can remember my first appendectomy like it was yesterday. Every little milestone meant so much to me. Unfortunately, I don't see that in many of the current generation.

LIVINGSTON

Do you think they have the same level of intellectual curiosity? I think that is missing sometimes.

MOORE

Yes, I think you're right. What is sad to me is that you can't inculcate that in someone. I think they're fundamentally born with that proclivity that has to be reinforced early in their life. I think that surgeons like you and me who really have genuine curiosity have a much more rewarding career, and I wish I could inspire more people to see that.



CLEON W. GOODWIN, MD
PRESIDENT 1994–1995

DR. FREDERICK A. LUCHETTE

Let's start with hearing about your decision to pursue a surgical career and then your decision to focus your career on burns?

DR. CLEON W. GOODWIN

I think my beginning epiphany, if you believe in those, started when I was a third-year medical student and first set foot in the surgical ICU. I was mesmerized by the activity going on, the complexity of the problems, as well as the very talented ICU nurses at the time, and decided that I really liked that type of activity. I certainly didn't decide on trauma at this point.

Another influence of my medical school training was in my senior year I took an elective with Billy Fitts who was also a past president of AAST and editor of the *Journal*, for four weeks in the summer. I was impressed by this experience and by Dr. Fitts. Dr. Fitts and I had a great interaction; he took me out to dinner several times. He gave me a membership in the American Trauma Society, of which he was a founding member and president. He was the editor of the *Journal* at that time and he gave me several manuscripts to read through and make suggestions. That was the first time that I understood the intellectual process behind something like trauma surgery and care.

Time went on in my residency, a number of Penn faculty had previously been to the Army Burn Center and, at that time, Dr. Rhoads would send residents to rotate through the Army Burn Center in San Antonio. I went down in '72 or '73 when Basil Pruitt was the rela-

tively new commander and director. That was probably one of the most fantastic experiences in my life.

Burn cares in that earlier time involved other trauma and frequent complications such as Curling's ulcers and acalculous cholecystitis. We treated releasing abdominal compartment syndrome back in those days. I thought what is the type of surgery that I liked. But I was a Berry Planner in general surgery and cardiac surgery.

After rotating with Basil's unit, I decided that since I had to go back into the Army to serve my Berry Plan obligation, I wanted to go back to the Army Burn Center. And I did. When I got out of the Army (stayed in reserve), my first real job was at New York Hospital. My two partners and I ran the burn center at New York Hospital and also the trauma service at Jamaica Hospital in Queens; the three of us for about ten years worked in a very busy Level II trauma center.

I liked the surgery. It let you operate on just about any part of the body without specialty restrictions. This sort of surgery evolved into the concept today of acute care surgery. If I were starting out now, that's what I would identify as my major interest.

LUCHETTE

Who else was important to your career? And if so, how did they influence your career?

GOODWIN

Well, when I was a Penn resident, I spent four years in the respiratory physiology department with Robert Forster, who was a classic respiratory physiologist. I certainly learned a lot of general physiology and respiratory physiology as a surgical resident and was able to translate directly to taking care of sick patients. Frannie Moore had just introduced the concept of post-traumatic pulmonary insufficiency, and so I saw a direct road between clinical trauma care and the understanding of the response to trauma.

When I finished my fellowship with Dr. Forster, we maintained close contact over the years. He was a major influence on my choice of career. Although I pretty much had decided by this time what I wanted to do, I hadn't quite figured out how to do it. My return to the Institute of Surgical Research and working with Basil and his group cemented my long-term career path.

LUCHETTE

What did your fellow residents and peers think about your career decision to work in burns and trauma?

GOODWIN

Well, during my medical school training and even during my residency, burn surgery was never that visible to my fellow residents, in that we didn't have a burn center at Penn and, as a resident, you immerse yourself in each new experience that is going on at the time. Trauma was definitely the "red-headed child" of the surgical coverage schedule and certainly did not

have the prominence that it has now. Dr. Fitts kept it alive while I was at Penn. He was still pinning hips and taking care of fractures as well as general trauma. Trauma care was not at the forefront at that time. Although Penn had a reputation of excellent pre- and post-op surgical care, trauma really had never assumed the position of a separate competence in general surgery. It has astoundingly changed under Bill Schwab.

So I guess I didn't get too much push toward trauma at that time. I went into burn care; that's a relatively arcane corner of trauma and surgery. Burn surgeons can be somewhat insulted, and can have our own unique view of the world.

LUCHETTE

When you look back now, which of your studies are you most proud of because they influenced the practice of trauma and burn care?

GOODWIN

I think the two areas that I am most proud of is the work we did with crystalloids and colloid resuscitation and helping to define the metabolic response to severe surgery.

This happened while I was at the Institute of Surgical Research [ISR] with Basil and Doug Wilmore. The ISR is one of the few places that could have carried out a randomized controlled trial evaluating these two modalities of resuscitation. With today's emphasis on evidence-based research and clinical trials, I am very proud of the fact that early in my career I was actually able to carry out a clinical trial. Our research certainly has not resolved the issue of the best resuscitation solution, but I learned an awful lot about physiology and about clinical investigation and structuring clinical trials.

LUCHETTE

As you reflect on the talks you have delivered throughout your career, is there anything you say today that wasn't the best patient care or was frankly wrong?

GOODWIN

There is certainly a lot that I wouldn't have done had I known what I know now. I remember early in my career that the approach toward surgical patients, at least in retrospect, could be very timid. Sick patients didn't get fed early. Hernias required bed rest for two to three weeks. We now know the idea of enforced inactivity and not addressing the overall response to injury is wrong and now employ mobilization, increased feeding, and extended rehabilitation.

LUCHETTE

Cleon, what do you feel are the two or three greatest advances in the care of burn patients and trauma patients that occurred during your career?

GOODWIN

Well, in the clinical investigation arena I think the definition by people like Basil Pruitt and

Doug Wilmore of the metabolic and physiologic response to severe injury was and is a real milestone. Non-surgeons these days call the hypermetabolic response to injury SIRS, but I think this is a misleading term. This concept has provided the groundwork for critical care support of severely-injured patients and the understanding, at least in part, of why each patient infected and how to respond to that.

On the clinical side, there is no doubt that from my point of interest in trauma, I think the most important advance is the concept of the trauma center and regionalized trauma care. Part of this concept is the ATLS course. I think that has probably saved more lives from injury than anything else around the world.

LUCHETTE

Tell me what specifically has been the impact of trauma systems on care.

GOODWIN

Well, I think several things. It has allowed the allocation of expensive resources so that they could be used most efficiently. It's provided the intellectual and clinical environment to allow people to study the results of trauma care and the effects of treatment. I don't think that would ever have been done if every hospital had its own approach to the care of injured patients.

I fully believe that it has improved survival and outcome, although those type of data are very expensive to accumulate.

LUCHETTE

In a similar way, tell me what you think have been the changes in practice patterns that influenced burn and trauma care? You touched on one, the regionalization that has gone on with trauma systems. Are there any other major changes that have occurred during your career?

GOODWIN

That's a difficult question to answer, since we currently are undergoing a nationwide change in workforce patterns. Burn centers are still run under the philosophy of the so-called "old guard," in that the concept of trauma surgeons being the managers and providers of trauma care from start to finish still persists.

My concern is, as I see medicine develop, is the increasing fragmentation of medical care and the shift-work mentality that is entering all of medicine. Emotionally, I think it may not provide the best care, but I certainly have no data to support that concept. I think that's a trend that's going to continue. I think the most important intellectual question in effective research is going to be directed toward how can you make this new system of care as effective or more effective than what used to be done when people were much more willing to provide their time for patients.

LUCHETTE

Tell me what aspect you have found the most rewarding? At the end of the day, what brings

you the greatest satisfaction and joy?

GOODWIN

Well, something I haven't mentioned is I spent, I guess, 16 years on active duty in the military, all of it at the Army Burn Center. When Basil retired, I was promoted to his job.

As a commander, the Army requires you to take command training, including leadership training and administration. I think my biggest lack in my residency training was how to manage people. I gradually learned that when I went back into the Army and really realized that a leader's prime role is taking care of his people and choosing good people.

I found that I really liked mentoring people to produce a great product, like a good burn team or a good trauma team. The few instances that I've been in a position to be a mentor, a true mentor, one that only started in early training and lasted years, in one case, for decades, has been the most rewarding experience I've had. I'm awfully proud of these individuals.

LUCHETTE

What causes you to stay up at night worrying about the future of medicine?

GOODWIN

The thing that bothers me most is a dream of patients getting really sick and nobody coming to see them. I'm in a hospital now where I have nurse practitioners and physicians assistants, but no residents, and you adapt. You teach your nurses how to be residents, to some extent, and nurse practitioners to take more responsibility.

Even in academic centers with the night float team taking care of patients, there is so much that can go wrong when that continuity of care is interrupted. It only takes one wrong step for a critically ill patient and I worry about that. I have a team that knows how I think, and I know how they think. I know when a particular person calls what that person calls for and how I need to react. But, still, I worry about the gaps in patient care and observation that comes with shift work.

LUCHETTE

What advice can you give to young surgeons that are interested in an academic career in trauma, acute care surgery or burns?

GOODWIN

For me, maintaining broad intellectual interests and interests outside of one's daily medical activities is important.

Most of the medical students I see these days have bachelors or masters in engineering and physics and other scientific disciplines, which I think is very helpful for medical study. But, this education keeps you on a narrow path throughout your career. You might not explore other areas which may be interesting and applicable to future avenues to medical care.

If I ever have an encore career, I'll probably stay in medicine but begin looking at health

care delivery, quality assurance, activities of that sort. I think the most important thing is to maintain a broad range of activities so that you can keep yourself entertained throughout your career and life, in general.

LUCHETTE

Tell me what you perceive are the greatest challenges and then what are the opportunities for the future of trauma and acute care surgery?

GOODWIN

I think the future approach to provision of medical care for trauma surgeons will not require the surgeon to be available around the clock. I think the acute care surgery direction for general surgeons is the future for maintaining excellent trauma care. I suspect that acute care surgeons are going to become surgical hospitalists. Looking back on everything I've done since I started my career, I have, in effect, been a surgical hospitalist.

Having said that, I'm not quite sure what a surgical hospitalist is. But as I watch the medical hospitalists here, in my institution, they spend their careers in the hospital and that is certainly what I have done.

I think trauma surgery will be the last specialty to fragment. I can certainly see the forces pushing trauma surgeons to fragment and parcel out care to other specialties. The whole center of excellence concept requires hospitals to commit resources on activities that may have negative returns on investment.

I see, particularly in hospitals that are not led by physicians or medically-trained personnel, services with negative returns on investment are not tolerated. I can see pressure by administrators who are reluctant to meet guidelines for COT [committee on trauma] or ABA [American Burn Association] verification in order to save money. I think that's going to be the big line of battle over the next 10 to 20 years. I certainly hope and believe that the AAST and the College will hold that line.

LUCHETTE

Tell me what you envision the practicing burn, surgical critical care, trauma, and acute care surgeon will look like in 10 or 20 years?

GOODWIN

Well, I would hope it would look like what I've done. In my career, from the time that I finished my training, we were sort of jack-of-all-trades. I fully believe in that concept. It was a thrilling approach. I cover trauma in my current job on a regular basis—my wife says too regular—as well as burns. I now don't do any acute general surgery except on my own burn and trauma patients.

Our general surgeons here are integral to the trauma program in terms of providing coverage and extra hands in an emergency. I think the acute care surgery paradigm is how I would go preparing for the next 20 years. A good general surgery training, good training in

surgical critical care, and focusing on trauma and, for the odd individual, on burns, provides a good model for general surgery and trauma care.

I think the focus on surgical critical care needs to be more heavily emphasized. I am disappointed that burn training during residency is no longer required. I would certainly like to see that restored if for no other reason than to improve a hospital's capability for meeting mass casualty situations and related activities like that.

LUCHETTE

As you look back, is there anything in your professional career that you would change?

GOODWIN

I probably would have somehow tried to learn better leadership skills and management of interpersonal relationships. When I started medicine it was a fairly hierarchical system, which I actually liked quite well. But I would like to have learned more non-technical management skills and to have acquired skills with computers and databases.

LUCHETTE

What about your life outside the hospital is there anything you would change?

GOODWIN

For me, I can't think of a thing. I followed my own instincts and interests and I probably did not think as much as I should have about my wife and family. When I was preparing for this interview, I asked my two children and my wife, and they said there was nothing that they would change. But I know, if I were really honest with myself, that it was tough for them.

We moved to New York City with a one-year-old and a three-year-old. My wife was essentially left to do all of the home-front care for our kids for ten years. In retrospect, I realize how really difficult that was for her. That's what I mean if I had something to do over again, I would like to have more widely considered their needs than I did at the time. But the end result has been great.

I hate to keep saying that I had a great time, but I remember, as a resident, recognizing if I could be a resident the rest of my life, I'd be happy. As my burn team points out, when patients come in with blue numbers, I don't get so excited. But when their computer screen has all red number, it's fantastic. I like taking care of sick patients. It's terrible that patients have such devastating injury, but it's wonderful when they are able to go home.

LUCHETTE

What are your future plans clinically, academically, and personally?

GOODWIN

Well, I think at the end of this year I'm going to ask my bosses if I can go part time clinically and spend the other time sort of looking at what we've done since I've been here in the last

eight years, and in particular looking at our outcomes.

Then, hopefully I will focus on hospital or patient care and hospital administration, quality, and getting more involved with evidence-based activities.

LUCHETTE

Do you have any last comments for the readership on the 75th anniversary of the AAST?

GOODWIN

Well, for me, being a member of the AAST has been very rewarding. Having been a past president was probably the biggest honor I've ever had. The friendships with members of AAST still carry me through life. I've watched the organization for a long time and it certainly has grown and matured. It seems to be in stride with everything that is happening in our changing medical care environment. I think without the AAST, trauma would not have the stature that it has now. The college and the COT [Committee on Trauma] have provided the umbrella and intellectual guidance for the AAST.

So it has been exciting to be associated with real experts and just listening to them talk. My favorite paper at an AAST meeting was the one that John Border presented years ago when he first proposed that we shouldn't wait long periods of time to fix major fractures but do them as quickly as possible (*J Trauma*. 1994 Aug;37(2)262–264). I haven't mentioned, but for years we talked about sailboats and going sailing. I visited him on his boat. What I really wanted to do as an encore activity. But somehow it's hard to stop what I am doing.



KENNETH L. MATTOX, MD
PRESIDENT 1995–1996

DR. DAVID H. LIVINGSTON

The first question is obvious, but when did you decide to do trauma in your career?

DR. KENNETH L. MATTOX

I decided to go into surgery about my third year in medical school. I really enjoyed most of my rotations during my residency. At the end of my chief year, I was about to go as a White House fellow, but that fell through because the competition was very keen. I would have become an administrative medicine person at the time of Watergate so I'm glad I didn't go to Washington!

Two weeks before the end of my chief year I didn't have a job, but somebody dropped out of the thoracic fellowship so I slid into a cardiothoracic slot. At the end of my two years of cardiothoracic, Dr. DeBakey offered me one of two jobs: Run his big bad, big tough case room at the Methodist Hospital where we were doing vascular and hearts, or go over to Ben Taub and take care of all the surgery over there because they had limited faculty.

I chose the Ben Taub and I looked around for things to write up and study. There were plenty of people writing about vascular and cardiac but very few people were writing about trauma. We had no shortage of trauma, so I started writing about what we had. The rest is sort of history. I worked with what I had. It was my first job, first months out of my cardiothoracic residency, and I just slid into trauma.

I also liked the challenge. Ben Taub didn't have many faculty, didn't have many resources. Methodist had everything. I liked the challenge, so I took the tougher road.

LIVINGSTON

Obviously Dr. DeBakey was a mentor or an influence. Who else?

MATTOX

Well, the mentors at that time were Dr. DeBakey, Dr. George Jordan, Dr. Arthur Beall. In the early days, Arthur Beall had a lot of articles in the *Journal of Trauma*. It was expected that everybody at Baylor would follow Dr. DeBakey's military experience, his vascular experience, his heart experience, so everybody who trained here was expected to be "hot stuff" in trauma, in vascular and in thoracic. It was just assumed that you would be good in general surgery, but those three areas were all equally looked upon with respect among the existing faculty.

LIVINGSTON

So it wasn't odd that you did two years of cardiothoracic and then did trauma?

MATTOX

It was sort of expected that you would get all of the training Baylor could give you and then you would figure out where you worked. Everyone was expected to do everything. We weren't limited by the diaphragm or by the union card. Having the extra ability to not be afraid of the heart and the lungs and the thoracic outlet, cardiopulmonary bypass and cannulation and pulmonary emboli and portacaval shunts—it was just expected that you would love those.

LIVINGSTON

A little different than training today?

MATTOX

Yes. You're going to ask me later about what's different, and that's a major difference. We were expected to be good at and interested in everything back then. Now, people are single organ surgeons and limiting their practices.

LIVINGSTON

Besides going over running Ben Taub, what was the best career advice you've received over the years?

MATTOX

Probably the best career advice was from DeBakey who was always pushing—if you're given a choice, always take the high, hard road. Whatever you do, pursue excellence and have great attention to detail. You are given a bag of tricks from your residency training, and now it is up to you to use those tricks to ride the next horse, to pursue the next areas of challenge. Just because you have had training in a given area doesn't mean you are going to be expert. You need to work at it.

LIVINGSTON

Did you get any bad career advice over the years?

MATTOX

Not really. I never had enough time. Even in college I was advised to go into various fields. I think I would have been happy, I could have been happy wherever I went. I wanted to do a lot more basic science work, but I did not take time off for two years in the research lab. I wasn't really advised to do that. Whether or not I would have benefited or not, I don't know.

I watch the people that take two years off now—probably 80% to 90% of them really never use it. Many schools push it. I look back and I wonder if I shouldn't have had that additional skill. I just don't know how I would have worked it in.

LIVINGSTON

Which contributions are you most proud, what would be your top two?

MATTOX

Probably the work we did in addressing hypovolemic shock. First, early on in the use of MAST [military anti-shock trousers] and then using hypertonic saline and the discovery that we actually made people worse when we raised their blood pressure. Moving from there into limited resuscitation, limited fluid replacement. That's a biggy.

Also all of the work we did in taking on virtually every major blood vessel in the body. The exposure and the techniques to quickly repair aortas in the chest and the belly and the cava, thoracic outlet. Those are probably the two in trauma that I am the most proud of.

LIVINGSTON

Anything that you championed or adopted and then you gave up on? Anything you ask yourself, "Why did we do that?" especially as we knew more?

MATTOX

I was convinced—I guess in the '70s—that component blood therapy was good. I was convinced by the blood bankers that we ought to chop the blood up and give plasma and platelets and packed cells differently and then clotting factors.

Looking back on that, I think we probably took a wrong road because now we are re-constituting blood by the 1:1:1 and even beginning to think about fresh whole blood again. I think that was a detour that we probably would have been better had we not taken.

LIVINGSTON

Looking at your career longitudinally, what do you think the two or three big advances in the science of trauma care were?

MATTOX

I think CT scanning was a major shift. Second, the damage control approach allowed for people who really weren't that extensively trained to get control of things. I think that was major. It took us a while to stumble into that.

Finally, the entire shift of resuscitation from what occurred pre-1960, then from '60 until about 1995 when we flooded everybody, and now going back the other direction to limited resuscitation.

LIVINGSTON

You alluded to some of the ways the overall practice patterns have changed, could you expand on that?

MATTOX

Yes. Currently we have hospital-based practices, emergency medicine, anesthesia, radiology, and now surgeons and internists are hired by the hospital.

We have group practice and integrated care and no one can really tell me what that means. Then we have restricted work hours where the patient really belongs to a committee. I see that as a practice pattern that is not comfortable for me.

LIVINGSTON

How do you think your residents see that?

MATTOX

Some of the people who want a different lifestyle, whatever that is, because they want to avoid stress probably appreciate restricted hours. Those people are more stressed than I am, and probably have more family problems than I have, and don't enjoy life and the opera and photography and travel as much as I do, and yet they don't work as much. They punch a clock and they are always looking for things to do when they are off. The people who talk the most about it, I find, to be the most uncomfortable.

The fourth-year and chief residents think more like I do, and they don't like the regulations that force them to work only so many hours a week. So, the younger people are buying and drinking the Kool-Aid. They are accepting the dogma of whatever the wimps wrote about. The regulatory people who have been trying to regulate medicine for decades have finally succeeded. I am of the old school: one patient, one doctor and you work until the work is done.

LIVINGSTON

What aspects of your career have you found most rewarding?

MATTOX

I think there are a lot of things I am happy with but probably two things are the most rewarding. Number one, the people that I've helped to train who dot the world as master surgeons.

Many are not in academia but are out in the small communities doing good bread-and-butter surgery for that community. I'm very proud of that legacy.

Second, I am proud of establishing the reputation it's okay to be an iconoclast. It's okay to say, "The emperor has no clothes." As a matter of fact, it's probably important that there be people like that. I have developed a reputation and people expect it when I go to the microphone and the podium that I am going to say, "There is another way of looking at this."

LIVINGSTON

Challenging the status quo is always very important. What parts of the career has been the most challenge for you?

MATTOX

Probably the evolution of medicine becoming a business corporation and that in the private world we have forgotten the purity of why the guild of medicine and of surgery was developed in the first place. The regulations and the governmental restrictions and the financial side of medicine have tempered what we can really do for a patient, and we sometimes get away from the basics of why health care was developed initially. For me, that is very frustrating.

LIVINGSTON

So what is your career advice to your young trainees who want a career in academic surgery, trauma, acute care surgery?

MATTOX

Number one, know yourself. Don't get on a conveyor belt that you are not happy riding. Find what you like best and once you do, go to the heart of danger and find safety. Pursue it with a vengeance. But if you find you don't like it, take the next wave, like a surfer, and you will soon find a wave that you find comfort in. Mainly, you have the talent, figure out a way to use that talent on something that makes you happy and then master that field.

LIVINGSTON

Where do you see the greatest challenge right now in trauma care and acute care surgery going forward?

MATTOX

Well, I think the biggest challenge facing us right now is that the renaissance time of trauma surgery is probably past. In surgery, the remaining renaissance men and women are the pediatric surgeons. Everyone else has tended to focus in one area.

Every community in the country needs a go-to person that when things are really tough you can call that person up and they can take care of it. So I think there is going to need to be a back-to-basics on the overall renaissance surgeon. We need to encourage that to happen. We have moved in that direction with acute care surgery, but I think we're not moving as

fast as we could. I personally think we should have taken all members of AAST five-ten years ago and grandfathered them into acute care surgery, as long as they met certain qualifications. Then we would have had a critical mass.

I think we are again being boxed into a corner in acute care surgery by the people who see acute care surgery as a threat to their private practices, especially with tight money. I also think one of the greatest challenges and opportunities for us in the future is that the acute care surgeon absolutely must learn the endovascular and catheter-based skills. It's really not that complex. It's not rocket science.

Just as we have taught ultrasound to many different disciplines in medicine, endovascular should not just be in the armamentarium of the vascular surgeon or the interventional radiologist. There are real opportunities there.

LIVINGSTON

Would you be in favor of being very liberal in grandfathering AAST membership into acute care surgery?

MATTOX

I don't know if I have published it or not, but I was pushing that loud and hard a long time ago. If you look at the bariatric surgeons, if you look at the minimally-invasive surgeons, SAGES [Society of American Gastrointestinal and Endoscopic Surgeons] actually credentialed those people. They didn't go through the other route. They immediately had a huge mass of people that were minimally-invasive surgeons. I think politically I would go that direction.

LIVINGSTON

Where do you think the next great advances are going to be?

MATTOX

Endovascular. I think that the Mattox maneuver ought to disappear. There ought to be a hybrid approach. When you get in the belly and you see there is retroperitoneal hematoma, lean on it, don't open it, put in a balloon, get control, slide in a wire, put in an endograft, and decide if you need to do a bypass. Cut down on the blood loss.

The same sort of thing applies to areas all over the body. The same catheter-based technology might be used in the gut, might be used in some solid areas. This technique is going to totally revolutionize thoracic outlet kinds of injuries and take a 45-minute subclavian artery bypass and think of the 15-minute procedure.

LIVINGSTON

Would you change anything in your career?

MATTOX

I've had one hell of a ride and I've had a lot of fun. I've operated on probably more than 70,000

people. Nobody ever told me I can't do something because of the training I had and where I worked. So I can switch from doing a Whipple to doing a coronary bypass to doing a congenital heart to doing a portacaval shunt to doing an amputation, whatever it is I like to do.

At the same time I have been able to say no to things I don't like. I don't like burns so we've stayed away from burns. So yes, I've had a great time.

I do wish I had learned 10 or 12 different foreign languages. I've traveled one heck of a lot but I'd like to have traveled a great deal more. I always learn from wherever I go because the individual artisan skills of surgeons, even in small places, are sometimes fantastic.

The genome that drives people who ultimately become members of AAST is something special. Even those people who are not members of AAST in some small African country or in Asia or smaller, less known countries have the same skills and, when given the opportunity, those skills are mastered. They have sometimes learned to do some things differently. I would have liked to have seen more and more of that, although I have participated quite a bit.

LIVINGSTON

Anything you would like to do outside the hospital that you haven't had an opportunity to do?

MATTOX

Well, I'm doing some of it. I'm getting involved in health policy. I think politically we are going down some wrong paths. I do think one thing we have learned in trauma and in disaster management is that, like politics, healthcare is locally-based. It's all local and regional and no single formula fits everything. Just as we have developed regional trauma systems that work, and we talk to each other and we're integrated, that same kind of approach ought to be the basis of our integrated health care delivery systems in the future.

Unfortunately, politically, we are getting into a single-payer, Obamacare-directed, federally-mandated, federally-reviewed health care delivery system. I think we, especially in trauma, especially in AAST, acute care surgery, need to recognize just what we have produced in this systems approach to care and replicate that for health care delivery in the future.

I think we have not been as politically active as the leverage that we really have would have allowed us to build. So yes, I'd like to and will be more involved in health policy.

LIVINGSTON

What's the future for Dr. Mattox besides that, clinically?

MATTOX

I probably have material for about six or eight more books I want to write about various things. I think we live in a very small world right now. The globalization of academics and the globalization of trauma care are things we really need to do more of. We speak the same language. We have the same genome. The Internet allows us to do it.

I'm not talking about using global healthcare to refer cases to the megalopolis hospital, but instead, sharing of information, responding to each other in a productive way during times

of disaster, consultation that's really not a formal billing, but a how-do-I-manage-this-case-that-I've-never-seen-before kind of thing. We have that capability with the Internet.

If you think about it a moment, the surgeons that are members of AAST are usually respected members of their community that have operated upon or cared for critical political folks in the community up to and including the heads of state. Think how wonderful it would be if professionally we had a united nations of acute care and we had individuals from every country in the world. We may not be able to solve the Israeli-Arabic feuds, but almost everything else in the world we could approach and maybe bring some order to some of the crazy chaos that occurs right now. That would be fun.

LIVINGSTON

Anything else you would like to comment on?

MATTOX

Thank you for the opportunity. Thank you for doing this. We have many great challenges before us. For those who are just coming along, there is no shortage of opportunity to do something new and exciting. I look forward to reading what those who follow us do better than we ever did.



ANTHONY A. MEYER, MD, PhD
PRESIDENT 1996-1997

DR. DAVID H. LIVINGSTON

How did you get into trauma? When did you decide to go into that?

DR. ANTHONY A. MEYER

It was interesting because my PhD work was in tumor immunology and by my the third year I had already written to a couple of places about oncology fellowships. I was early and they said it's too soon to accept applications. I was in my fourth year when I rotated at San Francisco General on the trauma service, which I enjoyed a great deal. I was working with the different faculty and probably the ultimate thing was talking to Don Trunkey about career opportunities and options and things to do. Having spent three extra years in research I wasn't really keen on two more years of oncology fellowship, although I think at that time several of them were only one year.

I decided I would probably pursue surgery and maybe something in trauma and look for clinical opportunities doing anything, maybe just general surgery. At the end of my fourth year, M.D. Anderson called me and said they had my application and had a spot for me if I wanted it, but by then I decided not to take it. I was waiting to find out if I actually had a job and, in late April of my chief year, I found out I had one at San Francisco General.

LIVINGSTON

So mentors, Dr. Trunkey, obviously.

MEYER

Well, Don Trunkey but other people. Paul Ebert, although he was a cardiac surgeon, he was one of my mentors. Dr. Blaisdell though I only worked with him for a year.

George Sheldon, Larry Way and Bob Lim were also mentors to me. Another person who was a mentor was Jim Carrico. I met him when I was a chief resident presenting my first surgical paper at the AAST at The Homestead in 1981.

LIVINGSTON

Your first presentation was at the AAST?

MEYER

I had presented some in my basic research at the federation meetings, but my first surgical one was as chief resident at the AAST.

LIVINGSTON

When you finally decided to do trauma, how was that viewed?

MEYER

I guess I never thought much about it. At that time there were a few oncology fellowships and most people did general surgery with a different focus in some specialties. There wasn't the degree of sub-specialization there is now. People just thought that was the reasonable thing to do. I didn't want to do vascular. Although I thought a little bit about cardiac, I decided it was time to be done with training. Nobody asked me or said, "You should go do a fellowship."

LIVINGSTON

San Francisco was your first position?

MEYER

Yes. Paul Ebert was the chair. I asked if he knew about any jobs or openings and he said, "Well, I can ask around." Then he said, "If you were going to stay here where would you want to be: at the VA, at the university, or at the county?" I said, "Probably at the county—at San Francisco General." He never mentioned more about it. The only job interview I had was in Cincinnati. After the interview I wasn't clear what my role would be, so a couple of days later, I sent a letter back to Joe Fischer saying, "Thanks for interviewing me but I don't really see a job there."

He sent a letter to me that crossed in the mail that said, "Thanks for coming to interview but we don't have a job for you." In retrospect it was a fortuitous thing. It wasn't until our Nafziger Society dinner, not at graduation but in late April, when I saw Dr. Ebert and he asked me if I was ready to start at San Francisco General. I was surprised because nobody had said anything. I had no formal offer, no contract, nothing. So I said I didn't have any contract and Dr. Ebert tells me we don't have them. If you want one, write one. That's when I knew I had a job.

LIVINGSTON

Although I can't imagine finishing as a chief and not knowing what you are going to be doing two months from now.

MEYER

It was a little stressful. It was a little stressful for my wife, too. I had been up at the bar getting a glass of wine for my wife and myself and that's where I ran into Dr. Ebert. I came back to my wife and said, "Here is your wine and I got a job."

LIVINGSTON

What do you think is some of best career advice you got?

MEYER

I think most people encouraged me to do what I wanted to do. I thought about doing several things, including congenital heart surgery. I thought about other things. But Don Trunkey encouraged me to look at trauma seriously and that it was a real career opportunity. I would say if you picked one piece of advice that was probably the best.

Somebody really encouraged me to pursue endocrine surgery. It was interesting, but nothing that really excited me. So that was it for that.

LIVINGSTON

Any bad career advice you've gotten over the...

MEYER

I would say the endocrine was the worst career advice. No, I think by and large most people – very few people offer advice offhand.

LIVINGSTON

What contributions are you most proud of and how do you think it influenced trauma and critical care?

MEYER

I think one of the first things I did when I was a brand-new attending out at San Francisco General. CT was just being regularly used on trauma patients and we started doing non-operative management on selected liver injuries. I wrote about that in '84. When I actually presented it first to the faculty, I got a lot of push-back. In fact one of the attendings said he didn't think it was a good idea but I said, "One of those was your patient."

It was using imaging to be much more selective in appropriate operative management. I'm sure a lot of people started doing it or thought about that at the same time, but that was one of the early papers on it. I remember I presented at the Western Trauma Association. There wasn't a huge amount of enthusiasm for the concept.

LIVINGSTON

Well, it went from almost heretical to standard of care in less than two decades probably.

MEYER

I think Gene Moore sort of challenged the idea, but that's how things change. I wrote on operative management of acute pancreatitis guided by fine-needle aspiration. That's been made a little less relevant now because of the better quality imaging.

Another area was pushing critical care as having a major role in surgical management, because when I first started doing that there were only a few people who identified themselves as intensivists. Especially as a surgeon having a major role as part of surgical management. The first surgeons who really pushed that were Joe Civetta and Frank Cerra.

LIVINGSTON

Anything you thought was a good idea, you adopted it, and in light of new data you said, "Oh, that wasn't really the idea we thought it was?"

MEYER

Well, I had spent a lot of my research efforts on trying to develop cultured skin for burn wounds. It's actually still being worked on, but there are a lot of problems that haven't been solved on it yet so it's still a potential, not an actual. People use it but there are significant problems with it because it's still grown with fibroblasts as feeder layers that get incorporated which lead to late graft loss. It's not been the big plus that I had hoped for.

LIVINGSTON

In your career what do you think has been the big advances in trauma care that has really changed the way we do things?

MEYER

Looking back I can certainly remember as a second-year resident when we first did CT scans for abdominal trauma, for blunt trauma. It took 20+ minutes for us to scan an abdomen. By the time we were done and the patient was hypotensive, you already knew what the problem was. But imaging has made enormous improvements not just in abdominal but in head trauma and many other things. So I think it has been one of the big advances that impacts trauma care.

I think refinement of resuscitation. We have gone through different schools of thought, different approaches. At one point you'd give them too little fluid, later you'd give them too much, and then even more extreme fluid. Now I think people are getting back to a physiologic approach and so I think resuscitation has improved.

Another advance was damage control. We've done that for a long time but having actually studying it was a new thing. I think that that has helped.

Lastly and most recently has been transfusion and avoidance of coagulopathy. Those have all made real positive strides. That's in terms of the medical care. Things like routine air

bags and better car design and have made a major impact in prevention and outcome.

I guess the very last thing that I probably should say that is trauma centers. If you look at the data from the national studies, being injured in the county with a trauma center gives you a 25% to 30% improved survival. There are very few things in medicine that gives you 25% to 30% improved survival. It's remarkable.

LIVINGSTON

What about changes practice patterns that you have seen?

MEYER

We've all seen a reduction in penetrating trauma. The move to non-operative or selective non-operative management have been a couple of big things.

LIVINGSTON

What parts of the career have you enjoyed the most and found most rewarding?

MEYER

I think training residents is what I enjoy most. Taking care of individual patients and helping teams make progress in getting better at what we do. But all that is tied in to training residents. Whatever field they pursue, helping residents develop into capable surgeons who commit to taking excellent care of their patients is incredibly rewarding. Getting them to be interested enough to participate in trauma care and whatever else they do is also important.

LIVINGSTON

What has been the most challenging or distressing times in your career?

MEYER

Recently? Finances. You know, being a chair of a department that's the thing you have to worry about most, the most trying. You have to have to make things keep working because if you can do that, you can recruit and retain and build. Without it you are scraping along and likely will fail in the long haul.

I guess I never really had that much trouble with deans or even with hospital directors. If you make a reasonable case for what you want, you can usually get a reasonable response and an expected commitment. I don't go and yell and scream and pound on the desk just to prove that I can get somebody to do what I want. You may get it one time, but they soon stop listening to you if that's how you always approach a problem. At the same time the challenge of trying to get things done can be trying.

The other thing, it used to be more difficult having people that were willing to cover trauma and emergent general surgery. That has seemed to change in the past five to ten years. We've never had that much of a problem at UNC, but it is an issue in a lot of places.

LIVINGSTON

What career advice do you give your young trainees or young surgeons who are interested in a career in academic trauma, critical care, acute care surgery?

MEYER

Tell them to do what they like to do, but make a difference in whatever you do. If you're just doing this to fill a job, then don't do it. Do it because you feel you can make a difference at what you do, and then make a difference in your own life and that of your family members by also being part of them at the same time.

LIVINGSTON

Where do you see the big next challenges are for trauma and acute care surgery?

MEYER

I still think, like everything else, it is going to be health care cost control. We have pretty good evidence of the financial/societal benefit of trauma care and organized trauma care systems. But with the mounting pressures to reduce what we spend on health care because it's unsustainable it could be one of the things that takes a big hit.

LIVINGSTON

What do you think the next big advances are going to be in trauma and acute care surgery?

MEYER

It is hard to predict them. I think that there is going to be more regionalization, including acute care surgery, because they're tied together and because the trauma systems have shown it to be not only clinically effective at improved outcomes but also cost-effective.

So I think that there may be more of that. Rather than every hospital having their little ER and taking care of patients, I think if there is universal coverage for health care the indigent care referral structure won't go away but I think that the resources required to provide high-quality, comprehensive, urgent and emergent care are going to require more regionalization.

LIVINGSTON

Anything you would change in your career?

MEYER

I guess probably I would try to worry less about whether or not I would be able to accomplish anything. In retrospect I probably shouldn't have worried or been worried. But it's how I am. I tend to worry about things.

LIVINGSTON

Anything outside the hospital you would change?

MEYER

I guess I'd probably try to spend more time with my wife and children. The kids grow up pretty fast—you blink and they are gone. At times I thought I didn't spend enough time with them. Once they hit 14, they're pretty happy to not have you spend any time with them. But it's amazing how much what you did with them they do remember. So even if it may not seem as much as you wanted, in retrospect, they remember it.

LIVINGSTON

What are your next plans—career, personal?

MEYER

I've re-upped for another five years of being chair in 2012, so I plan to finish that. After that I'll probably stop being chair then and enjoy somebody else having the opportunity.

If I can still operate and enjoy it and take care of patients, I will do that. If they want me to do some administrative things relating to the health care system and I want to do it, I will do that. I'll probably try to stay involved in resident teaching regardless.

LIVINGSTON

Anything else you'd like to comment on? Any words for the 75th anniversary of the AAST?

MEYER

I think that we get all wrapped up in the concern about funding and costs and all that. But people are always going to be getting injured and they are always going to be getting sick. So trauma, acute care and critical care surgery are going to always be important. If we stay focused on doing that and making a difference there, then I think we don't have to worry so much or not get too overly concerned about the other extraneous factors.

I also think the AAST will play an essential role in improving the care of the injured patient, both in delivery of care, and research to improve care. I was at the 2012 meeting and was incredibly impressed with the commitment of the younger surgeons and their innovative ideas. Many organizations are having problems these days, but I think the AAST is an incredible organization that keeps getting better because of the commitment of its members.



ANNA M. LEDGERWOOD, MD
PRESIDENT 1997–1998

DR. FREDERICK A. LUCHETTE

How did you decide to choose a career in surgery and when did you decide to focus your career on trauma surgery?

DR. ANNA M. LEDGERWOOD

Well, as a medical student I went to Marquette in Milwaukee in 1963. I was fortunate to be one of three out of 100 women at that school. I was just scared to death and just tried to survive the first two years. It was absolutely wonderful and for sure what I wanted to do. When I got into the clinical years, I liked all of my rotations, but obviously surgery really turned me on. I was on Ellison's service at the County Hospital in Milwaukee. It was called the blue surgery service. What really turned me on was not only taking care of patients but the caliber of the surgical residents and the attendings. But in particular, it was the surgical residents.

I could really identify with them and enjoyed that rotation. Then during my senior year, I spent another month as an elective on that same surgical service. I absolutely loved surgery, but I could sort of sense that I wouldn't be readily accepted, being a female, into surgery.

Next, I worked at the Children's Hospital in Milwaukee doing lab work at night and on weekends. Pediatrics seemed exciting. There were patients with tricuspid atresia, lupus, glomerular nephritis and leukemia. Pediatrics was exciting enough and I thought I should be a pediatrician. I had no money or time and I never interviewed anywhere. So I sent out applications to three places that had busy emergency departments affiliated with a university. They

included the hospitals at L.A. County, Cook County in Chicago and Detroit General. I never interviewed at any of them. I just sent the applications in. And then I got my acceptance for the Detroit General Hospital which I listed as my number one choice.

I was a little leery about moving to Detroit. One of my classmates said to me, "Where are you going?" I said, "I'm going to Detroit General." "Oh, some intern got shot there while working in the emergency department." My response was, "Oh, god. Really?" One of my other colleagues said, "Where are you going?" They said, well, "You know they've got a jail in the emergency room," which is true. So, I was just a little nervous about going to Detroit.

But over the Memorial Day weekend that year as I was matriculating from medical school, I drove to Detroit and looked at the place. After a day or so, I said, "Gosh, everybody seemed pretty reasonable here. This will be all right." So I showed up on July 1st as a rotating intern. Three weeks later, the riot broke out. It was kind of an exciting time.

My first rotation was in the emergency department on the pediatric service and that's where I learned that pediatrics is skin, rash, fever, and diarrhea and it all gets well anyway. Then they sent me to OB/GYN and that was my second choice. I thought, if I don't do Peds, I will do OB/GYN. Well, my god they have abdominal hysterectomy and vaginal hysterectomy. And that's about all they did.

I didn't know what took them so long to learn. Must be obstetrics. Next, I went to OB and they sent me to the homes whenever somebody had a baby at home. I must have done 15–16 home deliveries as an intern. You took a medical student with you and you just wanted to be sure everything was okay. It was a fantastic experience. But I thought, babies fall out no matter who is standing there.

I went on to medicine thinking it was going to be medicine for me. The first day I was on this big ward. There was one 13-bed ward, one 11-bed ward and one 4-bed ward and one surgical intern, me, and one medical resident. I went in early and drew blood for two hours. Then the resident came in and we start these ward rounds. And they get interrupted. We went to X-ray and then got coffee and then lunch and then finally at four o'clock we'd finish these god-awful ward rounds and then we'd start chart rounds.

And honest to god the very first patient we saw that day was an 18-year-old with rheumatic fever. We changed her medications from aspirin to Tylenol and it took 45 minutes. I couldn't stand it.

I did two months on medicine. The second month, I had a wonderful first-year resident. We had a great experience. There were 18 beds on the ward. Whenever we were going to send somebody home, we'd go to the emergency department and pick a patient with a disease we hadn't treated. That's how much pathology there was available.

I cared for the patient who had the first kidney transplant in Detroit. I managed another patient with venous stasis ulcers by placing him on a starvation diet for his morbid obesity. There were patients with a lung cancer, hypothyroidism, lupus and glomerular nephritis, gallstones, and a lung abscess. It was very exciting. So, the two months weren't bad.

My next rotation was emergency surgery. The first morning I went to the recovery room and there was a patient who had a gunshot wound to his carotid artery and jugular vein,

a patient with a gunshot wound to his superior mesenteric artery, kidney, duodenum, another patient with acute appendicitis, another patient with a bowel obstruction, a patient with a gunshot wound to the heart, and a patient with a stab to the heart. That was what they had done during the night. I thought, oh, my goodness, this was great.

That's when I learned that, when I needed help as a rotating intern I would go to the emergency department and find a surgical resident. They were able to help me and I could identify with these people. It was just fantastic. I just loved it.

So, I'm just a rotating intern and I didn't have a job for the next year. One day the surgery attending brought an application down for me to fill out for the surgery residency. So then I sort of knew that at least somebody thought maybe I could get a job.

Then one day Dr. Robert Wilson saw me and said, "Somebody told me you wanted to do surgery." And I said, "Yes." He said, "Well, you know, you've got to see Dr. Walt." So I made an appointment. We visited about ten minutes and he accepted me into the residency. That's how I ended up in surgery.

LUCHETTE

What an amazing story, Anna. And how is it that you then decided on trauma surgery?

LEDGERWOOD

That was really Dr. Lucas who tricked me. Of course, there were a couple of attendings that would regularly scrub in the operating room. Many of the senior residents would be helping the junior resident do the operations without an attending scrubbed. But, Dr. Lucas and Dr. Ike Rosenberg were pretty good about scrubbing and we rotated through two hospitals: the VA and the Detroit General.

When I was finishing my residency, Dr. Lucas called me. One of the residents that was scheduled for the emergency surgery rotation did not want to cover the service so Dr. Lucas asked me if I would. So instead of spending a couple of months on the shock unit with Dr. Wilson, I got to spend two additional months on emergency surgery. And the only other resident on the service was a second-year resident or a PGY-3 which was great for me.

Dr. Lucas called me one day when I was finishing the residency. He said, "You know, I really enjoyed these months." I was happy because he had such a high standard for patient care.

In the last year of my residency he called me after he finished teaching the medical students. There were 256 third-year students at Wayne State. He had been doing a patient management problem 16 times a year. He lectured each Monday for an hour and a half and each Friday for an hour and a half. The format was on Monday you give them the problem and then Friday they presented the results of what they wanted to do and Dr. Lucas would give them some more information.

He was kind of tired of doing that and he wanted to make a movie to do it and there was some money available from the medical school for that. He had this harebrained idea about making this movie on teaching priorities of care of the injured patients to third-year

medical students. He had met with two educators from the medical school. They wanted certain things and that wasn't what he wanted.

I was working on emergency surgery at night when he called me and wanted to know if I could meet at a four o'clock. He got me and a fourth-year medical student that was doing an elective on emergency surgery. So, now it was three to two and he could get whatever he wanted. He made this movie of priorities of care. Then I wanted to stick around and see what came of it. So that's how I ended up staying on as faculty. That was the main reason that I practiced trauma surgery.

That's how I got started in trauma surgery. But always we did acute care which was emergency surgery then. Emergency surgery not only included trauma but it included hand surgery. We repaired all the hand injuries including tendon and nerve repairs. We did thoracic, neck, vascular, whatever!

LUCHETTE

Could you expand on how difficult it was as a woman going into surgery in the '60s?

LEDGERWOOD

Yes. Late '60s. Actually, that just came naturally. In other words, when I was a medical student at Milwaukee the surgical residents treated me wonderfully. I had absolutely no qualms. Now, of course, I worked very hard. I really liked what I was doing. They learned to trust me.

At Marquette University, you had either an intern or a fourth-year student on-call for your service. And the chief would come and make rounds every night at eight o'clock. We made rounds three times a day. The chiefs were able to rely on me to take care of things so they were very happy with that. I did think they were happy to have me on their service.

The same thing happened when I was a rotating intern. They were very happy to have me on their service. I then went on to the elective division as a rotating intern for a month of surgery. Well, I knew all the people on the medical service and so I would go find all of the thyroids and, they loved me, loved what I was doing and taking care of these patients and it really came very easily. Everyone treated me absolutely spectacularly.

I had absolutely no problems anywhere. Even the attending, Mike Denny, who brought that application down for me to fill out, he didn't have to do that.

Then I said that I was only going to stay for a year because I was afraid. There was a female fourth-year medical student at Wayne State who wanted to do surgery when I was a rotating intern. She was working with Bob Wilson doing research. But she was a real pest. She would see something that the resident did in the ICU and go tell Dr. Wilson. Then Dr. Wilson would come down to the ICU and say, "What are you doing running blood in the CVP line?" The medical students in her year told Dr. Walt that if he takes her as a surgery resident they wouldn't come here.

He wouldn't take her as a surgery resident and she did a mixed medicine/surgery residency and ended up eventually going into radiology. But you know, it all had to do with how you treated other people.

I had absolutely no problems. Everybody treated me wonderfully. In the second month of my first year they asked me “You are staying, aren’t you?” I lucked out because at that time there were far more positions available than there were people to fill them.

LUCHETTE

During your training, there was a lot of specialties in their infancy, like pediatric surgery, vascular surgery, cardiac surgery, and trauma surgery. How did your peers and mentors feel about you deciding to pursue trauma surgery?

LEDGERWOOD

Actually, vascular surgery was just beginning to take off. And the pediatric thing had already existed. Quite honestly, it wasn’t trauma, it was more emergency surgery. Dr. Lucas has always said, “Trauma can’t be your wife; she is your mistress, can’t be your wife. You have to have something else.” Emergency surgery was really what I was interested in as much as the trauma. The trauma had some advantages to it but, it wasn’t just trauma that I was doing. It was emergency surgery and always has been.

Before Dr. Walt asked me to stay on staff, Dr. Lucas called me and said, “I had gotten a call from this person who I know who is up around Grand Rapids, and that he is looking for a partner and I gave him your name but I hope you don’t go.” And that was the first time he had ever said anything to me about staying.

And then Dr. Walt asked if I would stay as staff on the emergency surgery service. Now, at the time emergency surgery staffing was done year-round by Dr. Lucas, and he had been covering the service for about a year and a half. The other staff was somebody who rotated on for two months. Most of them really were not too fond of doing it. They did it because it was a requirement of the department and hospital. But they would rather staff the elective divisions. But the emergency division was a little more stressful and harder work.

And of course your coverage was daytime coverage. And the weekend coverage and the night coverage was done by a full-time faculty for that day. The night-time coverage was done by the community surgeons who came back and did their one night for the department. So that’s how the service was staffed.

LUCHETTE

Tell me who were instrumental mentors in launching your career and in helping develop your career.

LEDGERWOOD

Well, I suppose you know the one that first intrigued me was the general practitioner back in my hometown. Then the one that has been most important has been Dr. Lucas. I mean we worked together as partners for 40 years. Partners in terms of we share patients. One of us rounds at one hospital for three days and the other at the other hospital. We switch midweek.

We are in the office the same days. We steal patients from each other, even if it’s a per-

irectal abscess. I just stole a colon resection from him yesterday, kind of wished I hadn't done it. I thought it was diverticulitis. It was colon cancer, perforated colon. He has obviously been the most important one.

Dr. Walt was very influential. The one thing about Dr. Walt was that he accepted you for what you were. He was intrigued by everybody. He wanted to know more about everybody as a person. He cared about everybody as a person: medical students, residents, attendings, whoever. He did give me a residency position and he gave me a job. Dr. Walt did whatever he could do to help you along with your career.

I can remember working on papers with Dr. Lucas. That was the other thing he did. It wasn't just taking care of patients. You had to be writing something. Every weekend something was being written. He would do one draft and give it to me. I was supposed to do a draft and give it back to him. This went on, always one of us had a draft of something that we were working on. He was very insistent on that.

LUCHETTE

Tell me about some of your proudest scientific contributions in the field of trauma care.

LEDGERWOOD

One of my first papers dealt with the exposed vascular graft and covering them with pigskin to get them to granulate (*Am J Surg.* 1973;125(6):690-5). I presented that study at the Central Surgical as a five-minute presentation. The thoracotomy prior to laparotomy for patients with hypotension and penetrating wound to the abdomen (*J Trauma.* 1976;16(08):610-5). I think the albumin work has been class and really got us into looking at patient resuscitation and the three phases of resuscitation. The three phases of resuscitation is the study that I am proudest of (*JAMA Surg.* 2013;148(3):239-44).

LUCHETTE

Is there anything that when you look back on your career that you were passionate about that today we know is not beneficial to patients?

LEDGERWOOD

Well, I think when you look back at earlier ages where everybody got a laparotomy, a little penetrating wound to the abdomen got a laparotomy, a little hole in the colon got a colostomy, I think those things that you know we thought were just holy and righteous turned out to not necessarily need to be done.

LUCHETTE

As you look back over your illustrious career, what do you view as the two or three greatest advances in trauma care science that have occurred during your career?

LEDGERWOOD

Well, as I just mentioned, the management of colon injuries is a big one. I think the ability to have CT scan be able to help us decide what to do is another one.

Quite honestly I think the verification review process has contributed more to care of injured patients than almost anything else because it is really forcing places to meet certain criteria. So you know I think when you look at all of trauma care that's a major influence on improving care.

LUCHETTE

What do you feel are some major changes in practice patterns that occurred during your career?

LEDGERWOOD

Well, when I was coming through as a resident I was the one who was taking care of the patients. I was the one who went to the clinic. I was the one who did the operation—as a resident. As time has evolved and I'm still the one that sees the patient at the office, and I'm the one that does the operation.

I think that aspect of resident training has changed dramatically. I can remember the time when you didn't have to have an attending in the operating room, and now I'm in the operating room for every case I do, including tracheostomies. I can remember, as a senior resident, one of the patients we were filming for the movie was a patient with a gunshot wound to the abdomen. We thought he was dead. But he moved and we intubated him and took him to the OR. He had a gunshot wound to his iliac artery, just about a half a centimeter beyond the bifurcation. We got control of it, but I couldn't help the PGY-4 resident who was with me repair it and I had to call an attending down to help me. The attending happened to be a transplant surgeon. He showed me how to do it. He was very helpful. But that was one of the few times I ever called an attending to help me.

LUCHETTE

Tell me specifically what brings you the most joy about your career at the end of the day?

LEDGERWOOD

Oh, I think there are three aspects. One is seeing the patients do well because the agony of defeat when you lose a patient is so painful. The other thing is teaching the residents and students to be able to do this and to have them so wide-eyed and happy to be able to do practice surgery. To see them do well and to have them do well as they leave and go out into practice, I think that's probably the most enjoyable aspect of my career.

LUCHETTE

What do you find most challenging in modern medicine right now? What keeps you up at night?

LEDGERWOOD

The brokenness of health care and how difficult it is to be able to do what you need to do in order to take care of a patient.

And then some of what I consider just absolutely stupid things that we end up doing that, you know, don't necessarily help patients but harm them. When you have to apply pneumatic pumps to a lady's legs and then she tries to get up and falls and breaks her hip and all we're trying to do is prevent DVT. That probably isn't doing anything anyway with the compression stockings. So it's that you have these outside people telling you how to do things I think is just crazy.

LUCHETTE

You've trained and mentored a lot of general surgeons and trauma surgeons and acute care surgeons. What advice would you offer to a young academic trauma/critical care surgeon for a successful career?

LEDGERWOOD

I think the most important thing is you have to have a surgical practice where you are taking care of patients of some kind and operating. People who don't operate lose their skills. Trauma is becoming very much a non-operative field and so you have to do something that allows you to operate. And they have to keep writing. If you're not going to write, you might as well go into private practice.

LUCHETTE

Let's talk about the future of trauma and acute care surgery.

LEDGERWOOD

Well, I have a whole general surgery practice, too. I do breast. I don't like breast, but, you know, there are some people that send me all their breast patients. Some of it is a bit of a nuisance, but you know you go ahead and you deal with it. I see patients of any kind in the office, elective hernias and elective gall bladders. I do those in addition to whatever comes in acutely.

LUCHETTE

Well, as you look at the future of trauma and specifically acute care surgery, what do you view are the challenges and the opportunities for acute care surgery?

LEDGERWOOD

The challenges are going to be the ability to maintain one's operative skills and the challenges are going to be how to determine how one is going to work with, you know, multiple people dealing with the same patient clientele.

When I go out and do site visits, I don't see many people who do things the way I do. I see people who cover for a week at a time and then they're off a week doing something else.

What I enjoy is the rapport with the patients and taking care of patients and seeing them on a regular basis. I sense the attraction to acute care surgery is the work hours more than the patients. That's what I'm afraid of.

LUCHETTE

What do you see are the opportunities for acute care surgery?

LEDGERWOOD

I think there is a tremendous amount of opportunity. I just did a site visit. There are two general surgeons working there. One guy lives in Chicago and they're doing all of the general surgery. They are taking 25–26 calls a month and paid \$2,500 a session. One guy lives in Chicago. He drives up and stays at the hospital three or four days and then goes back to Chicago.

The other guy lives there in Jamesville but, gosh, he can't find anybody to come and work with him and yet he is doing 300–400 cases a year, most of it is acute care surgery.

He only did about 20 trauma operations, but it's a busy place. So I think there is a tremendous opportunity but you have to be willing to work and take care of a lot of patients.

LUCHETTE

What is your prediction for trauma surgery 20 years into the future?

LEDGERWOOD

My guess would be that someday we're going to see emergency medicine doing all of it, except when we need to go to the operating room or admit the patient.

LUCHETTE

Emergency medicine or hospitalist doing the non-operative care? And that's the only prediction you see for the next 20 years?

LEDGERWOOD

Yes, I think that's probably going to happen. Hospitals can't afford to pay for this.

LUCHETTE

Well, as you look back on your professional career, is there anything you would have changed?

LEDGERWOOD

I don't think so. I don't know what it would be. It's been great.

LUCHETTE

How about your life outside the hospital. Is there anything you would do different?

LEDGERWOOD

I suppose the one thing I would have done, Fred, I would have kept a better diary of these things because someday I could write a pretty good book from the stories some of the patients tell you.

LUCHETTE

What are your future plans both personally and professionally for the next 5–10 years?

LEDGERWOOD

I'm probably going to keep working. I've got my farm out west where we raise wheat and barley. I get out there four times a year or so and go fishing. There is lots of things to do if I had time to do it. I've got to cook for a party next week. All the residents and students rotated with us for six months come.



J. DAVID RICHARDSON, MD
PRESIDENT 1998–1999

DR. DAVID H. LIVINGSTON

As I was your first “modern day” trauma fellow, it is a real honor to interview you for this project. From my time in Louisville I knew you did a cardiothoracic fellowship, but when did you decide to do trauma?

DR. J. DAVID RICHARDSON

I never did. I think you know, I never viewed myself as a trauma surgeon. I didn’t then and still don’t. I was just a surgeon who did trauma. I never was going to do it to the exclusion of other aspects of surgery. The reason I did cardiothoracic wasn’t to do cardiac. For better or worse, what I intended to do was one of the few things that actually worked out the way I planned it. I came up in an era where surgeons did a variety of big operations and I didn’t want the diaphragm to be a limitation, so I did non-cardiac thoracic surgery as well as vascular, broad-based, general surgery, and trauma.

When I came to Louisville, trauma was a big part of what we did in the department. I had a large elective practice, but also felt an obligation and responsibility to cover trauma, so I just did.

It wasn’t a conscious decision, “I want to be a trauma surgeon.” I was just was a broad-based surgeon who happened to have trauma as a part of a much larger scope of practice. I enjoyed the challenges of trauma surgery and believe that having a good elective practice enhances trauma skills.

I find the hoopla about ‘acute care surgery’ amusing in that everybody acts as if this is something new. As you know in Louisville, we built a model that was really acute care surgery plus elective if you wanted to do it. When I hear people say, “we discovered or named acute care surgery,” I note we have been practicing what we called emergency general surgery with trauma and surgical critical care for decades.

LIVINGSTON

Who influenced your career? Who were your mentors?

RICHARDSON

Certainly when I started medical school I never intended to be a surgeon. I thought, I’ll probably be an internist. And the fields I thought I had ruled out were psychiatry and surgery. However, I wanted an opportunity to work before I began medical school, and was hired in the surgical labs at the University of Kentucky with Dr. Ben Rush. I then came under the influence of Drs. Rush and Ben Eiseman and got the surgery bug.

It was a very good, young, exciting department. I also did some work in the lab with Dr. Ward Griffen and I got caught up in the excitement of it and decided to pursue a surgery career. It made me appreciate early mentoring.

I started at Kentucky but finished my residency in San Antonio. In those days, it was thought to be good to move around and not do all your training in one place, although I didn’t have any real desire to move.

Dr. Kent Trinkle who is long deceased—Kent died a number of years ago at a very early age—left Lexington to start the cardiac program in San Antonio. I had worked in the lab with him and went to Texas with him. There I also met Fred Grover who just stepped down as the chair at The University of Colorado in Denver recently.

I’d been fortunate enough to have been able to write those with them and they treated me extremely well. We worked hard, but it was a very collegial group. I was the only cardiac resident there for two years, so I did all the cases and it was a great experience. They were important mentors along with Dr. Bradley Aust who was chair in San Antonio, Arthur McFee, and Dave Root. Of course Dave Root is also a past president of the AAST. When I came to Louisville you know about my relationship with Hiram [Polk].

It is interesting but I learned a lot from Hiram, in terms of the political things he did and the way he did them. If you are asking, did I have somebody that pushed me and made my career? I would say no, I don’t feel that way. But in terms of people that I learned from, respected and admired, I think I’ve named some of them. There were a lot of others as well.

LIVINGSTON

What’s the best career or life advice you got?

RICHARDSON

I don’t know. I’m philosophical about life on my own. Dr. Eiseman once told me that to be ac-

ademic surgeon, you ought to do three things. The first was write two papers a year. If you do that, soon you will have a pretty good CV that nobody can quibble with. Second was that you should try to get on the operating schedule every day so that people will know you are a real surgeon, and the third was to have an exciting hobby so that it takes you away from things. Of course Dr. Eiseman was a mountain climber and I have my horses. I always thought that was good advice.

LIVINGSTON

Any particular bad advice?

RICHARDSON

The think the worst advice I was ever given was when I was told, "Dave, you have to specialize. You can't be so broadly focused." As you know, I never did take that advice. It may be good advice, I just never took it.

LIVINGSTON

What scientific contributions are you the most proud of?

RICHARDSON

I think the flail chest work was pretty important but nobody ever talks about any more. Currently few remember what a ground-changing concept the changes in flail chest management were at the time. We totally changed flail chest management in a year or two from the days when a patient with even a minor flail and no physiologic deficit had a mandatory tracheotomy and was placed on a ventilator for a month. We changed that based upon some animal work. The science was certainly crude by today's standards, but at the time it was the best we could do. We really pointed out that the problem with flail chest was not a mechanical one but may be due to underlying pulmonary contusion.

I find it also fascinating that, if you go back and read these papers, we pointed out one of the real problems was over-resuscitation. At the time we presented the concept of low-crystalloid resuscitation with pulmonary contusion, we got beaten up. Now, 30 or 40 years later, people are coming around and saying, "Hey, we don't need to give all this fluid." I think we convincingly showed in patients and animals that if you had pulmonary contusion and you gave a large volume of crystalloid it increased the area of the contusion, made the lungs heavier and worsened hypoxia. Likewise, flail chest patients could be often treated without a ventilator at all or with short-term support.

I also think the developed protocols of injuries that Lewis Flint and I did in Louisville was really pretty good. What we developed were protocols that could work. It may not have been the only way to treat duodenal, pancreatic, or colonic injuries, etc., but they worked pretty effectively and were important where you had variety of residents and attendings.

LIVINGSTON

Is there anything you embraced or championed that you look back on now and say, “Why did we do this?”

RICHARDSON

Well, I don’t know. I know this sounds bragging, and I don’t mean for it to, but as a resident I had the concept of abdominal compartment syndrome. I gave the paper at AAS as a resident and it published in the *Journal of Surgical Research* (*J Surg Res.* 1976;20:401–4). What I had noticed was that when the abdomen became tight, patients didn’t do very well. In a canine model, I created intraabdominal hypertension, that is what I called it, and showed how the respiratory mechanics changed. I even did some microsphere work and demonstrated that that intestinal and renal blood flow changed as you elevated abdominal pressure beyond a certain level.

I always joked and said if I had been in the Navy and come up with the analogy of damage control on the ships, I’d have been famous. But I didn’t make enough of a clinical connection, which I think why the studies were forgotten. The other connection to damage control was that Lewis Flint and I had sent an abstract to the AAST where we had had this novel notion of packing people’s abdomens. We had seven or eight patients and we’d saved five or six of them, and I was fairly sure it would get on the meeting just so they could throw things at us. Instead they took Feliciano’s paper which had *ten* patients and then made me discuss it. So there is lots of near misses in your career even if you come up with good ideas.

In terms of really dumb ideas, I don’t know. We all have them, thankfully we don’t act on most of them. I think we may have been behind in embracing non-operative management of solid organ injuries. Not that we didn’t eventually get there but I think we were probably a little late to come around to that viewpoint.

LIVINGSTON

What do you think are the major changes in practice patterns that you’ve seen in your career?

RICHARDSON

I think specialization has been huge in terms of practice. You know the most-quoted paper I have ever written, by far, was the one asking “will there be trauma surgeons available?” The workforce study that Frank Miller and I did (*J Trauma.* 1992;32(2):229–33). If you look back in time and see what the mood was then and then go forward to today where there are a lot of residents wanting to do trauma and critical care, it is a great thing to have watched. That to me has been the thing that I’ve found the most interesting. An awful lot of our great young trainees are embracing trauma and emergency surgery as a career, and I think the way the field has grown has been the biggest change that I have seen.

I do have some general concerns about training in the country. I have worried that even in trauma and critical care that we may oversaturate the field if we are not careful. We need to be training people who can do a more than one thing. I still think what the country needs are

more general surgeons who can multitask and do trauma and other things including acute care surgery or nocturnal surgery or whatever you call it.

LIVINGSTON

During your career what do you think are the two or three biggest advances in trauma care we've made?

RICHARDSON

I think the biggest has been the advances in surgical critical care. Frankly, I'm not sure surgeons operate better and maybe not as well in some ways compared to years ago. I believe surgical critical care and the ability to keep really sick people alive—all the advances in ventilator care, understanding of and the ability to manipulate physiology, and give really super sick and hurt patients a chance to survive—has been the biggest advance by far.

Secondly is the concept of damage control. I can remember when we would struggle in the OR trying to stop bleeding that was untreatable because of the triad of hypothermia, acidosis, and coagulopathy. It was just a lack of understanding. I remember we had a discussion about that topic at the Southern Surgical and a couple of surgeons got up and said, "You boys just don't know how to operate, just suture the blood vessel" and all the stupid stuff that people will say who haven't been in an OR at night in 30 years and haven't taken care of really bad, hurt trauma patients ever in their life. That whole concept and recognition of the importance of blood clotting and damage control is huge. I think the recent extension of the damage control resuscitation has also been a big advance in saving patients.

Imaging would be the third major advance. David Root revolutionized diagnostic evaluations with peritoneal lavage [DPL] and we did hundreds of DPLs in San Antonio when I trained and here in Louisville and that was the great advance. Today, the imaging capabilities are astonishing.

LIVINGSTON

What parts of the career have been the most rewarding for you?

RICHARDSON

Resident and fellow education and helping them in their careers. I am extremely proud of you and your fellow trainees. There is a saying that: "You drop a pebble in the water and you don't know how far the ripples will go." I believe in that. If you're going to do academic surgery, you've got to believe in that because so much of what we do put up with in academics is awful. Having to deal with deans and all of the other administrative headaches is often unpleasant and an impediment to you doing good. You can quote me on it if you want. I suspect it's true every place.

So if you don't believe that you're making a difference in people's lives other than providing clinical care, one should likely go into private practice. But helping and watching the residents and fellows mature and progress in their careers is the thing that has given me

the most pride. In addition to yourself, many leaders have come through our department. Gill Cryer, David Spain, Eddie Carillo, Bill Flynn and many others who have done well. We now have an amazing group of young people currently with us. My current boss, Kelly McMasters, trained with us and I gave Mike Edwards, who is the chair in Cincinnati, his first job in general surgery, although he eventually did oncology.

It is also not just the trauma fellows but students and residents that have come back years later, totally unsolicited, and say you changed my life because you helped me do this or that or you helped me get a job or you gave me this advice or I learned this from you or whatever. That's an amazing and heady thing for me and by far the most rewarding.

LIVINGSTON

What advice do you give a resident or fellow wanting to do pursue a career in academic surgery?

RICHARDSON

Well, I think the first thing is it's important to understand what you're getting into and why you are doing it. I find an awful lot of people now who say they want to be in academics who have no academic leanings or pretentions. They don't particularly like to write, and often they don't have an inquiring mind. They like working and hanging out with residents, but not necessarily because they are interested in education. Maybe they see it as cool or because that's what they know.

While it sounds simple, if you are going to pursue an academic career you should really enjoy the academic part of it. Really teaching, not just having a resident assist you in the OR. Really being a mentor to somebody. It should include some degree of scholarship. I'm not necessarily talking about doing bench research, but I do think you should have a scholarly, inquiring mind if you're going to do academics.

I am also a big believer in life balance. Unfortunately many people have interpreted the concept of life balance as you can't or don't work hard. Real life balance is just that, balance. I've managed to do that with my horses and it's been a huge part of my life. But I surely worked hard to pay for it. I also really think it's important to be family oriented; I am and I know you are.

I'm very close to my children. You always wish in retrospect you'd probably spent more time with your children, but, having said that, I don't know that they would have wanted that. I mean they are kids and they don't want their dad around all the time. Additionally, you've got to earn a living and I was the sole breadwinner. I came from Appalachia where I was the oldest of four children and had to always make it on my own from a financial standpoint. You end up working and doing things that, had you had a little more freedom and flexibility financially, you may have done a little differently. Managing the balance is hard, but life is hard. I think having a good, active life outside the hospital as well as a vibrant family life is important.

LIVINGSTON

What do you think the next challenges and opportunities are for general surgery, trauma and acute care surgery?

RICHARDSON

The problem that I have with acute care surgery is that while we have given something a name, I worry that often the people who talk about it don't have the skill set it takes to do the job for which the discipline is named. For example, if you are going to purport to be an acute care surgeon, then the cases treated are some of the most challenging cases that come through the door. If a patient presents with a gunshot wound to the chest and you call thoracic surgery and they take care of it or you've got a vascular emergency and you call the vascular surgeon, or your blunt chest trauma patient has an empyema or a retained collection and you get a thoracic surgeon again to do the VATS, or you call the colorectal surgeons for the patient with a perforated diverticulum, then what have we really done? Unfortunately we've not done anything more than just become a simple non-operating referral-based service that triages patients to somebody else who really takes care of the problem.

What I fear is then we've named something "acute care surgery," but in many places we're not giving people the tool box they need to really manage the acute problems which are often vascular or thoracic or major abdominal problems in nature.

Can you operatively manage a really bad liver injury if you had one? I still assist junior surgeons with thoracic trauma and am called in for some of the complicated other injuries. The greatest challenge is how we teach those operative skills and how we really give people the skill set they need to manage the acute problems that they're going to deal with if you want to be an acute care surgeon in something other than name.

When you were with us, you came to the OR to see patients and operations even when you weren't on call. That mindset is very hard to get back. I did that as a resident. I said, "If you've got something really interesting, call me." I mean call me. You'd go to jail if you did that now. That's bad, and not good for training.

LIVINGSTON

Given our conversation it doesn't sound like you would change much in your career or in or out of the hospital.

RICHARDSON

No, not really.

LIVINGSTON

Maybe get a few more winners in the horse races.

RICHARDSON

Well, that's always—I bred a big winner of a Grade III race on Thursday in San Anita that I had sold to Bob Baffert, so that was good. I also won a Stake's race, 100 Grand, at Saratoga this

summer with a horse that Hiram and I still own.

LIVINGSTON

Anything else you want to comment on for the 75th anniversary of the AAST?

RICHARDSON

I've had a wonderful career. I've really enjoyed the trauma part of it. I know it sounds sort of tacky, but I mean it—I can remember many nights when I'd have big operative days, a full day schedule with a full day schedule planned for the next day, and climb out of bed to come in and help some poor person that was injured in the middle of the night. I may have left sad because the outcome was not good but I never left angry or said, "Boy, why did I have to come in and do that?" I always felt that this was a part of giving back and that was what you did and you paid your dues and it always gave me a great sort of charge to be able to do that. Many a night I have come home bone tired and laid down for an hour and gotten up and taken a shower and operated all day the next day and not felt badly about it. I was fortunate to be able to do that and I certainly don't have any complaints about a thing.



FRANK LEWIS, MD
PRESIDENT 1999–2000

DR. DAVID H. LIVINGSTON

How and when did you decide on trauma as a career?

DR. FRANK LEWIS

I guess I decided on trauma midway through my residency as a result of working with Bill Blaisdell at San Francisco General. Bill was my primary mentor. He was chief of surgery at San Francisco General and during my residency and then when I stayed on there on the faculty for next six or eight years. I always thought he was an inspirational figure.

Dr. Burt Dunphy who was the chairman of the department was the other really extraordinary role model and probably secondary mentor. Dr. Dunphy was the chair at UC from 1963 to I think it was 1976 or '77, and I came in as a resident in 1966 and finished in 1972. I was there right in the middle of his tenure and it was an extraordinary era of people who were really amazing. It was probably the best training program in the country at the time and it was blind luck that I fell into it.

When I went out to San Francisco as an intern, not in the surgery program. I went to medical school at the University of Maryland and there was a really equally charismatic figure who was the chairman of medicine named Ted Woodward. Woodward was probably the single best teacher I ever had. He was an incredible clinician but he was also an incredible Socratic teacher. He spent an amazing amount of time with the medical students when you were there. Based on my exposure to him, when I finished medical school, I wanted to be an internist and

had arranged to do a year of internship in San Francisco and then come back to Maryland as an internal medicine resident. I did an unusual internship and there weren't many of them around. They were called mixed internships rather than rotating. We had six months of medicine, six months of surgery, but no OB-GYN or pediatrics. When I got to San Francisco General my first six months were all medicine. It took me all of about two weeks on the medical services to realize that I had made a big mistake. Internal medicine based on my encounters with Dr. Woodward was really not what internal medicine really was. Within two months at the most, I had decided managing all this chronic disease was not satisfying or what I really wanted to do. I called Dr. Woodward and told him that I was giving up the residency.

When I rotated onto the surgical services, it was three years after Dunphy started and he already had this extraordinary group of residents and it was just like night and day. Suddenly there was this group of incredibly talented people. It was a time when the trauma experience was just beginning to increase in the late '60. Bill Blasdell had come out there as chief of surgery the year before. It was just exciting on a day-to-day basis.

Bill developed the first trauma center in the country there in 1967 or '68 and fostered all the research, so I just seemed to accidentally drop down into this amazing place. At that point, I had given up my medical residency. While I applied for surgery as soon as I realized that it was what I wanted to do, it was too late to get in the following July. But I was accepted for the year after so I spent a year doing some graduate work. A belated experience but I ended up in the right place.

LIVINGSTON

When you decided to pursue trauma, how was it viewed? I imagine given your location and the faculty at SF General, it was considered a real career path compared to cardiac or vascular or GI or whatever?

LEWIS

You know I don't know that we even thought about it in those terms. It wasn't a matter of thinking about it as something different or something special. It was just what you did every day and it was just fascinating stuff. So it really was not a conscious decision that I wanted to do one specialty versus another.

In retrospect the entire time I spent at San Francisco General was really what is today called "acute care surgery." It was not just trauma but an incredible variety of acute illness. San Francisco General, I don't know how much you know about it, but it's the only city in the country where the city actually owns and runs all of the ambulances that pick people up. It's a legacy of San Francisco's fairly socialist history.

Back in 1890 or so, the city started a whole series of emergency hospitals which were dispersed throughout the city. Originally I think there were seven. They were really first aid stations that were geographically spread around the city. They created an ambulance system that if someone had something that needed hospitalization would move people from the emergency aid stations to San Francisco General. San Francisco General was the final receiv-

ing place. At the time the emergency portion of San Francisco General was actually a separate hospital by itself. It was called Mission Emergency Hospital and San Francisco General was the admitting facility attached to it. All of the care provided, both in the facilities themselves and in the transport, was all free. It was part of the tax base of San Francisco and that system continued, basically without much change, until 1965.

The patient population at San Francisco General just prior to Medicare was about half chronic-care patients who were there for months at a time and about half acute-care patients. Every medical service had a ward full of chronic patients and a ward full of acute patients, about 45 of each. Once Medicare legislation passed, all of the chronic patients could be moved out to nursing homes. So from 1965 to about 1968 the population of San Francisco General was but in half from about 1,000 to about 400–500 patients. Nevertheless the facility still got everything in San Francisco because the city owned the ambulances. There was virtually nothing in the way of emergency rooms at the other hospitals and there were no other ambulance services except for residency transport. It was an unusual system, so even though the city is not that big, San Francisco General got all emergencies of every kind.

It was fantastic training. The other important aspect of the General was that the surgical faculty was never larger than eight or nine people. So that was not enough to specialize and we never had pure vascular or thoracic surgeons or anything else. We just did it all. We grew up with that and never thought about it as anything particularly unusual.

LIVINGSTON

What was the best career or life advice you ever received?

LEWIS

I don't know. I don't know that I ever really received any actually. I've always just kind of done what I wanted to do. If I wanted to give somebody advice, that's what I'd tell them: just do what you have fun doing. That's probably the best advice I could give to anybody.

LIVINGSTON

Did you ever get any bad career advice?

LEWIS

No, I don't really think so. I think the key to happiness is doing what turns you on and not paying attention to secondary issues. Paying attention to things like how much you get paid or secondary issues never turn out to be the right motivator.

LIVINGSTON

Of all of your scientific contributions, what are you most proud of and how do you think it influenced care in the field of trauma?

LEWIS

I don't know that I've really had that much impact, quite honestly. The paper that I wrote that has always been cited more than any other was a paper that was written about prehospital resuscitation. It was kind of interesting because back in the late '70s and '80s, the whole issue of prehospital resuscitation was being talked about a lot as paramedic services were developing. But based on what we saw at the General, I developed the belief early-on that there was actually nothing that a paramedic could do to a patient in that environment that would be beneficial in the way of resuscitation. My reasoning was that it always takes time to start an IV which is virtually impossible to do in a moving ambulance up and down the SF hills. So they always hold the patient at the site until they can start an IV.

In San Francisco, the time to a hospital is never more than 15 minutes because the city is only seven miles square. So it was my belief that in San Francisco, which was what I was experiencing, it was foolish for paramedics to start IVs because the time that was lost in doing that could not be compensated by the amount of volume you could give in the time it took to get to the hospital. Hewlett Packard had just made a new programmable calculator that you could actually program in machine language and they had all these little gadgets that went with it including an X-Y plotter. I got interested and thought, you know, the resuscitation issue would be a great problem to model scientifically. So I sat down one weekend after I bought this new computer, which in retrospect is so simple and archaic, and set up a model where you would specify at the outset what the patient's rate of bleeding, how long it took to start the IV, fluid infusion rate and then how long it took to get to the hospital. After you put in this initial set of conditions the "computer" would calculate the patient's physiology one minute later for the next two hours.

You could generate these curves so that you could compare different bleeding rates, different transport times, different delays in starting an IV, etc. Over one weekend from Friday night to Monday morning I sat at this computer for probably 20 hours and plotted all these possible circumstances out. While not surprising now, it turned out that there is no winning strategy to starting an IV in the prehospital setting if the transport time to the hospital is less than 45 minutes. Slow bleeding, fast bleeding, anything you want to think, it doesn't matter. I wrote the findings up the next week, sent it off and it got published in *Journal of Trauma* a while later (*J Trauma*. 1986 26:804–11). To this day that paper is more cited than any other single paper I wrote. It was written by myself over a weekend based on this little computer.

LIVINGSTON

During your career, what do you consider the two or three greatest changes in trauma care were?

LEWIS

I think the biggest change is clearly the concept of a trauma center and having immediate facilities available for treatment. Everybody thinks that's second nature today, but in late 1960s or early '70s it was a new idea and not widely accepted. The institution of trauma systems

and the understanding of the improvements that they could provide for trauma care was something that started evolving back then and took another 15 or 20 years to become widely accepted. I think that's the single biggest event that occurred.

Another thing was how the specifics manage individual injuries changed. There are obviously many controversies around how should you measure splenic laceration for example, but many of those issues, conservative versus operative, played out during my career. That whole process continues to evolve but what is most important is the concept of defining a whole area of management in trauma care, analyzing the results—what works, what doesn't work, how should you be doing it, how should you train people to do it—and pick the best of it all.

Lastly the evolution of what is now being called acute care surgery as a distinctive specialty area I think is a significant step forward. It is clearly still in its infancy and needs a lot of further development and work but I think it's the right way to go forward in terms of improving care for the public.

LIVINGSTON

What aspect of your career have you found most rewarding?

LEWIS

I don't know that I could pull out one aspect. I haven't practiced surgery, per se, since I came to the American Board of Surgery, but during my practice I always thoroughly enjoyed the personal aspects of dealing with patients. I always thought patients are infinitely variable and they were infinitely fascinating. I really totally enjoyed all of the aspects of patient care.

The second part of it, which is equally true since I was always in academic institutions, was that I thoroughly enjoyed the residents and watching them learn and participating in that process. Residents as a group are extraordinarily idealistic and hardworking and interested. They are bright, motivated, exceedingly diligent in what they do. They are remarkable people to work with. Having a group of people like that to interact with was always just very rewarding to me. I just had fun doing it.

Merge that with the scientific aspects of medicine and the taking care of patients was something I couldn't imagine doing anything that was more fun.

LIVINGSTON

What have you found to be some of your biggest challenges in your career?

LEWIS

I don't know. I mean I've not really had any huge setbacks or whatever that were problems for me. People have always been quite good to me and I've been able to do what I wanted to do.

The politics of medicine is an issue. I think since I came to the Board and I'm looking more at the global aspects of how do you promote quality of care, how do you enhance care broadly and whatever, you get into obviously all of the politics of medicine. How you do that

is challenging. I think you know our system of care is not organized for high quality care nearly as well as it could be. Trying to get that changed is a difficult issue because many of the players in the game are not highly motivated to address quality as a first issue.

LIVINGSTON

What advice do you give a resident or junior attending interested in a career in academic trauma/acute care surgery?

LEWIS

Well, I think it goes back to what I said earlier and beyond trauma. The most important thing is to really have a passionate interest in what you do. When you figure that out jump into it and to do it as well as possible, to advance the science of it wherever you can, to constantly look at how you can do things in the best way. If you do that, it's hard for anything else to be a problem.

LIVINGSTON

We've spoken a little bit about acute care surgery. What are your perceptions of the current challenges and opportunities and the future of trauma and acute care surgery?

LEWIS

I think the greatest opportunity is the fact that it's the area for which there is the greatest public need, unquestionably. It's the one for which the most significant shortages either exist already or are developing and will become more severe over the next five to ten years.

So I think it has a golden future and I think it will ultimately thrive. One of the biggest challenges is it doesn't enjoy broad support across the surgical world and for reasons that I think are actually not very good. Many people see that there is a conflict between broad general surgical practice and the acute care surgery. I don't believe that myself.

I think the number of programs and fellowships in acute care should be expanded much more rapidly than is happening because the number currently is not even close to supplying the need we have in country for practitioners.

Obviously another challenge is the hours involved. But as people move to defined shifts and responsibility that problem will tend to solve itself. I think money has pretty much already been solved. It's possible today for someone to come out of a fellowship and get into a position with an excellent salary and I think that's only going to improve.

Overall I think it's an issue creating a practice pattern where you have an adequate call schedule and compensation, are not worked to death so that you burn out and attracting enough people trained to do it. I think the job itself is going to do nothing but grow.

LIVINGSTON

In the next decade what changes do you see in trauma/acute care surgery do you foresee? What's the next big advances?

LEWIS

I think the change which is already occurring and is going to probably push on to near 100% is that surgeons are becoming hospital employees rather than individual practitioners. That process is moving forward pretty rapidly and probably will be largely complete within the next four or five years. That changes the nature of practice and ties surgeons much more closely to a given hospital than they have been in the past.

It has its dangers in the terms that it puts surgeons much more under the control of the hospital than they are when they are in individual practices. But it's clearly the way things are going.

As far as trauma systems, I believe it's very much in a hospital administrator's interest to be designated as a trauma center, even if it is only Level III or possibly Level II. There is a great incentive to do that because it has a halo effect on a lot of other programs and administrators really want to do that. Unfortunately they don't always provide the resources to actually make it a high quality trauma center. The problem is made worse because you tend to have too many trauma centers, particularly in an urban region, and the individual centers don't have enough volume to be optimally viable themselves and you have no political structure which allows you to do anything about it.

Obamacare is probably going to make that problem worse because now you will have a larger percentage of patients with insurance so the previously indigent patients that many of the hospitals would shun to take are now going to carry a check with them. If anything, it is going to increase the tendency for hospitals to want to be trauma centers because not only do they get the halo effect but now they will also get paid for delivering care and yet they don't necessarily want to provide the resources to deliver that care. Growing the system in that environment and providing effective care to serve the public is always a challenge which is probably not going to get any easier.

LIVINGSTON

With your new career at the American Board of Surgery what does the future hold for Dr. Lewis?

LEWIS

Well, I don't know. I just kind of carry on here from day to day and try to be useful. I continue to have fun with what I am doing. Hopefully I am doing something useful. There are a lot of challenges for the board so there is no lack of things to do. I have a fantastic group of people to work with so I'm actually just as happy as I can be.

LIVINGSTON

Anything you would like to comment on or any parting words for the 75th anniversary of the AAST?

LEWIS

I commend the organization. It's done a great job in providing an academic focus for trauma over the years and I think it has adapted appropriately at different times. When it needed to loosen up the criteria, it has done so. When it needed to expand more into critical care, it has done so. I think it has been a great organization. I think it continues to do quite well and I hope it will continue to be as successful in the next 75 years as it has been in the first.



RONALD V. MAIER, MD
PRESIDENT 2000–2002

DR. DAVID H. LIVINGSTON

When did you decide to do trauma and critical care as a career path?

DR. RONALD V. MAIER

Well, as you know, I went to Duke Medical School and, until my fourth year, I was planning on joining the new specialty of interventional cardiology because I liked working with my hands and it was an exciting and interesting new field. In addition, my favorite mentor and role model at Duke was Eugene Stead, MD, who was an internationally famous cardiologist and superb clinician of the day. However, if there is a theme that should run through my message today it would be my increasing recognition of the relevance of good mentorship and how important it is for anyone's career.

So I had planned on being a cardiologist but, in my fourth year of medical school, I did an elective on surgery—Dr. David Sabiston's service—with Drs. Bob Anderson, Bill Gay, Bill Devries, Walt Wolf, Brad Rogers and other future stars in cardiothoracic surgery. It was an unbelievable experience, mainly because of the quality of the residents that were on the service, who have almost all gone on to be chairmen and academic leaders. Again, role models and mentors were critical. They convinced me, by their example, that my personality fit with surgery. So I switched fields at the last second and applied to general surgery. A very difficult decision came when Dr. David Sabiston asked me to stay at Duke but I was also accepted at Parkland Memorial Hospital, working for Dr. G. Tom Shires. However, something in my gut told me that I was a better fit in Dallas than Durham for the next ten years of my training. I

still don't know what made me decide, but I have benefited greatly many times listening to my gut help me make critical decisions. And, I continue to pass this advice on to students, residents and fellows as they wrestle with their tough decisions.

My primary goal during residency was that I wanted to be, above everything else, a well-trained technically excellent clinical surgeon. Second, since it was a long, hard process, I thought it would be ideal to train someplace where people respected each other and were enjoying the challenges of training. At Parkland, the chief residents had obviously achieved both of those goals. These residents ran the service, operated 24 hours a day, had a phenomenal *esprit de corps* and were excellent surgeons; and that was what I wanted so I went to Parkland.

I got entwined in the G. Tom Shires/C. James Carrico web of mentorship. When Dr. Shires moved to Seattle to become the chairman at the University of Washington, he recruited ten residents from Parkland to go with him, two at each year of training. He asked me to go with him as an R2 and I did, primarily at the urging of Dr. Carrico, who badgered me into it. In addition, the move exposed me to Dr. Pete Canizaro and the AAST created the Canizaro Award. This honor arose because of his phenomenal dedication as an educator and defender of residents. He loved teaching and guiding residents. And all three were superb trauma docs. Again, Drs. Shires, Carrico, and Canizaro were phenomenal role models, mentors, educators and I slowly became more and more involved in trauma and trauma system development, which is what Drs. Carrico and Shires came to Seattle to do. So I was just swept up by the grand plan and I ended up becoming a trauma surgeon.

LIVINGSTON

I think what you stated about the importance of mentorship is going to come through in a lot of these interviews. That and being in the "right place at the right time" to be exposed to these unique individuals.

MAIER

Correct. You need to find what fits your personality and then, if you have the good fortune to work with people who are committed leaders in the field, it's a wonderful match that can last a lifetime.

LIVINGSTON

So there was no question that trauma was a defined and accepted career path at the University of Washington?

MAIER

It was the beginning of high-end ICU care. I was fascinated by the severity of the illness in the ICU and elucidating the underlying pathophysiology drove my desire at the last minute to do a two-year, actually it turned out to be a three-year, post-doc fellowship at Scripps Research Foundation in La Jolla, California. As I became a senior resident, we were saving more and more severely injured patients and the severity of illness in the ICU was growing exponen-

tially. We were just beginning to understand the underlying pathophysiology. That was the challenge that really sucked me into an academic career. And it has become a focus of my whole career.

LIVINGSTON

What was the best advice you got, besides following Drs. Carrico and Shires to Seattle?

MAIER

The best advice was two-pronged: first, to do what I truly had a passion for and secondly, to build an infrastructure for myself to follow that passion. And, that was based on Drs. Carrico, David Heimbach, and Cliff Herman saying, you need to build an academic base from which to work. Even if that required moving once again and delaying starting my faculty position for three years. One needs the passion to make the commitment to create a base to rely on, to build on. I think a lot of people have a hard time doing that, delaying. But the opportunity created by that infrastructure is priceless. I walked out of the immunopathology laboratory, wrote my first RO1 during the first six months of my faculty position and ended up with 28 years of continuous NIH RO1 funding. I believe that had to have been the best advice I had for an academic career.

LIVINGSTON

Did you get any bad advice?

MAIER

Actually, I don't remember any. I was thinking about that and actually I don't think I ever have had bad career advice. Plus a lot of what happens with advice is what you do with it. I've had the good fortune that many people were very committed for my best and to helping me. I would add that similar support exists for many that are just beginning their careers also, and they should actively seek it out.

LIVINGSTON

What scientific contributions are you the most proud of and how do you think it influenced trauma and critical care?

MAIER

Regarding basic research, I believe the most rewarding to me was being able to build on the training I had received in cell and molecular biology and to describe the importance of the "angry macrophage" in the pathophysiology of multiple organ failure.

We were trying to elucidate the causality in the pathophysiology of MOF and developed the paradigm, which primarily, as you know in those days, was focused on excessive pro-inflammatory response and bystander injury in causing organ failure. I believe that tenet is still basically true but has become much more complex. We have since continued to expand

our understanding and make it more complete, but, at that time, the concept was really new. I think it is still a major contributor to what we believe is the major pathophysiologic paradigm today in these patients and has become increasingly important in our clinical care. So I'm very proud of what I was able to contribute to that early work.

Second is in the educational/clinical arena. We had one of the first trauma/critical care fellowships in the country but, in addition, by a decade, I was the first to create the marriage of trauma training to an MPH in epidemiology as a critical necessity to move the field forward using crucial clinical outcomes and systems analyses. Rather than reporting on our individual or institutional results, it was a systematic, global approach to producing evidence based medicine that had been strikingly absent previously in the field. By training a select group of surgeons to use the appropriate scientific methods to analyze the clinical care, hopefully we can prove that we truly are having a beneficial impact. Also it was critical and remains a major challenge to educate our elected leaders as to understand why trauma systems are important.

LIVINGSTON

Anything that you kind of wrote or thought was a good idea and then as data became more and more apparent you go, "Oh, I wish I didn't do that"?

MAIER

That comes under the descriptor "the enemy of good is better." A very good concept from Dr. Shoemaker was that "occult hypoperfusion frequently persists following trauma resuscitation and we need to address it," which was absolutely correct and I think that observation has saved innumerable lives. In fact, it may be a causative factor in the current debates regarding the coagulopathy of trauma. But then he added, "We need to not only correct it immediately but we also need to over-resuscitate and drive oxygen delivery in excess of 600 mls of oxygen per minute" to correct an amorphous "oxygen debt". However, by doing this, we created the abdominal compartment syndrome epidemic, worsened TBI outcomes, and increased ARDS. I and a whole lot of people in leadership roles jumped on the "give lots of fluid" to drive cardiac output bandwagon. The answer to everything was "give more fluid." We took a good idea and made a bad idea out of it and I went along with what most of the country was doing.

LIVINGSTON

During your career, what has been the two or three greatest advances in trauma that have changed the field?

MAIER

First was the creation of the modern ICU and the focus on the underlying pathophysiology of severe illness, sepsis, and organ failure, using rational resuscitation studies, antibiotics, more appropriate nutrition and improved ventilator management. We dropped mortality with ARDS from 50% to 25% in ten years because of that focus and using logical approaches based on data, such as the ARDSNet program, was a major step forward.

Second, I would say is orthopedic treatment using minimally-invasive stabilization of fractures which initially was femur and, tibia rodding, with the extension of that to percutaneous posterior pinning of pelvis. Those patients used to come back from the OR with large blood losses and very sick, when I started in the ICU. When intramedullary rodding and the percutaneous treatment of fractures became common, it was like the patient hadn't left the ICU. It was a phenomenal improvement. Patients could be mobilized and complications, such as VTE, decreased dramatically.

A third one is the development of trauma care systems. Rather than focus purely on the institution, we made it into an inclusive system. In an inclusive system, each component contributes to the optimal efficiency for treating the disease. And, as proof of the validity of the concept, many others are now adopting our concept to improve care. Stroke and cardiology intervention centers have mimicked the trauma system approach. A system that we created through our own initiative to improve patient care rather than responding to government mandates. The fact that trauma surgeons were willing to self-analyze and critically interrogate what was optimal for the system is truly a unique concept in American surgery or medicine. It follows the ideals Dr. Codman brought to the ACS advocating outcome based change to improve care., Again, the best compliment is others want to copy us now.

LIVINGSTON

Besides the development in inclusive trauma systems, what other change in practice patterns have you observed?

MAIER

A major change has been the formal development of acute care surgery. It evolved out of necessity rather than a thoughtful process of planning or preparation. Patient need and access to care has caused it to evolve and I think we are developing the appropriate approach to the problem. However, it's going to remain a major challenge in the future to control it. As accessibility to care decreases, funding will be found to underwrite acute care surgery. Therefore, it will stimulate a lot of interest and a lot of distractions with the risk for potentially less than optimal care delivered through the process.

The challenge will be to balance adequate funding and resources to optimize the patient's outcome versus having inappropriate leverage and, potential cherry picking of the marginal cases for financial gain. In fact, a similar challenge is becoming a significant threat to our current trauma system in this country.

LIVINGSTON

What part of your career have you found most rewarding?

MAIER

Clinically, it is the adrenaline rush of a challenging life-threatening injury and positive reward of helping somebody who is dying to survive. And, secondly, the reward of working with

young people and training them. With senior residents, fellows and junior faculty, helping them choose a career, succeed in that career, advance their career and achieve their goals is, to me, phenomenally rewarding. That's why I haven't moved four blocks down the street to a large private hospital and double my salary, because those are the two things I can do here I can't do there. I truly enjoy mentoring.

LIVINGSTON

What are the biggest challenges and the most difficult things you deal with?

MAIER

I think on a day-to-day basis the most challenging thing in trauma and critical care is the inability to control your daily life. To even schedule a one-hour conference call cannot be achieved without stress. For example, this morning I have two previously unscheduled operations which could have gone when I had other things planned and caused me to cancel and reschedule. It creates a background stress that you live with on a daily basis. You become so accustomed to it—I don't even think it really affects you overtly, but it is still always there in the background. You just don't have as many dinners out with your family. You don't go to the movies as often and so forth that a lot of people do. I think it's a price we pay but you can't change that because it's the disease we choose to treat and you just learn how to cope. But it's definitely a constant tension and stress in your life, and a major reason why so few choose to do it.

The other challenge is the increasing burden of practicing medicine in America. One of the reasons I finally gave up my RO1 is that in my position as chief of surgery, not even being the chairman of the overall department, the administrative load is unbelievable. It keeps growing exponentially. As we face the electronic medical record, increased documentation requirements, and process improvement expectations, everything is becoming more time consuming. At some point that's going to cost us a heavy price in being able to retain people in the field and to keep people optimally functioning in the field.

LIVINGSTON

So care to predict the next great thing in trauma/critical care is going to be?

MAIER

From a basic science level, in the next ten years we will figure out how to utilize the patient's genomic and proteomic response to injury to drive individualized care and appropriateness of potentially toxic care for patients at high risk for complications from the therapy. Personalized medicine was promised ten years ago but in the next ten years we may actually be able to utilize it. If so, this unique and individualized care will have a major impact on patient outcome.

Second, the specialty of acute care surgery is going to continue to grow. Large private community hospitals are seeing the benefit of hiring surgeons trained in critical care and acute care surgery. They will become an increasing portion of the surgical workforce and, hopefully,

increasingly recognized for the service they contribute, similar to other specialties. These are good things which we should leverage to improve resources for optimal care, not only from the institutions but also the state and the federal government.

LIVINGSTON

Any changes you would make in your career?

MAIER

No. I have been phenomenally fortunate. I have had the great opportunity to be trained and tutored by what I think are some of the best surgeons in the country. In addition, I have a strong recommendation for the young surgeon, which was one of the pieces of advice I got from Dr. Carrico in particular, but along with many other people as well. If you're going to survive all the challenges of academia and the stress of being in trauma and critical care, you best make a strong commitment to your family. Family should be your number one commitment. People use the phrase, "Medicine is a very seductive mistress," and to deny that is I think foolish. You need to admit this very potent distractor exists and you need to deal with it. You need to make the extra efforts to carve out time to be with your spouse and kids. I've watched too many faculty suffer great losses because they weren't able to achieve that balance. Without that balance you're also in trouble because little seems worthwhile. When I give advice on happiness in academics to fellows, residents, or junior faculty, I always emphasize, "Make sure you maintain the balance you need with your family."

LIVINGSTON

Any specific words or thoughts about having the fortune and misfortune of being president over a two-year time span because of 9-11, anything in particular reflective on that? That's a unique question to yourself.

MAIER

Just one more, in this case, very questionable opportunity that fell in my lap. It was a very painful time for the country and all of us. However, it again identified, how critical it is to have a trauma system in the richest country in the world, that is actually able to respond to the unexpected. I think one of our biggest failures, going back to your earlier question, is we have been unable to educate the public, and our elected leaders regarding the ability to respond to disasters—you can't prevent them so you have to plan on how to deal with them. We can't seem to convince our leaders that a national system of trauma care delivery needs to be very flexible, and responsive. 9-11 was another example of how poorly we have learned these lessons. We continue to compartmentalize trauma as, "Well, that's not going to happen to me. It's not going to happen again. It's not going to happen to my family." We can't seem to overcome these deceptive thought processes. Thus, I would list one of our biggest failures in trauma as not being able to better educate people to the reality of what can happen during a disaster and not having achieved a truly national response capability.

LIVINGSTON

What are your future plans?

MAIER

I'm quitting tomorrow. No, actually, one of the only good things about being so old is if work gets to the point where I'm not having fun anymore with the good parts then I can just retire. But I still really enjoy teaching. I enjoy doing a challenging gunshot wound at two in the morning. I'm continuing with collaborative basic research projects. And, I enjoy mentoring greatly. Overall, I'm enjoying what I'm doing and as long as the net balance between good and bad is still good, I'm just going to keep doing it.

One thing I would like to do in the future is somehow free up enough time so that I can participate in volunteer international surgical care. To extend a bit more globally and take some time off to contribute to an effort and need elsewhere.

My several experiences spending time at Landstuhl, Regional Medical Center, Germany with the Visiting Senior Trauma Surgeon Military program have been exceptional. While the injured may be a little bit closer to home, since they are our own wounded warriors, the honor of taking care of these injured young soldiers and the phenomenal positive feedback one receives are unbelievable rewards, that I will cherish always.



DAVID B. HOYT, MD
PRESIDENT 2002–2003

DR. FREDERICK A. LUCHETTE

Tell us how it was that you decided on a career in surgery and then your career decision to focus on trauma surgery.

DR. DAVID B. HOYT

I became interested in surgery because while in medical school, surgeons seemed to have the most fun and had the greatest sense of pride in what they did. Trauma surgery attracted me because you had to think on your feet, you had to respond, you could operate on every body cavity, and you could occasionally truly be participating in a life-saving event. I think my interest in research then derived from that.

LUCHETTE

When was it that you decided on a trauma career?

HOYT

I would say it was probably when I was a PGY-3 or PGY-4 resident. I was asked to be one of the first people to participate in this new innovative course called ATLS. We were actually offering the second or third course in the country. It was during that course and the people that I was exposed to that really helped me make a decision that I had picked the right field.

LUCHETTE

And there was a lot of new specialization going on in surgery at that time. Vascular surgery and cardiac surgery were really beginning to flourish. So how did your peers respond to your decision to go into trauma surgery?

HOYT

Well, I looked long and hard at many specialties, including cardiac. Vascular was just developing as a specialty with specific training but in particular cardiac surgery had a lot of appeal because of its technical side and the quick decision making skills of having to think on your feet with critically-ill patients.

But I had a mentor that really suggested that you pick a field where your interest in research could also be complemented by your clinical interests. At the time, gastrointestinal surgery, oncology, and trauma and critical care were sort of the three areas that were really frontiers to be challenged. And so the one that fit with my clinical interests happened to be trauma and critical care. At that time, there was nothing really understood about the inflammatory response. The concept of multiple organ failure was about two years old. Our whole approach to critically ill patients in the ICU and in the operating room was really new territory. So it really looked like an opportunity to contribute.

LUCHETTE

Who were the particular mentors that helped guide you in your decision making and what influence did they have on your career?

HOYT

Well, I was in a department where the leadership changed and it was sort of a tumultuous time. I had some external advisors that were really advisors because of what they were doing at a national level were attractive.

In particular, my chairman who I worked with for about three years, Marshall Orloff, was very helpful in helping me sort through what was attractive and tailoring that to an academic career. He was very much committed to developing academic surgeons. So the process of consideration was mentored with him, although I would say most of my sort of appeal or icons in the field came from outside my own institution, people like Trunkey, Carrico, and Charlie Lucas.

LUCHETTE

Tell us about the view that Dr. Orloff had of trauma surgery compared to the other new surgical specialties?

HOYT

I would say that trauma was considered something that young people did that was associated with being up at night with call and not surgery that necessarily challenged your technical

skills as much as the other specialties. Orloff saw the research opportunity and developed one of the first trauma training and systems grants in the country. It was really I think our generation that transformed that perception and opportunity. A lot of it was by being exposed to people that were committed to it, that had just come back from Vietnam, so people like Dick Virgillio or Jim Carrico and people like that who went back into academic institutions and really established the credibility of clinical science and the basic science I think helped it, but it was really the generation that was my age that sort of made trauma a special field.

There were no fellowships at that time so you sort of self-declared and then through your academic interests and by focusing your clinical career you declared yourself a trauma surgeon. Most of us did not declare ourselves exclusively a trauma surgeon by any means. But as organized trauma systems developed which, again, started about that time, the identity of the trauma surgeon started to take shape.

LUCHETTE

Tell us about a few of the contributions you are most proud of and how do you feel they've influenced the field of trauma care?

HOYT

I think of the two major contributions that I'm most proud of, one would be in our early work that helped define how to measure performance of a trauma system through the development of quality indicators and databases. We were talking about things that people are talking about throughout the country today, but we were talking about them 25 years ago. And I think the trauma system, the model of accountability, the conversation one has with the public in terms of exposing yourself to verification and ongoing performance measurements, we were really sort of leading in a lot of ways in that area of research.

In basic research I would say the ability to manipulate the inflammatory response, which is still a big question mark, but the opportunity to better understand that and then help develop strategies, particularly with substances like resuscitation fluid, and then the ability to ultimately test those in clinical trials, I am very proud of that as well.

LUCHETTE

Is there anything in your career that you championed and today you look back on and say that was probably not the right thing to be out there waving the banner on?

HOYT

Well, I think there are several things. But you know that's both a true-true and also why it's so important to do clinical trials. Twenty years ago, we thought that intubating patients in the field using rapid sequence intubation would be really important and published a lot of materials suggesting the potential importance of that for patient care. Then we trained people and did the appropriate trial and were not able to show improvement, in fact showed that it actually put some patients at risk. And that taught me how important it is to do a clinical trial.

I think we went through the same thing with hypertonic saline. We had a lot of very significant basic science data from many labs around the country and some preliminary clinical trials suggested that it would really be a panacea for inflammation. And when we did the clinical trial it did not improve mortality and in fact, again, there even seemed to potentially be a safety concern.

So those are the two ideas where at the time, based on animal data and basic science data, there seemed to be a lot of excitement. But in retrospect they were wrong.

LUCHETTE

What you think are the two or three greatest advances in trauma care and science during your career?

HOYT

I think in terms of practice patterns the development of systems of care and the team approach to a critically-injured patient as a prototype for how you should take care of a cancer patient or somebody with complex GI disease or any other problem. We don't have those models yet developed but what we've learned from trauma care and how that can reduce mortality by having an organized system and a team approach is probably one of the most significant contributions that has reduced mortality.

I think another is probably the impact of imaging and its ability to evolve non-operative management of many injuries. I mean that sounds a little strange for a trauma surgeon to be saying that, but when I think of a lot of the things we did 25 years ago that we don't even think about doing today and the results, it's really amazing to see the impact that CT scanning and technology has had on the evolution of care.

In terms of specific care, I think you can look at it in terms of a specific drug or technique like better ventilatory management or the use of a different resuscitation regimen emphasizing less volume. Or you can look at it as the application of process measures, the use of bundles of care, the use of, again, clinical processes that make care consistent. I think both of those have contributed significantly to improving ICU care. So those would be four examples to me that have really evolved over the last 25–30 years.

LUCHETTE

You've done so much in research as well as teaching and administration. What aspects do you find to be the most rewarding and that bring you the most joy at the end of the day?

HOYT

Being associated with a field that was evolving, that developed an identity along the way, that really did seem to make a difference and that you could, at the end of the day, feel that you had really done something to improve patient care. You could feel that on a daily basis working as a trauma surgeon. And with your colleagues and nursing colleagues, that was probably the most satisfying part of my entire career. I would put in there my partners as well, just because

you really can't do this work without great partners.

In terms of difficult issues, I think trauma has always had to push itself against the inertia of a hospital or people who don't want to participate in emergency call or the sub-specialization of fields of surgery where people increasingly got less interested in participating in caring for trauma patients or found them to be economically unattractive. All those things that we continue to worry about and fight for have made it a real frustration and put a target on our backs as trauma leaders. I think some of those things are starting to change but they really continue to be the biggest set of challenges that we have in terms of really all agreeing on what the right thing to do for patients is.

Trauma can often be very time consuming on a particular case. The commitment this requires is not something that some people want to make independent of whether it involves the on-call part. The patient clientele can often times be challenging. I think we're seeing it in people's willingness to participate in emergency room coverage and that kind of thing. But we've seen it for years in terms of not every general or specialty surgeon wants to be part of a trauma program. The conflicts and the difficulties that occur with your colleagues during this time is, in my opinion, the hardest part of being a trauma surgeon.

LUCHETTE

What advice would you give someone who wants to pursue a career in an academic setting practicing acute care surgery [ACS]?

HOYT

I think the most important thing is to be sure that you enjoy the clinical side of trauma and critical care. If you want a successful academic career then it's best to find an area of academic contribution, whether it's in outcomes research, health policy research, basic science or clinical research, that really complements that activity. And then try and become the best at that activity to complement your clinical interests. You can't take away from somebody who really enjoys what they're doing. If they're willing to work hard at it, they will succeed.

LUCHETTE

You advice or guidance for these young folks on how to have a life outside the hospital?

HOYT

Well, I think the biggest opportunity that, again, a career in trauma and critical care offers in that regard is that you have partners and can practice as a team and cover each other and each other's patients so that people can have protected time.

On the one hand, you have to perhaps devote as much or more time than any other group in surgery because of the on-call responsibilities, etc. But if you take advantage of the team it can also be very liberating for people to pursue their outside interests, their family, etc. I think there is real evidence for that in the attractiveness, in particular, to a career in trauma amongst young women. Some are picking it because they realize that they can balance a very

aggressive surgical practice with their interests in their family and other interests.

LUCHETTE

What you perceive to be the greatest challenges and opportunities for the future of acute care surgery?

HOYT

I think the ACS model is evolving. But as physicians increasingly become hospital-based, collapse into groups to cover a particular hospital, ACS services are going to just continue to grow and flourish, just like trauma systems have.

I think the biggest challenge to acute care surgery is to maintain the surgical abilities and interest in some type of elective practice to balance what acute care surgery offers. I think this is something that has been discussed since the ACS's origin. I'm not sure we have it right yet but it's very important that people have an opportunity to continue to develop clinically as a surgeon and really it's essential that they participate in some way in elective practice to do so.

LUCHETTE

What do you think acute care surgery is going to look like in 10–20 years?

HOYT

I think most hospitals will be covered by an acute care surgery team. I think if it's a large inner-city or large academic medical center in a large city where the volume of general surgery, emergency general surgery is such that everybody is so busy with that and trauma and critical care that they don't have time to do anything else other than academic responsibilities, that will be one model. If you go to a smaller community hospital in a large city, it will be a group of surgeons that probably are employed by the hospital but do a combination of emergency surgery and elective practice. And then if you go to a smaller community where there is a mix of so-called rural surgeons; I think our biggest challenge there is to figure out how to support their needs so that they are not disproportionately affected by the call burden and at the same time that their practices are not stripped of interesting cases to keep them interested in rural practice while balancing that with the expertise that is available at larger hospitals.

And I think having a system of care that involves people practicing in smaller hospitals, maybe with some call coverage from a larger hospital's group or an integration with a larger hospital's group, those models that seem to be evolving seem to be successful and will probably be what people evolve to.

LUCHETTE

As you look back over the years, is there anything you would have changed or done differently?

HOYT

You know, I think one struggles to sort of balance with the optimal mixture of your career and your personal goals and life. I started out wanting to be a freelance writer and actually went to film school for about a year before I went to medical school. That has been a recurring interest to me. As to when I am going to start writing, finally, the great American novel, the great American script, I don't know.

Another thing is how to really spend a little bit more time with your family and balance that against your kids and their needs, etcetera. That is very hard when you are running a trauma system and a trauma service. Oftentimes the choice was to do what the hospital or the patients needed. But I think there are better ways to manage that today. I think we've given ourselves permission to be a little bit more realistic about balancing those needs relative to my own generation. And I think I would change those things.

You know, it's really hard when you love what you do because you know most of us in trauma do this because we really love it. I mean there are certainly plenty of things in medicine or outside of medicine that would be a lot easier to do. But the thrill and the excitement for me was always there. Even now I still miss the excitement of being on-call and that kind of thing. I don't miss losing sleep. But once you discover that in yourself, it's very difficult to just find an optimal balance. So I don't know if I'd balance it any better if I did it again.

It's the profession, the opportunity to serve, the opportunity to be involved that has always found a way to eclipse a lot of other choices. And I'm not sure if that's bad or good, it just is what it is for me.

LUCHETTE

What plans do you have for the future clinically, academically and personally?

HOYT

I made a decision two-and-a-half years ago to come and work with the College. And that had to be a thoughtful decision because I knew that I could not maintain a practice and maintain a lot of academic involvement. Although I love those, the draw and the opportunity to contribute at a different level challenged me and I made that decision. So I don't think I will return to clinical practice or academic practice because I'm not sure that I would draw the same satisfaction from it that I have in the past now that I've done something different.

I still participate academically in some things and do some writing. But the challenge for me has been to try and take a lot of the ideas and things that I've learned as a trauma surgeon and try and help apply them to practice more broadly through the American College of Surgeons. That's a daunting task. It's got me plenty challenged. So at least for the foreseeable future that's what I'm going to be doing.

Personally, I looked at getting a master's in a film school in Southern California about three years ago. They have a night school course. And so you know, maybe I'll go do that some time.

LUCHETTE

I want to offer you one last opportunity to make any additional comments that we haven't had a chance to cover?

HOYT

I think an organization like the AAST is really the epitome of a group that is convened and meets on a regular basis to not only foster science exchange but to really foster the essence of what a trauma surgeon is. I don't think you can derive any more personal satisfaction from your career than you can through your professional relationships. The AAST and its sort of companion organization, the Committee on Trauma, are those organizations. I think they have been the forum that we've all looked forward to participating in and contributing to because it really defines who we are.

The only thing that eclipses that in my mind is really knowing that you really helped somebody get better and their families, as a result, have the satisfaction of having somebody that lives or gets better. Those two things—the professional association and the relationships with your patients—are what it is all about.



H. GILL CRYER, MD, PhD
PRESIDENT 2003–2004

DR. DAVID H. LIVINGSTON

When did you decide to go down the trauma and critical care pathway?

DR. H. GILL CRYER

For me it actually developed during medical school. I had a really interesting situation in that I went to medical school at the University of Nevada. When I started it was a two-year school and then you would go to places like Tufts or Washington to finish the clinical years. My year transformed into a traditional four-year school and they hired department chairs for all the clinical departments.

Between my second and third year I got a job doing history and physicals at the VA over the summer and it turned out to be on the surgery ward. About a week after I got there I got this phone call from the dean's office telling me that "The new chair of surgery is coming and wants to make rounds with you at five p.m."

I said, "Well OK, but that's about when I'm leaving." She said, "I suggest you be there." So I'm waiting in the ICU and about 5:30 and then Bob Fulton and Don Fry walk in. I look up and Bob is in cowboy boots and Don is in his traditional black suit, Blues Brothers-type thing and they want to make rounds on all the patients. Of course there was a patient in the ICU with multiple organ failure and here are the professors that wrote the initial papers on it explaining this to a brand-new, not even third-year, medical student. I was blown away. So what happened is I became their resident because *there were no residents*. There were *no*

interns. There was just me and the department chair of surgery for the whole summer and then he arranged it so I had surgery first for another 12 weeks. He also arranged for me to have an externship on the trauma service in Louisville and I just knew right then that I wanted to be a surgeon. Terry Hicks, the chief resident, tucks me under his wing on the trauma team and I just knew that this was for me.

The other interesting thing about it was that Bob Fulton's time in Nevada was quite short—only a year or so, maybe a year-and-a-half—but as you said it almost seemed like he showed up there just to point me in the right direction and then he was gone. I know that I will always be grateful.

LIVINGSTON

So when you decided to do surgery, how was trauma looked at?

CRYER

Well, the University of Nevada was founded to be a rural-type school, putting doctors into rural America. So going into surgery and to be an academic trauma surgeon was not exactly what they had in mind.

On the other hand, once I got to the University of Louisville, as you know, it was a huge part of their culture and it wasn't just trauma. The trauma service at the University of Louisville was really an acute care surgery service before that name was ever even thought about. You'd be doing ruptured abdominal aortic aneurysms and then a gunshot wound to the heart would come in. We did everything. With mentors like Hiram Polk, David Richardson, Lew Flint, Don Fry, Frank Miller, Kirby Bland, Mark Malangoni, Neal Garrison, Rich Mullins, Sue Briggs, it was an incredible training environment and I think that it was very favorably looked on by the people around me that I would become a trauma surgeon.

LIVINGSTON

So what's the best career or life advice you have ever gotten?

CRYER

I can't tell you one single person or event that gave me really good advice but over the years, I have had many people help guide me. It is a general attitude of "when you come to a fork in the road you take it" kind of thing. It will work out. It probably doesn't matter which fork you take, if you just have the right attitude about what you're going to do with the opportunities that come your way. Work hard, learn from everything, keep the patient's interest foremost in mind and keep going. Life tends to work itself out despite the ups and downs.

LIVINGSTON

Now any "less good" advice you received in your career?

CRYER

I thought about this because you had that written down somewhere. The worst advice I ever got was “buy tech stocks” in the ’90s. That set me back a bit but nothing that couldn’t be overcome.

I think I learned to be careful of people who think they know what is good for you. There are a lot of them. The people who say “Gill, you know what you really need to be doing is—” that sort of thing. I’ve learned to totally ignore that and to go with my own gut. On the other hand, there are some people you ought not to say no to. Particularly individuals who you work for, your department chairman, division chief, and of course your spouse. If you don’t want to jeopardize your career or your home life, when they ask you to do something, I think it’s really important to give it a go rather than say no.

LIVINGSTON

With all the contributions you’ve made in the lab and in the clinical arena, what are you most proud of? How do you think it influenced trauma/acute care surgery?

CRYER

As I said earlier, from the very beginning with my exposure to Bob Fulton, the whole idea of multiple organ failure that was occurring in surgical patients when I started was really interesting and has pretty much remained my focus throughout my career. I think that it is extremely rare for any one person to makes some dramatic discovery that really changes the course of clinical history, and I certainly have not. Instead clinical innovation happens in increments by a lot of people discovering a lot of little things. Resuscitation from hemorrhagic shock and multiple organ failure, ARDS and management of pelvic fractures are the areas that I have really felt grateful to have contributed to in some small way.

In my laboratory years, studying the microcirculation in shock and sepsis led me to a totally different way of looking at almost everything. Just by looking you can see a tremendous amount of heterogeneity in what is going on. There is so much going on that it’s just ludicrous to think that there is going to be a single mechanism that causes it or a single bullet that is going to fix it.

LIVINGSTON

Anything you championed or thought was a great idea that finally decided, “I wish I could take that one back” or maybe, “I wish we had known a little more than we did”?

CRYER

Yes, this one for me is indisputable. It was the whole idea of super normal resuscitation. When I was a resident, we resuscitated patients with 3:1 lactated Ringer’s to every unit of blood. I don’t ever remember giving anybody fresh frozen plasma. We had all these edematous, swollen patients and all of my mentors said, “Edema is good.” That was sort of the prevailing opinion—actually it wasn’t opinion, it was gospel. Then this whole idea came along that we

would put a Swan-Ganz catheter in everyone and if we pushed their resuscitation to super normal levels of oxygen delivery they did better. This made us give even more and more fluids trying to make that happen. The number of people we drowned, caused abdominal compartment syndrome, and ARDS—almost all iatrogenic—was huge. It's incredible that it took us over a decade to figure out that that was wrong.

I was out there writing papers saying how good this was, going to conferences, being visiting professor and giving talks about it. It just turned out to be dead wrong. The whole episode reminds me of something Will Rogers once said, "It's not what you don't know that will get you in trouble, it's what you do know that just ain't so."

LIVINGSTON

As your career spans mine, I am interested to know what you think are the big practice pattern changes that have occurred?

CRYER

I think that is something that's really interesting because we are in the middle of a great change now and we need to be the leaders in making it change in the right way. The whole idea of acute care surgery and trauma surgeons delivering excellent care while teaching others to do it really depends on being able to create an environment where the young people coming up can excel and yet still not get driven into the ground. The level of commitment and the kind of work that you and I have done in the past, the 36-hours on and 12-off thing for your whole life, just isn't a good work model. It's not good for the patient. It's not good for the residents. It's not good for the faculty, either. So I think as that has evolved we are being forced to figure out how best to deliver that high quality care.

LIVINGSTON

What do you think are the two or three biggest advances in trauma care that have occurred in your career?

CRYER

It's remarkable how many there have been. But for me the biggest one is the development of CT angiography. It really changed everything. It allowed us to be able to see what is in the "black box" and know exactly what we have to take care of, which led to different paradigms in managing patients.

I mean, in the old days when I was a resident we operated on everybody that had a red cell on their diagnostic peritoneal lavage. We did so many unnecessary operations that now hardly ever occur that that just has to be huge.

Another one that was pretty dramatic was the understanding of the abdominal compartment syndrome. We always kind of knew it was there but we never really quite got it until we started doing decompressive laparotomies and open abdomens and damage control resuscitation and damage control operations. That was another whole paradigm shift that went

counter to the idea that we're the big hero that goes in and fixes everything in the middle of the night and don't-quit-until-you're-done kind of thing. So I think those are huge for me. Others include interventional radiology, improved enteral nutrition, vascular stents—the list just goes on. There are so many. I mean it's just on and on and on. If you think about all the things that have changed over my career, it's almost a different career now than it was.

LIVINGSTON

What is the aspect of your career that you found most, you know, rewarding, gives you the most joy in going to work?

CRYER

Yes, this one is pretty easy. It's taking care of the patients and teaching the residents. Doing a job well. It sounds like cornball stuff, but it's really about the patient. That's what I'm good at and that's why I'm here.

Training residents. We have a great opportunity to be able to pass something on. We are really fortunate in that not very many people in their careers really have the opportunity to train their successors like we do. We are lucky to have a really pretty remarkable job.

LIVINGSTON

What part of your career has been the most challenging for you?

CRYER

Well, I think it's the same thing, right? It's the patient that doesn't get well or the patient I can't get well or the resident that doesn't seem to, quite get it—trying to figure out how to be successful more often. I think that is the frustrating part. What I really hate is when I'm in the middle of an operation and it all of a sudden dawns on me while I am working my butt off, that even as everything seems to be going okay, I'm not going to get this patient well, that it's not going to work out. You can just sense that the life energy or whatever just has gone out of the patient. No matter how hard you try in the OR or ICU you just know that it's just not going to end well. That one is a tough one.

LIVINGSTON

You have young resident comes up goes, "Dr. Cryer, I want to go into academic trauma/critical care. I want to be like you." What advice do you give them?

CRYER

I tell people to just go with your heart. If you love it, do it because there is really nothing more satisfying than doing what we do. I think they get that. They get that energy. It's interesting to me that there was a span of about 10 years or so where nobody from our program wanted to go do what I do. Then all of a sudden, in about the last five years, about a third to a half of the residents want to do that, which is really quite interesting.

LIVINGSTON

Why do you think that is? Why do you think that was?

CRYER

I think it's multifactorial. Sometimes I think it's that I've changed. Maybe I'm feeling happier about life or happier about doing what I'm doing. The residents recognize that and respond. I don't know whether that's true or not, but I wonder about that a little bit.

But also, I think all the efforts that we've made to get this whole acute care surgery thing going, to create an environment where people have some control over their lifestyle. Some people have looked at that negatively and said it's shift work but I look at it in a completely different way. It's the job of a trauma director to design a program where everybody works well together as a team and that you can rely on your colleagues when you're not there so you can get sleep at night, do things with your spouse, have children and actually participate in raising them. At the same time your service becomes respected for being able to solve the tough surgical problems 24/7 and everyone knows they can rely on your team, surgeons and internists alike. That is what has made our field a little more attractive.

That process is one of the things that makes me really proud of the AAST. The germination of an idea which happened maybe 15 years ago and just percolated through many boards of Manager and president after president until it just grew. Like a relay race, sequentially handing the baton off for a good ten years, getting further each time until acute care surgery came to fruition.

LIVINGSTON

Okay, now you get to predict what the next big things are going to be in the next decade. How are we going to take care of patients? What are the next big advances?

CRYER

You know I've learned long ago to quit trying to predict the future. First of all, I do think that life gets more complex all the time. It is busier and faster and this affects the diseases, the patients, the doctors taking care of them and the technology we use to do it. The solutions to that will be continual innovation. More computers and simulators and all this stuff to allow us to take care of all that increased complexity. That's sort of on a philosophical ground

I think minimally invasive technology will become the norm even for the bleeding multiple trauma patients and hopefully we will be much better at resuscitating patients.

LIVINGSTON

Anything you would change in regards to your professional career?

CRYER

Just like trying to predict the future, there is no point in worrying about the past. It's already done. But all in all I'm pretty happy with the way things turned out. We all make mistakes no

matter what. Luckily the ones that I've made I've been able to circumvent and come out okay. I don't want to brag, but I feel that what I'm doing is the thing I'm absolutely best at. As a result I'm happier doing that than anything else I do. I don't know what more a guy could ask for.

LIVINGSTON

Anything you'd change, life outside the hospital?

CRYER

No, I think that's another important thing that I learned along the way. You really have to treat that part of your life with just as much energy and passion as you do your career work.

For instance, you have to make time for children. You treat a child's baseball game or play just like it is an operation. If it's scheduled then you're going to go do it. You learn how to not take the troubles from work home, and that one is a little tough. I guess I could be a little better at that.

LIVINGSTON

So what is in the future? What is your next ten-year plan?

CRYER

That one, again, it's hard to improve on what I'm doing now. It's a good question because I've had multiple opportunities to go look at different positions. Maybe chief of surgery somewhere rather than just a trauma director chief and so forth. But I really have found what I'm good at doing and, in some respects, when I think of that it just seems foolish to go try to learn to do something else that I'm not as good at.

LIVINGSTON

Any other parting words on the 75th anniversary of the AAST?

CRYER

It's all about the AAST and it's just really important. It's growing and it's doing wonderful things that we've never done before. But I think it's really important that we don't lose what made us great as an organization.

I reflect back on when I was a resident, going to my first AAST meeting and presenting some research paper that we did, scared s---less, and it was remarkable to me compared to other meetings that I had been to how approachable everybody was in the AAST.

All the giants, you could walk right up to them and they'd introduce themselves and they'd talk to you and talk about your research. I remember having discussions with Bill Blaisdell, Don Trunkey, Charlie Lucas, Harlan Stone, and many more when I was just a young nobody. It was just so easy to talk with people and they cared about what you were doing and they would remember you later. It's just not like any other organization that I've been a part of.

So I think fostering that is extremely important and the whole reason behind these interviews is to perpetuate that ideal. That is really a great thing. It is part of who we are. Thank you so much for giving me the opportunity to talk about these things, I really enjoyed it and I feel quite humbled to have been included.



STEVEN R. SHACKFORD, MD
PRESIDENT 2004–2005

DR. DAVID H. LIVINGSTON

How did you come to a career in surgery and trauma surgery specifically? When in your training did you decide?

DR. STEVEN R. SHACKFORD

In medical school, I had thought I wanted to be a pediatrician and, in fact, took several pediatric electives during my senior year. But I had a great deal of difficulty dealing with dying children and, simultaneously, I became very interested in surgery, primarily because of two role models: Dr. Vallee Willman and Dr. Rick Barnar.

I also took an elective in surgical technique in the animal laboratory and I was just so impressed by surgery and the immediacy of the outcome that I decided on a career in surgery. I decided on trauma surgery on the first day of my internship when, again, another mentor stepped in to my career. That was Dr. Richard Virgilio who had just returned from a tour in Vietnam. At that time, I was in the Navy and in fact I did all of my training, surgical residency, and vascular fellowship at the Naval hospital San Diego. At the time that facility was the largest military hospital in the world with over 3,000 beds, 1,000 of them being surgical beds. Dr. Virgilio, at that time, was the primary investigator on an Office of Naval Research grant investigating the metabolic and physiologic responses to shock and resuscitation, which immediately spiked my interest in trauma surgery.

I was also influenced by Dr. Richard Peters who was a thoracic surgeon at the Universi-

ty of California San Diego. Dr. Peters was a co-investigator on the grant and would frequently round at the Naval hospital and, like Dr. Virgilio, was a great teacher.

LIVINGSTON

So it would seem that your exposure to all of these post-Vietnam surgeons and mentors, the choice of trauma was a natural and big part of surgery there. Was that how it was viewed by your peers and your non-trauma mentors?

SHACKFORD

Exactly. Because the mission of the United States Navy Medical Corps at that time was care of injured Sailors and Marines, my choice was encouraged and viewed as an excellent selection.

LIVINGSTON

How was trauma considered compared to other specialties at your institution at that time?

SHACKFORD

I received some “pressure” to go into cardiothoracic surgery by two other mentors, Dr. Ted Folkerth and Dr. Jim Aurey. They did not discourage me from going into trauma, but said that I would have a more fulfilling career in cardiothoracic surgery. However, I did not agree with that because I thought the types of procedures that they did in the chest were limited and a lot of what they did was directed by cardiologists, even though there was some independent surgical judgment involved.

I decided when I finished my general surgery that I would be doing trauma surgery. I wanted to be comfortable around blood loss and fixing blood vessels so I took a vascular fellowship. But my real love was trauma.

LIVINGSTON

What was the best career or life advice you ever received? What was the worst?

SHACKFORD

I have received a lot of advice over the course of my career and it’s hard to pick good or bad. Only subsequently looking back you can see, perhaps in retrospect, what the best advice was.

Dr. Virgilio, just by the way he was so committed to patient care and achieving a good outcome, set an example and influenced me greatly. It was, basically, be the best surgeon you can be. Follow up on imaging and labs; do your very best and work hard.

The worst—well I am not sure I ever received any real bad advice. If I did, I probably had the good sense not to do stupid things when people told me to do them so I can’t really remember any bad advice that I got.

LIVINGSTON

Which contributions in research are you most proud of and how did they influence the field of

trauma care?

SHACKFORD

I think that there is a great deal of self-deception involved in claiming contributions. I think all contributions are the result of a collaboration and, in some ways, group think. Obviously, somebody has to do the grunt work and somebody has to work hard at gathering data or doing some of the more onerous work. In short, all contributions are the result of teamwork.

For my part, Dr. Virgilio early-on had used base deficit when we would evaluate patients in shock. I found that there was no literature on its clinical use. When I went to UCSD, I had the good fortune of having Dr. Jim Davis as one of our trauma fellows and I suggested to him that this might be an excellent way to evaluate our resuscitation. Jim took the bit in his teeth and he published a multitude of papers on this work. I think that my contribution in that case was stimulating Dr. Davis to do this excellent work. I am proud of him and I am proud of the work that he has done.

Secondly, I think my use of hypertonic resuscitation may have predated the surgical interest that eventually Jim Holcroft and others pursued. I got the idea from Bill Monafó, who was using it in burns. I did some work back in 1980 on hypertonic resuscitation during aortic reconstructions and found that hypertonic resuscitation compared to Ringer's lactate resuscitation during aortic reconstructions resulted in lower compartment pressures in the legs following rep perfusion. When I went to UCSD and became exposed to Larry Marshall and his interest in head injury a light went off in my head and said, "Wow, this would be great for the brain." We then went to the laboratory with Mike Todd, Mark Zornow, and Mark Scheller and developed a pig model and, sure enough, intracranial pressures were reduced using a hypertonic saline. At that time we were using 3% and not 7.5%, which came into vogue later. But the use of hypertonic saline in the resuscitation of head injuries, was the result of the collaboration that developed and I am quite proud of that as well.

The third contribution, if it can be called that, was getting interested in ultrasound. Again, this was a collaborative effort. Grace Rozycki and I were talking in an airplane terminal one time and she told me about the research that she was doing on ultrasound. Following our conversation, I went to Munich to the real father of ultrasound in surgery, Dr. Tom Tiling, and spent some time with him in the ICU using a first generation Hitachi ultrasound machine. Despite poor technology, I was amazed at the information you could get. I became even further impressed with the idea that surgeons really know the abdominal anatomy pretty well and that ultrasound might have a role. I came back to the United States, talked again to Grace, and I believe we gave the first couple of surgeon-directed ultrasound courses. The American College of Surgeons got interested in it, specifically Dr. Jim Carrico. I think the first lecture on ultrasound was at the spring meeting of the ACS in the early '90's.

There is a bit of history here that others might find interesting. Once my interest was piqued in ultrasound, and because of my background in vascular surgery, using ultrasound daily in the assessment of graft patency and the assessment of the size of an aneurysm, I realized that the technology could actually be improved if there were less expensive trans-

ducers and machines for assessing general surgery patients. I also felt that general surgeons really could become facile in its use in emergency situations. At that time the radiologists at University of Vermont were not in-house and felt that the assessment of cholecystitis should be done in the morning rather than when the patients come in so that they would not have to at night. They suggested that the surgeon should admit the patients, keep them in the hospital overnight and in the morning when it was convenient to the radiologists they would perform an ultrasound. As you can imagine, that sort of raised the hackles on my back and I said why don't we begin to learn ultrasound. The radiologists were quite offended that we would even embark upon crossing specialty lines into their turf. Subsequently, a skirmish broke out with radiology and surgery at the University of Vermont. This was taken to the Dean and the Dean found in the favor of teaching surgeons to do ultrasound. I wrote an editorial (*J Trauma*. 1993;35:181-2) and then subsequently an article (Rozycki GS, Shackford SR. *J Trauma*. 1996;40:1-4) in the *Journal of Trauma* about focused abdominal ultrasound for trauma.

We also felt we needed to have an acronym for the use of ultrasound by surgeons, especially in the care of trauma patients. I was sitting around in my office one day with our vascular technologist, a guy by the name of Terry Case, and I said this is focused – F, abdominal – A, sonogram – S, by surgeons – S, in trauma – T, which was FASST. We were also teaching the emergency physicians and I said, "Well, wait a minute. It's just not surgeons. It's focused abdominal sonogram for trauma—FAST," and it became FAST.

LIVINGSTON

If you had one thing you championed or adopted that you would change in your career, what would it be?"

SHACKFORD

I was a strong advocate of total parenteral nutrition [TPN] when I was a surgical resident and junior attending. Others, such as Fred Moore, had the good sense to compare TPN to enteral nutrition and found enteral nutrition superior.

Another thing that I championed very vigorously was the use of crystalloid resuscitation. Now our military surgeons have taught us that 1:1 resuscitation or something similar to 1:1 is probably the way to go. In retrospect I remember a surgeon, Janet Mendelson, a member of the AAST, who was a colonel in the Army who at every AAST meeting would get up and say, "Why aren't we using whole blood?" The work done by Shires and Carrico and others seemed to emphasize avoiding the use of blood. The weight of Drs. Shires and Carrico and others made a junior resident and junior attending, like myself, impressed that this had to be the greatest thing since sliced bread. Ultimately, Janet Mendleson has been proven to be correct. So I wish I hadn't advocated so strongly and I'm sorry that Janet Mendelson wasn't alive to see this big change back to the use of essentially whole blood for trauma resuscitations.

LIVINGSTON

What do you consider to be the two or three greatest advances in trauma care science that

occurred during your career?

SHACKFORD

No question, number one is imaging. It is rare that we do peritoneal lavage any more. I think CT imaging and ultrasound have reversed that trend. I also think we will see less CT and more ultrasound in the future.

Number two is the conversion of TPN to enteral nutrition, using the gut more frequently. That's been a huge advance.

Number three is damage control surgery.

Number four is non-operative management, which would not be possible without improvements in imaging.

LIVINGSTON

What were the major changes in practice patterns that occurred during your career?

SHACKFORD

The first is regionalization of trauma care. Before regionalization, local hospitals took care of trauma patients, and only when the patients were quite advanced in their disease state would they transfer them to the academic medical center.

In my opinion, the increasing emphasis and practice pattern of super specialization has been a mistake. I think that general surgery has given up way too much and I'm sorry to see that. I consider myself blessed to have trained at a time when general surgeons were comfortable in the chest, in the abdomen, and in the extremities. I just don't see that any more. I'm hoping, and I think it will eventually happen, that the acute care surgery fellowship will bring back what we had when I was training.

LIVINGSTON

What aspects of your career have you found to be the most rewarding? What things give you the most joy?

SHACKFORD

I love to take care of patients. I love to make rounds with the residents. I think the combination of teaching and patient care are just about the most wonderful things that I can imagine in terms of career. I have frequently said—and I don't mean this with tongue-in-cheek—that I can't believe that they pay me to do this. One of the things that has always filled me with great emotion is having my patients come back and see me after I've taken care of them and see them now that they are well. I feel that I am very blessed to have been directed toward the profession of medicine and the specialty of surgery and specifically trauma and acute care. It's just a wonderful career.

LIVINGSTON

What parts of your job have you found to be the most challenging and difficult? What things are distressing to you?

SHACKFORD

When I was chairman of surgery at the University of Vermont, a lot of the administrative hassles and struggling with administration were difficulties. They were tough. Surgical departments are the financial engines of academic medical centers and every time you turn around the dean or the CEO is trying to reach into the coffers of the surgery department to distribute money around to other departments that, in my mind, are not held to the same standard as the department of surgery. I didn't think it was right. So for almost 20 years as chair I was trying to preserve the esprit de corps in the department of surgery and, at the same time, take great care of patients.

I say in passing that while I was there during my chairmanship, I went through something like eleven CEOs and four or five deans, so it can be difficult because what one CEO promises is not binding upon the next guy who comes in and says, "Well, that was then and this is now" and the whole landscape changes. Those were difficult, challenging, and distressing.

LIVINGSTON

What career and "life coach" advice would you give to young surgeons interested in a career in academic trauma and acute care surgery?

SHACKFORD

That is a relatively easy question to answer. The advice would be: "Success in one endeavor does not justify failure in another." I think it is so important for young surgeons to have a passion for surgery and a passion for their families. I have always told our residents that their families give up more for the patients than they do. I've been married for 36 years and there have been a lot of times when the family was all set on doing something and I had to cancel at the last minute because of an emergency case or a take-back or a problem at the hospital. They never groused about it or griped about it. On the other hand, when I was home, I was home and when I was home *I was really at home*. I put aside all the work at the hospital and unequivocally devoted my time and my focus on my family.

My mind wasn't anywhere else. And that's another thing I think is a practical piece of advice, in scheduling time away for vacation always take two weeks, minimum. The reason is that it takes about 48-hours to decompress from work. Then you can enjoy vacation and then about 24- to 36-hours before you go back your mind starts to race ahead about all the things that you have to do and the things you have to catch up on. So if you really want to enjoy vacations, plan long ones. I got that advice late in life but it has served me well.

Another piece of advice I would give my junior colleagues is, "Don't whine." You know, don't whine about the hours. Don't whine about the hard work. Don't complain. First of all,

others may hear you, particularly younger surgeons and that will be very discouraging for them. We've selected this career and the hard work and the long hours, they come with the territory. So in the words of the Eagles, "Get over it."

LIVINGSTON

What do you perceive as the greatest challenges and opportunities for the future of trauma and acute care surgery?"

SHACKFORD

I see the challenges coming from within general surgery. I think that general surgeons are reading way too much into the acute care surgery paradigm. I think that we just have to be very patient, logically address any fears they may have. We must view this as a specialty in evolution and acute care surgery must recognize it is going to be different at rural hospitals as it is at academic medical centers as it is at large community hospitals.

I think there is great opportunity when one looks at the gender demographic of people entering higher education. Most of the people entering higher education are women, which means that most of the people that will be going to medical school will be women, which means that most of the people entering a specialty will be women. Therefore, I think that the next generation of surgeons want time-specific time off. And I think acute care surgery fits that need very well. We, as more senior surgeons, must rid ourselves of the feeling, of the opinion that shift medicine is a bad idea. It is here and it is not going away. We've got to live with that. The best thing we have to do is improve our handoffs. That's all. But I think that young women and young men coming into specialties in surgery will be excited about the possibility of working hard for periods of time and then having time off.

LIVINGSTON

What are your predictions for the next great things in trauma, surgical, critical and acute care surgical care in the next 10 to 20 years?

SHACKFORD

I see further improvements in imaging. I see more in introduction of robotics and nanotechnologies in surgery. I think that there will be cell-directed therapies based on genomics. We are going to be able to tailor care based upon the genotype.

LIVINGSTON

Would you change anything related to your professional career?

SHACKFORD

I would change nothing. I think I have learned a great deal from life experiences and I think it's made me a better person. I have absolutely no regrets about my professional career.

LIVINGSTON

Anything about life outside the hospital?

SHACKFORD

I probably would have taken a little more time for myself. By that I mean probably less time at work and more time with my family and more time staying fit.

LIVINGSTON

What plans do you have in the future, clinically, academically, and personally?

SHACKFORD

Well, right now I'm 67 years of age. And I have tentatively drawn a line in the sand for 70. Right now I am taking four nights of in-house call a month which means 24 hours in the hospital and then the following 24 hours for immediate backup. I also take seven nights of vascular call a month. I've completely cut back on elective vascular surgery in order to do more teaching and some research.

So my future is that in three years I may just go "cold turkey." I really strongly believe in "compression morbidity," so I want to make sure that I am fit enough to enjoy retirement rather than having to watch the clock to make sure I get to all my doctor's appointments! I want to be able to enjoy my retirement. My wife and I and our family have lots of plans to travel which can be really curtailed if you're sick so I'm pretty sure about this line in the sand at 70—maybe sooner if I get less enthusiastic about taking call. I'm also fortunate enough to work with partners who have just said, "You tell us when you're ready to walk and we'll go for it."

LIVINGSTON

Any final words of wisdom you would leave for the 75th anniversary?

SHACKFORD

I think that trauma surgeons are really special. I don't mean privileged or anything else. I receive the most professional satisfaction at trauma meetings. I just have the greatest depth of feeling for my colleagues in the Western Trauma Association and my colleagues in the AAST. I don't get the same feeling when I go to the American Surgical and the American College meetings.

I really renew my friendships at the American College of Surgeons and enjoy the educational opportunities, but it's different at the Western and the AAST. It's a real fraternity with a wonderful group of people.

I think that the AAST has made incredible, incredible progress in the last ten years. Among the things that we've done which I think have just been remarkable are the development of the acute care surgery module and the hiring of an executive director and the staff which has been so important in the "chain of custody," if you will, of the organization. Sharon

[Gautchy] and her staff keep the continuity between presidents and boards that I think is critically important.

I also think that there has been more of a sensitivity to encouraging non-academics to join the Association. I also think that our *Journal* is going to continue to improve. I am very happy to be a part of that effort.



C. WILLIAM SCHWAB, MD
PRESIDENT 2005–2006

DR. FREDERICK A. LUCHETTE

How did you get interested in surgery, and more specifically, what attracted you to trauma surgery?

DR. C. WILLIAM SCHWAB

Like all the past presidents, I have to frame this by telling you about when I grew up.

My father and uncle served in various roles during the Second World War. My uncle was a very decorated paratrooper, a major actually, in Korea. Thus, I was greatly influenced by this great generation of American patriots.

In medical school during Vietnam, I took the opportunity to join the United States Navy. I matched for a residency at the Naval Hospital in Portsmouth, Virginia, and all of my teachers there had been to Vietnam and served as combat surgeons. There was no doubt in that environment, that trauma and the care of the injured soldier and sailor were the “mission” and center of the universe. It didn’t matter what specialty you were training for, ultimately, your focus was the care of the injured.

We had a very charismatic and inspirational chairman, Dr. Joseph Mullen. Dr. Mullen served as chair for 18 years, and many of his “chief residents” are well known trauma surgeons—Joe Tepas and Mike Hawkens, to name just two. He was prominent in academic surgery and a well-traveled visiting professor. Many of his articles and lectures were about trauma care and systems. Subsequently, when he became the vice chairman of surgery at East-

ern Virginia Medical School, he recruited me to establish the trauma center and first medical helicopter program in Virginia.

There was no better mentor and no better role model than Joe Mullen. I recently went back for and spoke at his 80th birthday. In a nutshell, it was growing up in the post-World War II years and the influence of some great men and mentors.

LUCHETTE

So it was the patriotism aura that drove you toward the military and then into surgery?

SCHWAB

At the age of 6 years, I was struck by a car while riding my bike. I had a leg injury, which is now called a mangled extremity. I was taken to a hospital in Amsterdam, New York, where there was a very gifted orthopedic surgeon named John Ferguson, who, interestingly, Mike Sise knows from living in that small upstate town in New York. Dr. Ferguson did several operations over a nine-month period on my left foreleg, so perhaps this changed RNA and emotionally drove me toward medicine and trauma surgery.

LUCHETTE

Who are other mentors in your career that you feel were instrumental in guiding you into the success that you've enjoyed.

SCHWAB

I must admit Dr. Mullen, who I just discussed, will always be my mentor who shaped me as a physician and surgeon.

When I came to Penn, Clyde Barker, who is perhaps one of the utmost surgical scientists and academic chiefs in American surgery, became my mentor and my professional coach. I had come from places which weren't necessarily heavy academic departments, and I needed a general manager and a coach for improving my scholastic focus. He was strong, direct and constructive during the first few years at Penn.

Of all the people that I could have pictures on my wall, there are three mentors—it's Drs. Joe Mullen and Clyde Barker. The third key person is Don Trunkey. Don has been a friend for 30 years. We just hit it off early-on. He took a liking to me—I don't know why—and has always been a tremendous friend and guide for my career.

LUCHETTE

Well, how did Dr. Rhoads feel about your choice of trauma surgery? There were a lot of specialties coming into light at the same time as trauma.

SCHWAB

Dr. Rhoads, like Dr. Barker, was very supportive of the trauma movement in America, at Penn and of me personally.

If you go back to I.S. Ravdin, and especially 1940 to 1976 (I just did 50 years of surgical history at Penn), Ravdin, Rhoads, and Bill Fitts had great influence on the care of the injured here.

Ravdin was very interested in resuscitation and took the 344th Army Hospital to Burma. Buried within the ranks of surgeons, Bill Fitts and Bill Scheie, who founded the Scheie Eye Institute, Clet Schwegman, a gifted general surgeon who in Burma became the neurosurgeon for the hospital, went on after the war to become very prominent surgeons. The war experience focused mainly on injury, and upon returning to Philadelphia, stimulated a thirty-year effort to modernize trauma care and systems. Fitts wrote about this extensively.

Dr. Rhoads was very interested in the organization of trauma in the nation. Rhoads became the Chairman at Penn about 1959 and in 1960, he decided that Dr. Fitts was going to be the trauma guru at the Philadelphia General Hospital and for the Department of Surgery. He supported Bill Fitts becoming the third editor-in-chief of the *Journal of Trauma*, and Dr. Rhoads put his efforts into founding the American Trauma Society.

Dr. Rhoads was very supportive of the work of the Committee on Trauma and the AAST. He shared my view that academic medical centers (like the University of Pennsylvania) should be committed to injury and trauma care. I think of Dr. Rhoads because of his fondness for Fitts and respect for Ravdin having the Trauma Center accredited at Penn was a fulfillment of a lifetime goal.

LUCHETTE

Which of your scientific contributions are you most proud of and how do you feel it influenced the field of trauma care?

SCHWAB

I'm most proud of the damage control concept we published with Mike Rotondo, Don Kauder and the team that was here in the early '90s (*J Trauma*. 1993 Sep;35(3):375–82). Packing the abdomen or liver, even the pelvis, was an old concept. Mike and the team developed and explained the broader and important approach—the damage control trilogy.

Surgeons have documented the effectiveness of packing to control bleeding since antiquity. Harlon Stone published a series in which packing worked with penetrating injury to the abdomen. Our paper sequenced operative control of bleeding and contamination with an ICU recovery phase that was necessary to stabilize physiology and, last, a delayed definitive operation to reconstruct viscera two or three days later. Our study was small, but the outcomes impressive, even to us!

The second most influential aspect of the program at Penn are the training programs. We are now in excess, if you include all disciplines, of 115 trauma/critical care fellows, about 90 of which are surgeons. Forty are in leadership positions throughout the world. Personally, this contribution is the most significant of my career. I'm very proud of that.

LUCHETTE

When you look back over your 30-plus-year career, is there anything that you really championed and that you say today, “That was probably not a good thing to advocate”?

SCHWAB

There are two things that I was passionate about that were total busts. One was MAST trousers and the other was needle catheter jejunostomy under local anesthesia (with sedation) in the ICU!

The MAST trousers journey was an important lesson for me in my academic career. What I learned is that before advocating, make sure the science and evidence supports your dialogue. Neither of these interventions turned out to be necessary or effective; in retrospect, I was not prepared to write about them objectively.

LUCHETTE

What do you think are the two or three greatest advances in trauma care and science that occurred during your career?

SCHWAB

I would have to say imaging, critical care, and trauma systems. Certainly, trauma systems—assuring access, demanding quality, and insisting on performance improvement—and imaging have revolutionized the care for the injured patient. The third is critical care. This is the infrastructure and “unsung hero” of the trauma system. Dedicated ICUs, intensivists focused on physiology, immune modulation and total organ support are as much a reason for improved survival as any other component of the system.

From a basic science view, the understanding of the biology of the immunologic response to injury, infection and sepsis, which has been a difficult and long journey, has had profound effect on the management of our critically ill and continues to be a fascinating journey.

LUCHETTE

What do you consider the two or three significant changes in practice patterns that have occurred during your career?

SCHWAB

In the 1980s, Brent Eastman, Frank Lewis, and others worked to change what had been described as “exclusive” trauma system to an *inclusive* trauma system. This concept strove to reverse the prevalent feeling of the day that only a Level I or II trauma center could take care of the “trauma” patient. By being inclusive, the system began to embrace all hospitals that committed to care for the injured. This change in approach slowly reversed a polarized situation and eventually was key in expanding the trauma center concept.

I think the development of the critical care intensivist has definitely changed and enhanced our specialty, broadened our practice base, increased our value as specialists, and

improved survival.

And then lastly, I believe the redevelopment of the emergency surgeon known as the “acute care surgeon” is changing how we will practice in the future. The scope and impact of our redesigned specialty provides a tremendous asset for the needs of patients in the next few decades. At the same time, there is a genuine risk that the demand for 24/7/365 emergency surgery, with large volumes of challenging cases, may dwarf or shadow the passion for trauma surgery. This, over a long time, may extinguish the development of the academic trauma surgeon.

But those three things: the move by the College to go to from an exclusive to an inclusive trauma system, the development of the surgical intensivist, and the emergence of the emergency surgeon are the three practice pattern changes that have changed my career.

LUCHETTE

At the time that the College was going to an inclusive system, where was the Pennsylvania Trauma System Foundation [PTSF] developmentally? Share with me how that was developing in parallel with the College’s model and your role in the PTSF.

SCHWAB

In the mid-to-late 1980s, key people developing the Pennsylvania Trauma System were Charlie Wolferth, Frank Ehrlich, Carol Forester-Staz, and Jim Redmond. At the same time, the activity of the College (COT); CDC (Mark Rosenberg) and HHS/HRSA (Judy Braslow) was influencing state departments of health, EMS agencies and trauma surgeons. Pennsylvania created an “exclusive” system, but they approached it inclusively. In Pennsylvania, there was no limitation to the number of Level I or Level II trauma centers. With the department of health and the Pennsylvania Hospital Association, the above leaders created the PTSF. A public process of information and distribution of an RFP to every hospital in the state followed and encouraged each to consider being a Level I or II trauma center. What the PTSF founders did was set the standards so high and the verification process so comprehensive, that it eliminated many hospitals that choose not to participate. It wasn’t a perfect process but served well to avoid any criticism by those who choose to not seek verification.

The PTSF and the Commonwealth of Pennsylvania should be credited with creating an effective and durable trauma system that is, in my estimation, a premier model of community and government partnership.

LUCHETTE

What aspects of your career that you find to be the most rewarding and bring you the greatest joy?

SCHWAB

There are three words that I put down for this answer: teaching, mentoring, and my professional colleagues here at Penn and especially at the AAST and EAST.

I used to dream as a kid that I was a college professor. I thought I would teach history. For my soul, teaching others is the most rewarding aspects of my career. Second, mentoring gifted and dedicated fellows is a special privilege that I have had. And third, my relationships and fondness for my professional colleagues, the people who do the same work I do, is absolutely a joy.

LUCHETTE

Now I want to hear about what aspects of healthcare keep you up at night.

SCHWAB

So 25 years at Penn and the biggest thing that I really was challenged with was to protect, defend, and grow the academic division, trauma center, and intensivist model. And the battles were always about money. The attitudes that come from the ever-increasing corporate mentality is very discouraging. In the face of that, I had to find ways to grow while caring for people of little means. It was really, without a doubt, the biggest challenge I had and it took a toll. Every two years, I had to justify why the trauma center was not profitable. It was distressing that so much energy was taken to continually change peoples' attitudes, that some aspects of medicine don't yield high margins. In retrospect, as I think of these "battles," it exhausts me.

LUCHETTE

What is your advice to the next generation of academic trauma and acute care surgeons?

SCHWAB

Most of our fellows will enter an academic position, so if they are going to be successful, they must publish. But as important, they must be able to operate. I tell them: "Don't let anybody tell you you can't or you shouldn't be in the OR. Don't ever subordinate the operating room to other duties. Be in the operating room as much as possible and take on the most challenging cases." Second, I emphasize the need to actively seek more senior surgical partners. They should ask those senior partners and mentors for help with difficult cases, in and out of the operating room, because these "senior moments" are so invaluable.

A lesson that I think most young surgeons haven't learned is to study the history of the topic you are addressing. It is as informative as the information within the current journal articles. History teaches how others before you (and with great success), analyzed and solved problems. This important step helped frame the present work and many times alters the idea you thought was so novel.

LUCHETTE

What do you see are the challenges and opportunities for the future of trauma and acute care surgery?

SCHWAB

I believe the AAST is the foremost scholastic trauma organization in the world. It owns the most respected journal in the field. Since inception, it has been a group of committed thought leaders about all aspects of trauma. Thought leaders with scholarly pursuits in the laboratory, in the hospital, and recently, as epidemiologists and translational scientists. Thought leaders in systems and outcomes. And thought leaders in leadership.

If you review presidential addresses of the AAST, these orations were not so much about the AAST, but focused on what the world needed to better the outcome of the injured patient. It is the injured patient that has been our passion, our mission and our quest.

My worry is that we lose the focus on trauma as we become emergency general surgeons. If we morph into an emergency surgical society with trauma as a subordinate, I'm very worried that this will change the essence of the AAST and diminish what still needs to be done—lowering the burden of injury. With one-third of the world's countries still struggling with primitive injury care, our work is far from over.

LUCHETTE

What do you see as the changes in the practice of trauma and critical care in the next 20 years?

SCHWAB

I believe there is going to be continued diminution of money in the government for health care. This will force the regionalization of emergency and critical care. Within the fringe counties of Philadelphia, we have 40-plus hospitals that have emergency departments and critical care units. They are all staffed and operate 24 hours a day. If you were to say that we need more than 10–12 hospitals that were staffed to provide 24-hour emergency and critical care for +16 million people who live in this region, this would greatly eliminate costs, duplication of services and the dilution of provider experience. From a financial perspective alone, we can no longer afford having 40 emergency departments, 40 intensive care units, and paying for on-call coverage within sight of each other.

I believe developing criteria for who needs to be seen urgently versus emergently (and requiring these centralized centers, like trauma and pediatric) must happen. I think it is going to take a decade, but regionalization of emergency is necessary and will reset the paradigm of all emergency care

LUCHETTE

Tell us about one or two things that you would change in your professional career if you had the chance?

SCHWAB

I would change the way other doctors in our profession value what we provide as trauma surgeons and intensivists. I think the value system in medicine has become very artificial. It is

based on cash flow and bringing profit to medical centers. I wish that others would respect the care of the injured as the basis of medicine and the foundation of surgery. Having said that, I would not change my career, and I would not change the opportunities that the profession of medicine has given.

LUCHETTE

Well, if there isn't anything you would change in your professional career, what about your personal life outside the hospital?

SCHWAB

I think the one thing I would do is take *more* vacations and not combine work and vacation. In other words, I would have learned earlier to divorce my professional responsibilities from my family life. And that would have led me to part two of the answer: I would have created a "family home" earlier in my career. We bought a gorgeous piece of property in Upstate New York on the Finger Lakes (near our childhood homes), built a house to hold all the kids and the grandkids. I should have done that earlier, Fred. I have always been hyper-focused at work, and luckily, a wonderful wife and children that deserved more quality time with me.

LUCHETTE

What are your plans for the next 10–15 years academically, clinically, or personally?

SCHWAB

First, I'm going to remember to try to come to work! For the next three to four years I am going to complete my ultimate dream here, which is to build a new trauma center eight blocks away at the Penn Presbyterian Hospital, one of Penn's three hospitals. The building, known as the Acute Care Pavilion, is part of a larger strategic building plan that encompasses the Penn Medicine campuses and clinical practices.

Step one is moving the Level I trauma center and trauma program to this new pavilion. We have been able to design a very contemporary trauma center within the 178,000 square-foot pavilion that is comprehensive with state of the art technology. This project is one that I envisioned years ago and recently got the green light.

I continue to work clinically every month and enjoy the challenges, and of course, the teaching more than ever. Once the new trauma center is completed, we will just see.

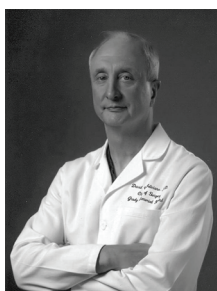
LUCHETTE

Are there any other comments you want to make about anything we haven't cover on the 75th anniversary of the AAST?

SCHWAB

My parting thought returns to not losing the history and core mission of the AAST. We create thought leaders and our purpose has been advancing injury care. I hope that always remains

as central to AAST. I have had many privileges and honors and, perhaps training in the United States Navy was the greatest privilege, but being a president of the AAST has been one of the greatest of honors.



DAVID V. FELICIANO, MD
PRESIDENT 2006–2007

DR. FREDERICK A. LUCHETTE

How it was that you decided on a career in surgery and then how you came to focus on trauma surgery?

DR. DAVID V. FELICIANO

My dad was a community general surgeon. He had me working in the hospital as a high school student doing urinalysis on Saturday mornings and had me start as an operating room technician after my freshman year of college in the summer. So I had a strong father influence.

The trauma came because after I got an early discharge from the Navy, I went to work as an emergency room doctor at Saint John's Hospital in Oxnard, California.

I was the only emergency room doctor on the day shifts. There was a certain amount of trauma in the community, so I became very interested in it just based on that early exposure. As an intern at the Mayo Clinic, I hadn't seen that much trauma. But I did see a fair amount in California.

LUCHETTE

But when you trained, emergency medicine was in its infancy?

FELICIANO

Emergency medicine started right around 1970–71, if you look at when they had their first

meetings, and the hospital that I worked in was going to have an emergency room group. But, as you say, there weren't any emergency medicine physicians around. I was the first hire for the doctor who was going to take over the emergency room, and he thought it was great because I had some surgical experience.

LUCHETTE

Now, regarding your childhood, is it almost fair to say the choice of surgery was partially genetic?

FELICIANO

Yes. My dad was the oldest son of a large Italian family, all of whom lived in one small community about 15 miles from New York City, and he was a very dominating force in the family.

I was quietly programmed or groomed to go into medicine, certainly, and then surgery later. It was always in the back of my mind certainly after high school and all the way through pre-med that surgery would probably be what I would go into, though I had fleeting thoughts of other specialties.

I knew I was going into science in high school. And by the time I got to college I was pretty sure I wanted to be a physician. After my rotations in medical school, I realized surgery was probably the only thing that was going to fit my personality. I just did not have the personality to take care of chronic and incurable diseases that make up the rest of medicine.

LUCHETTE

So obviously it sounds like your dad was an important mentor and advisor early-on.

FELICIANO

Yes, I was spoiled. You know, I had a very level-headed father who was a good operating surgeon. He was so well-respected in the small community and served on the board of health and the board of education doctor. He was at every high school football game. I mean my dad was just a major figure in the community and beloved in the hospital. He eventually became chief of surgery and chief of staff. So you cannot have a better role model than I had.

LUCHETTE

Who were some other important mentors?

FELICIANO

I think the biggest ones were during my residency at the Mayo Clinic, especially Jon van Heerden and Oliver Beahrs. I took a leave of absence from the Mayo Clinic then, when to go to Detroit and fell under the spell of Drs. Charles Lucas and Anna Ledgerwood at Detroit Receiving Hospital.

They just had an incredible influence on me because they were demanding, they had broad practices in general and trauma surgery, and they were excellent teachers. So, for the

past 38 years, they have been two of the best friends and best boosters for a career that you could ever have. They have been so loyal and supportive. There is no way I can ever express enough gratitude for what they did for me.

Another mentor during my residency was Peter Mucha who set up the original emergency room surgical service, the acute care surgery service, at the Mayo Clinic back in '76 and '77. I was one of Peter's first chief residents. He became one of my dearest friends and mentors of all time. As you know, Peter died prematurely a couple of years ago, and some days I'm still reeling from his death.

And, finally, Ken Mattox and George Jordan in Houston. I spent eleven years with two giants in American surgery. I just learned so much from them, not just trauma and surgery, but a lot about running departments, public hospitals, managing residents, and recruiting. I owe both of them an incalculable debt for the way they groomed and taught me. So I have had great mentors.

LUCHETTE

During your training at Mayo Clinic, there were several leaders in American surgery at that time. How did they view your decision to go down the road of trauma surgery?

FELICIANO

They were very dubious. I mean I had been groomed as a general surgeon by some of the real giants in American surgery like Ollie Beahrs, and Bill Remine and Don McIlrath and in endocrine surgery by Jon van Heerden and Tony Edis. Several of them spoke to me before I left for Houston and reminded me that they had not traditionally trained people for that kind of an academic trauma practice.

LUCHETTE

Tell us about some of your proudest work and how it influenced the field of trauma care.

FELICIANO

I think my organization of abdominal vascular injuries into regions was one of the best things I did. I always had trouble explaining to residents how to expose things and what's the approach. Dividing the abdomen into five regions, which we have kept in our trauma book even though most people use only the standard three zones had been helpful to people to learn which vessels are in which area and the difference in exposing them for a hematoma versus hemorrhage. I still write that chapter in our trauma book and feel very possessive about the various vascular injuries in the abdomen and pelvis.

I think the second contribution was in hepatic trauma. There are few organs where we have so many different ways of handling the bleeding. This includes hepatorrhaphy with sutures up to resectional debridement versus more exotic things like packing or vicryl mesh wraps, balloon tamponade, etc. I think some of the papers I wrote on packing and our large series on operative hepatic trauma were helpful to young surgeons.

I think a third area I've really been interested in is peripheral vascular trauma. It's important for young surgeons to understand the fine points of operative technique and recognize that many of these injuries are managed by non-vascular surgeons. I think there is a very structured, orderly and safe way for a general surgeon to repair what is otherwise a healthy vessel in a young trauma patient.

In more recent years, I have focused on things like shunts and balloons. Historically, the introduction of PTFE grafts (which Ken Mattox introduced me to) and fasciotomies. You know, a whole part of my CV is peripheral vascular trauma. So I think those three areas are the ones that I've been most interested in, honestly.

LUCHETTE

I'd like you to take a minute to look back over your career and tell us about a topic that you were passionate about 25–30 years ago and now, as you look back you say, "Boy, maybe I shouldn't have been so vocal about advocating for this because it was probably not the best thing for patients."

FELICIANO

I think the biggest thing was the emphasis on doing angiography in all patients with penetrating extremity trauma. We had such a generic definition that anybody who had a bullet wound within an extremity got an angio. When I was at Ben Taub General Hospital in Houston, we had second-year surgical residents doing percutaneous angiograms. In 18 months, the residents performed 554 of these!

Rick Frykberg and Jim Dennis from Jacksonville later recognized that most of these, of course, were negative studies and that a physical exam was probably just as good in many ways. I honestly was embarrassed to realize that, with such a high true-negative rate it's probably not a necessary study in many patients.

So I wish I had recognized that it was probably unnecessary in a fair number of patients. Rick and Jim's work on selective angiography has stood the test of time, and it's really changed the practice. I wish I had thought of it. And I have told Rick that a thousand times.

LUCHETTE

What do you think are the two or three most significant advances in trauma care and science?

FELICIANO

Two of them are imaging. Certainly CT and surgeon-performed ultrasound have incredibly changed our practice with blunt trauma and sometimes with penetrating trauma. The third one, without question, is the concept of damage control. I think we recognized in Houston in the late '80s that we were way over-operating on patients. I have great admiration for what Mike Rotondo, Bill Schwab, and Mike McGonigal and their colleagues did with codifying the term and pushing a concept that I think many trauma surgeons were unwilling to accept in the beginning.

So CT, ultrasound, and damage control are the three things that I feel have really changed our practice in my 34 years.

LUCHETTE

Is there a fourth? What about the concept of shunting for peripheral vascular or major vascular?

FELICIANO

That's something that is done only in 8–9% of patients, so I don't think that's up there with the others where the number of patients affected is so much greater.

LUCHETTE

How about changes in practice patterns during your career, not so much advances in the care but rather changes in practice patterns?

FELICIANO

One is the team approach. Certainly, when I started my career I felt totally responsible with the residents for everything about the patient. We didn't have the help of physician extenders.

And now with fellows, nurse practitioners, physician assistants, etcetera, you can offer a higher level of care. So, I do believe in the team approach. I hated to give up some of my authority over time, but believe that patient care is better for it.

The other really big change is the 80-hour work week for residents. I don't know if it is a practice pattern change, but I view it as that. Prior to 2003, when a surgical resident was working 120 hours each week at the junior level, I had consistent support on patient care with the same team all the time. I am one of those people who feels that the shift work related to the work hours has fragmented care tremendously. Since 2003, I have felt this pressure with my own patients, both in my general surgery practice and my trauma practice, to keep an eye on them because of the many changes in the resident team.

Residents change, of course, every four to six weeks, like they always did, but now we don't have continuity in the patient's care. I feel it is very hurtful to complex trauma patients to change residents in the middle of the day.

LUCHETTE

What is the single most significant "job" that you find the most rewarding and joyful at the end of the day?

FELICIANO

A good operation with a patient who then does well or a complex trauma operation where you do the right things. I still take care of patients every day.

In the end, if all the other stuff was taken away from me, I'd be happy just being a surgeon, caring for trauma patients and practicing general surgery. So, my most rewarding

experiences of all have been with patients. I can't believe that we have the privilege of doing what we do.

The second thing has been the trainees. I've trained over 245 chief residents and about 30 fellows during my time at Grady. And, I can tell you where most of my former chief residents are—not all of them, but most. I can tell you where all the fellows are. Grace [Rozycki] has really helped me recognize how important it is for us to groom our successors and do it well. And it's a great joy to train younger surgeons and then have them call me for advice to tell me how their careers are going.

Certainly the chief residents that I have trained have been incredibly loyal. At my 60th and 65th birthdays, many chief residents from Baylor and Emory flew in from all over the country just to attend my birthday party. It was overwhelming. And I'm just so proud of the way Grace [Rozycki] developed the Grady fellowship and refined it. So that's the second thing.

And the third thing that I'm really proud of is my peer group in surgery. I mean your peer group always rises as time passes. But I am part of a peer group, including yourself, that has been responsible for wonderful contributions in general surgery, vascular surgery, thoracic surgery, and trauma.

I really am proud of a lot of my friends. We went through a bunch of changes in our careers with imaging and less operative trauma and the resident work hours and all the things we've discussed earlier. It's just been so exciting for me at this point in my career to look around and see who the leaders of American surgery are. And, a lot of them come from trauma and a lot of them are in the peer group.

LUCHETTE

What sort of issues or changes keep you up at night worrying about where health care is going?

FELICIANO

One of the things that has always bothered me is that the complications that will be discussed in the surgical M&M this week are the same complications that were discussed in surgical M&Ms when I was an intern and a resident. It really points out to me that we have failed as surgical educators—not just in trauma, but also in general surgery and related services. Since we have failed to communicate when we make mistakes and how best to avoid them, our trainees do the same silly things over and over again. I go insane when I go to M&Ms because it's no different today from my time at Ben Taub in Houston. It's the same complications: people closing the skin when there is stool all over the place and people not taking precautions on wound fascial closure with patients who are on steroids, are distended, and have COPD, etc.

The other thing that has bothered me is that you know from doing a lot of operative trauma that one can predict, almost in the emergency room based on blood pressure, base deficit or lactate, who is going to survive and who isn't. The whole concept of irreversible shock has driven me nuts my whole career. We clearly can fix the injuries in bleeding patients. But, if we don't get them soon enough, they are still going to die despite massive transfusion

protocols, warming of the operating room, and a gifted surgeon. I just haven't seen that much progress in how to bring people back from being near-dead. I can open a chest in the emergency room and can tell the residents whether or not they're going to live because, if they don't generate a real pressure, they're going to die. If they don't have a cardiac rhythm, they're going to die. Their heart is still beating but this irreversible shock "thing" has always bugged me.

LUCHETTE

Do you think the over reliance on CT scan contributes a little bit to that delay and that "irreversible shock?"

FELICIANO

You know, not so much because, traditionally those are more stable patients. It's just the inevitable delays with exsanguinating patients. It's the time it takes EMS to get there. It's the time it takes to bundle them up and get them in the ambulance. It's the travel time. And we always lose, 25 or 35 minutes, even in a compact, urban environment in the prehospital phase of care. I don't know whether that can be changed. But I do know that in the hospital there is nothing new that we have done other than damage control that might have some impact on this near death group.

Every trauma center that does penetrating trauma has people exsanguinate, either during the prehospital phase or in the emergency room. And I think there are some things we could do like putting operating rooms in every emergency room for these kind of patients, which some places do.

LUCHETTE

And what advice would you give to young trauma surgeons or academic surgeons interested in a career in trauma and acute care surgery? What life coach advice would you give them as they start out in their career?

FELICIANO

I have mainly been in academics and divide academic careers into thirds. You know the first third is when you really spend a lot of time doing clinical work and operating and rounding and getting your skills up to par and then start doing some studies and writing. Then during the second one-third of your career you're starting to angle for leadership positions and maybe doing more sophisticated studies and moving up in the societies. Finally, the third phase of your career should be the last ten-plus years or so—this is where you really have reached the level where you can do what you want, where you can take on what you want, operate on what you want.

And I always remind people that to get to that third phase you've got to do things right in the first two phases. I hear a lot of young faculty in my travels talk about their frustrations in academic careers. My response has always been the same: "It's your career, and there are certain things that you feel are impeding you. You can either try to change things at the insti-

tution you're at or you need to leave. But it's your career. It's not so much anybody holding you back." I mean if a career is not going well and your medical school says you have to write 50 papers to become an associate professor, this is not a point that you argue. You write them. You figure out a way to get help and write them. So I think understanding how to run your career is a big deal.

Secondly, with the privileges we have to get this far in our lives, with all the people who have been involved in training us and supporting us, I like to see surgeons give something back. Whether that is serving your community, setting up a hospice, training residents, writing papers that will help the community surgeon get better, volunteering—I don't really care what it is, just give back.

Unfortunately, there are a lot of surgeons these days who have become so internalized and focused on themselves, their income and their family, that they're missing the boat. There is a whole other world that they can impact. Therefore, I think giving something back and keeping that in mind from the day you start your career. It's not, "Oh, well, I'll do it when I retire." That's nonsense.

The third thing is to take care of your family. We have been given this privilege and the family certainly pays a price, as all of ours have, with not being there all the time, not paying attention to a spouse. I would do certain things better in my younger years as I was writing a lot and spending a lot of weekend time in the hospital. In retrospect, I would take the time to make my family know how much I appreciated them. There is no particular order of those three, but family is something you've just got to balance with the career. And, it can be done.

LUCHETTE

Giving young upcoming surgeons advice on how to live their lives outside the hospital. Any other advice on outside activities away from medicine?

FELICIANO

Yes. Part of it is being really organized and disciplined. When I was staying busy in Houston, my oldest son became a pretty good soccer player. I made up my mind that I would not miss any of his games. If he had a four o'clock game at his prep school, I would leave at 3:30. And, I would just get somebody to cover me. It would be easy not to do that, but I think paying attention to your family demands that you have to be highly disciplined and structured. Also, you have to have good relations with your colleagues. You cover for them, and they cover for you. It's an art form.

I think the second thing that I would do differently is dealing with friends. All my friendships have been in medicine and, particularly, in academic surgery. Whether those people are colleagues or true friends is sometimes hard to know. But, I've never spent enough time at any place I've worked paying attention to the people around me. It would be those two things in terms of life outside the hospital: family and more attention to colleagues and friends, particularly outside of medicine and surgery.

LUCHETTE

What do you think are the greatest challenges and opportunities for the future of trauma and acute care surgery?

FELICIANO

I think everybody has to recognize that this is going to be a specialty that is going to attract, much as trauma and critical care did historically, a limited number of people. It still is hard in the sense that you're doing emergencies on difficult patients, often at off-hours, and reimbursement is iffy sometimes. Whereas it offers a benefit beyond a career in trauma and critical care, it also has some of the same limits. I think the day that every chief resident in a surgery program is going to go into acute care surgery is never going to happen.

I do think they are going to be doing shift work. Also, a guaranteed salary will be a major inducement since lifestyle is so important to the current generation of trainees in surgery. Also, I think that with interventional radiology and stents and other new technology, we're probably going to be doing even less and less operative management in emergency general surgery. For example, there are the laparoscopic washouts for perforated diverticulitis. Whereas acute care surgery certainly brings more operations to a trauma surgeon's practice, he or she is not going to be the busiest surgeon in the hospital. Shift work and dealing with some diseases that may be better treated in ways other than surgery impose some limits.

That being said, I think it is needed in certain universities and communities. In many communities, the general surgeons will want to hang on to their emergency practices and their emergency room coverage so that they can help feed their elective practices.

LUCHETTE

Where is acute care surgery going to be in 20 years?

FELICIANO

Well, the most important thing that we're all going to have to do in acute care surgery is do what we did in trauma, i.e. not accept the way we're doing things now and study how we can do things better or in a more innovative fashion.

When I started my trauma career, there were many things being done like exploring everyone who had stab wound through the abdominal wall or doing a cervical exploration on everyone with a little poke hole through the platysma in the neck. Once we studied these clinical situations, it was recognized that there was a high negative rate and exploration that non-op management is certainly appropriate in properly selected patients.

We are going to have to do those kind of studies in acute care surgery centers to actually convince general surgeons to do things a better way. If we study some things like which patients really don't need an appendectomy and which patients are going to benefit from a tube cholecystostomy, that would be the right way to convince the field academically.

Get these controversial areas studied properly, so it becomes a true specialty of its own. Then it will impact the way general surgeons who are not part of an acute care group practice

in the future.

LUCHETTE

Is there anything you would change in your professional career?

FELICIANO

Yes, without question: I would have left my last academic job before the new chairman started to dabble at Grady. We will leave it at that.

LUCHETTE

Is there anything else you would have changed as you look back related to your life outside the hospital? To take care of yourself better, maybe?

FELICIANO

Yes. I think if you enjoy this, like a lot of us do, you tend to not develop the other side of you. And, as I get closer and closer to retirement I mean people ask me, you know, "What hobbies do you have?" And I always, embarrassingly, have to say, "Well, I don't." Because I've really been spending all this time working at the hospital and then you come home and squeeze in family time. One day you wake up and all of a sudden it's 34 or 35 years later. Certainly the younger generation are much better about playing sports, enjoy traveling or have a true hobby. I regret not figuring out what other things would have made me happy.

When I was just starting my residency, immediately after serving in the U.S. Navy, I was a powerboat racer. I realized as I got into my residency that there weren't going to be too many weekends where I could be driving over to Wisconsin or Iowa to drive my boat. And I stopped. It's one of the single greatest regrets of my life because I could have, again, with a little organization and some cross-coverage with colleagues, kept doing it even now.

And I held on to my boat and all my equipment for years until my sister who was storing it for me finally made me sell it. But there was a hobby I absolutely loved. And, I gave it up. I have real regrets about that. I still, even as I get older, think about doing it. My son just gave me a gift on the history of boat racing, and I love it. Anyway, that's a regret.

LUCHETTE

So what are your plans both clinically and academically and personally for the next ten years?

FELICIANO

I'm going to work somewhere between two and five more years and hope to continue writing and mentoring people. And what I am also going to do in that time is try and find the other area outside of the career that might really excite me.

I've talked to enough friends and colleagues in recent years who have retired, and I've certainly spoken to Lazar Greenfield about this with his surveys of surgeons in the American Surgical Association and the American College of Surgeons. In essence, your health will

deteriorate rapidly after retirement if you don't have a focus that gets you out of bed in the morning, forces you to intellectualize a little bit, and that brings you some satisfaction. I've been really working at a high-intensity level for a long time. And I'm looking for another challenge after I stop operating.

I have teaching skills. Unfortunately, it is the least valued attribute that you can have in an academic surgical department. If you make money, they love you. If you do a hundred Whipples a year, they love you. If you bring in money-running courses they love you. If you get an NIH grant, they love you. If you have 35 teaching awards like I do, nobody cares. I am looking for something medically-related, but, if not, then something else that will really stimulate me and keep me intellectually active and happy. I am not going to sit there and play golf.

LUCHETTE

Any last parting comments you want to leave for the readership?

FELICIANO

Yes, I think one of the nicest parts about being involved with the trauma field is the people in trauma are some of the best I've met in my life, in or out of medicine. I really admire the incredible commitment that my peer group and the people who have preceded us and followed us have to the whole patient. I really appreciate the sacrifices everybody in this field makes personally and, sometimes, family, as we mentioned.

I have great admiration for the science that has come out of trauma during my three-and-a-half decades. Many of my peer group have done really brilliant studies that have absolutely impacted patient care, not just in trauma, but elsewhere. So, I think my contact with people in the trauma field has just been extraordinarily rewarding. And I'm sure people in breast surgery and laparoscopic surgery feel the same way. And, that's fine. But I feel I am part of a really special group of surgeons with this extraordinary energy level and commitment level, as I said. And, it's been wonderful to have colleagues like that.

There are a lot of people in trauma I really look forward to seeing at meetings. Though I am not a social person, there are some meetings I go to like the AAST and Western Trauma where I feel so comfortable. It's interesting to talk to everybody and see what they're doing and what they are planning for the end of their careers and how they are grooming young people.



TIMOTHY C. FABIAN, MD
PRESIDENT 2007–2008

DR. FREDERICK A. LUCHETTE

How you came to decide on first a career in surgery, and then, second, focusing your career in trauma surgery?

DR. TIMOTHY C. FABIAN

Well, I went to Loyola for college and medical school. And when we were out at Maywood my first inclination was to go into internal medicine, specifically cardiology, because I have always been enthralled with cardiovascular physiology.

And I had always been told, as all students are today, that surgeons are sort of obstinate asses. Well, then I had the M3 surgery rotation and came under the influence of Dr. Freeark and several of his residents. I was highly impressed.

And I realized within a couple of weeks that internal medicine wasn't for me and surgery was. It was more exciting and to me more gratifying. You weren't just holding back chronic disease, there was a chance to cure a lot more people. So that's the reason I went into surgery.

After medical school, I entered the general surgery residency at The Ohio State University. Dr. Zollinger had a profound influence on me. He was the consummate professional. He cared nothing about money, only about his patients and the profession. I was nearing the end of my training and I had always thought that I would go back to my small hometown of Marion, Ohio, which is just north of Columbus, about 40 miles or so, and be a general surgeon

there.

Well, towards the end of the residency I started wondering if I might get bored with taking out gallbladders, repairing hernias, and performing gastrectomies after a while. At the time I was on the vascular service working with a vascular fellow, Bhagwan Satiani, who had trained at Emory and I mentioned my dilemma. He said, “Well, if you really don’t know what you want to do, why don’t you go down to Atlanta and be a fellow with Dr. Stone in trauma for a year or so?”

I said, “Well, gee, trauma isn’t the sort of thing I was interested in.” He said, “If you don’t know what you want to do, there is a chance to operate a lot and you’ll have a good time regardless of what you do after the year.”

So I went to Grady Hospital and sort of instantly fell in love with the concept of trauma care. Again, you get a chance to cure a lot of patients, especially young people that otherwise would die. And it was the first time my eyes had been opened to doing clinical research, which I never had any interest in as a resident. And Dr. Harlan Stone was one of the most inspirational and brightest people I have ever come across.

So after coming under his influence it just sort of got me on my way to a trauma career. I stayed on the faculty with him for a year or so. And finances were tough at Grady, and he recommended, “Maybe you should look someplace else for a more stable, long-term position.”

He told me there was a place over in Memphis that was building a trauma center and he recommended I go take a look. And I said, “Well, gee, Memphis, I don’t know. That doesn’t sound very appealing to me.” He said, “Why don’t you just go learn how to interview, anyway.” So I did.

And I came to Memphis and there was a big hole in the ground where they were going to build a new hospital. The long and short of it was I decided to take the plunge based on his nudging.

And there was a lot of money involved! I was making \$35,000 a year on the faculty at Emory and instantly got a \$50,000 at the University of Tennessee, so I thought I was in “high cotton.” I didn’t have to moonlight on the weekends in ERs any more.

I was going to come here for four or five years, like most young academics for their first job, and then move on. Well, four or five have turned into I guess 32 now.

LUCHETTE

What did your colleagues that you were training with and the other fellows down at Emory think about your decision to pursue a career in trauma surgery? There were a lot of specialties in their infancy at that time. You mentioned cardiology. At the time cardiology was huge at Loyola, wasn’t it?

FABIAN

Yes. John Tobin, as a matter of fact, was the chief of cardiology. And he was a very bright, inspirational, tough guy. And I liked him.

But I just couldn’t face it—cardiology wasn’t as invasive as it would become. At that

time, the interventional radiologists were doing all the catheter-based work, for instance. Perhaps if they were like interventional cardiology is today, I may have ended up going down that path. I don't know.

LUCHETTE

But what did your fellow residents and the fellows you worked with at Grady think about pursuing a career in trauma surgery?

FABIAN

Well, at that time, you know, that was 1980 and trauma was really just coming around as a recognized specialty area. Up until then, essentially all trauma care was delivered by general surgeons on call. And outside of the big public hospitals in the country like Grady, Cook County, L.A. County and the others, there weren't any trauma centers. So they didn't even think of it as a career because it was just getting organized.

And that's also I guess sort of what appealed to me. I've always liked the idea of programmatic development and getting involved in new ventures. But very few people were really interested in trauma surgery as a career. I realized it was a gamble because it wasn't clear that it was ever going to work. At that time, your city/county hospitals were referred to as "knife and gun clubs" primarily caring for the indigents. But insured patients almost everywhere in the country went to the nearest hospital. And so there was very little money in it for either the hospitals or the physicians.

It quickly became apparent to me that the people that were getting the best trauma care were the poor people in the country and the people that had money were getting the poorest care because of the lack of a system. And I know that was true. I thought it was somewhat ironic and perhaps humorous, in a dark way.

LUCHETTE

So which of your scientific contributions are you most proud of and how did they influence the field of trauma surgery?

FABIAN

I think one of the other more important areas was development of the modern current management of blunt aortic injuries. You know, going from the issues of diagnosis, getting away from aortography and demonstrating that CT scanning was as good or, in fact, turned out to be better than aortography. I think that was important.

I know we were the first to champion the concept of anti-hypertensives to decrease risk and rate of rupture. And I think gradually this caught on all across the country. And I think it has made a huge impact on reducing mortality so patients survive long enough to have definitive therapy. It also allowed delaying surgical repair of the aorta in patients with multiple injuries, such as brain and pulmonary injuries until they are more stable and could tolerate, at the time, thoracotomy. Of course, today repair is nearly uniformly accomplished with endo-

vascular grafting.

So I think that's an important area that we've been able to contribute a lot. While some of the work originally met with some skepticism, I think most of the things we've written about management of aortic transection have turned out to be pretty much on target.

LUCHETTE

Well, if memory serves me correctly you were actually the lead investigator on one of the first major AAST multi-institutional trials, right?

FABIAN

Yes. Actually, that was the very first prospective trial of aortic injury. Well, it wasn't a trial, it was an observational study. Nonetheless, it was in the late '90s and I was chairman of the AAST Multi-Institutional Trial Committee. It was recognized that this was an important injury that we didn't, hadn't learned a lot about since Parmley described it almost a half-a-century before.

So I think the multi-institutional trial captured people's attention and made us look more closely at outcomes. For instance, consideration of "clamp and sew" versus bypass, a very controversial issue at the time. The multi-institutional trial was one of the final nails in the coffin on the "clamp and sew" because it clearly demonstrated that the results were inferior with a higher rate of paraplegia.

And I think it kick-started the AAST multi-institutional trials that have become much more important over time. We have learned how to form clinical trials groups which can conduct solid research. So regardless of the importance of that particular trial I think it did show that we could organize ourselves for clinical studies. Even though there wasn't any money involved for sponsorship, I think it was helpful in getting us moving in the right direction.

LUCHETTE

If there was one thing that you championed throughout your career and as you look back now you say, "Oops, that was probably the wrong thing to do"—is there anything that falls into that category?

FABIAN

Well, let me think. I don't know that I did anything wrong, but one thing that hasn't worked out as well as I would have hoped at this point in time, although it may still evolve over the next decade or so, was getting trauma surgeons more involved in modern vascular techniques, specifically endovascular approaches.

I did a sabbatical about 12–13 years ago as this new technology was just getting started in the country and hoped to bring part of that to trauma care as well as developing a sophisticated vascular division at our department. But the mistake that I made was overestimating the number of cases that endovascular techniques was appropriate for—and so there wasn't enough volume in the overwhelming majority of trauma centers so that five or six trauma

surgeons could attain endovascular proficiency and maintenance of their skills.

The skill set requires more volume than that seen with just trauma patients. And I sort of suspected the problem when I started, but it was a bigger problem than I realized. However, saying that, it is apparent to me now that there is a small cadre of young people in this country over the last couple of years that recognize the same ideas that I saw when I took the endovascular sabbatical. However, they are coming to a better solution to solve the training and practice conundrum.

They are beginning to do back-to-back vascular and trauma fellowships. And I think that is the way to go. I believe their practices will be primarily elective vascular surgery where they will maintain their catheter/guide-wire skills, but also leading the endovascular initiatives in the trauma population. Gradually, the core trauma faculty will learn routine endovascular techniques with the vascular specialist on-board for complex reconstruction. So I'm hoping that over the course of the next decade, there will be a reasonable enough number of people that in 20 years it will become the standard of care for trauma surgeons to be performing all of the endovascular stents for injuries to the aorta, renal vessels, and extremity arteries. Hopefully, core trauma faculties will eventually perform nearly all embolization procedures in sophisticated hybrid operating rooms.

LUCHETTE

So you see that becoming a more significant part of the practice of trauma care?

FABIAN

Yes, I think for sure it's going to happen. But, somewhat like acute care surgery, we've got to get a critical mass of people out there doing it. I know of at least three people right now, so there are probably two or three times that number around the country that are starting to go down this path. But it's going to take at least a decade for us to get there. And it will be very career fulfilling for the people that are doing it, as well as improving patient outcomes. So I think it will be a win-win for everybody.

LUCHETTE

As you look back over your career, what do you think are the two or three greatest advances in trauma care that have occurred in the last three decades?

FABIAN

CT scanning has revolutionized trauma care. We're able to both diagnose injuries more accurately and not have a high false-negative rate or false-positive rate for laparotomies. Another really important advance that may seem mundane and doesn't get much attention, but I believe has had a very important impact on patient care, is pulse oximetry. You instantaneously see what is going on with oxygenation. I think it's made a significant difference in patient outcomes over time. Many lives have been saved, and many brain injuries ameliorated.

But, clearly, the major leader has been CT technology. It's really changed the whole

game. It's allowed for non-operative management. You know, if it wasn't for CT scanning we'd still be operating on nearly all liver injuries. But today we're only operating on 5 percent of them. It makes a big difference in patient outcomes.

LUCHETTE

What kind of changes have you observed in the practice patterns of trauma care that have been positive and negative?

FABIAN

Oh, I really don't think there has been that much negative. I think for many years people young people finishing their training were less interested in trauma care because of the fact that, "Those are the guys that are up all night taking care of poor people that don't pay," and all of that typical whiney stuff that we heard over the years.

I think that is changing today, probably part to do with generational attitudes and quality of life issues that now I think it's sort of becoming a plus to be able to work your shift and walk away. A lot of people don't like to hear that, but I have no doubt that that will be attractive for a lot more people and be a positive aspect about trauma surgery and care.

Another big shift that has occurred, which is clearly for the better in my opinion, is the number of women that are in trauma care. Over the last ten years, at least half of our fellows have been women, which is a lot more than is represented in surgery departments over the same period of time. And I think it's healthier for the practice. Acute care surgery is also a major change. It will be curious to me to see how rapidly this evolves.

Going back to the lifestyle, you know, most hospitals in the country today are having a hell of a time getting enough general surgeons to cover their emergency rooms. As a consequence, regardless of us organizing acute care surgery, this is going to happen one way or the other—and actually something a little bit depressing to me is a couple of days ago I had heard the term "surgicalist," which made me want to puke when I heard the word.

But, nonetheless, I thought, maybe this is just something I don't understand. I thought it was a made-up word. Well, damn, I went to the internet and looked up "surgicalist." There are all sorts of places around the country that are advertising for these people which are surgeons that are covering ERs and in-house consults. I don't really like the way that this process is going, but I think because of manpower issues and career choices that we're probably going to go down that road to a more significant degree than I would have hoped.

I hoped that acute care surgery would make it a more formalized process and maybe, ultimately, we will win this. But I'm afraid that the manpower requirements for the hospitals that are looking for the damned surgicalists are going to overtake us if we don't get out in front of it.

I worked with two of our hospitals here in town to provide acute care surgery programs because of these reasons—they can't get surgeons to cover the ED. Well, I worked for a year-and-a-half with both of them. And they ultimately turned out just recently to start advertising for basically this surgicalist thing. And I told them, "You aren't going to get the same quality of

care. And, it's going to be at least as expensive as the formal acute care surgery *program*." But they just want somebody that is employed by them and they can tell them what to do. They don't get it. And everybody talks about quality of care, but I think so many of these administrative types talk about it because of it being tied to future reimbursement. While they talk about it, they wouldn't know quality if it bit them in the ass. So I guess when we get to the downsides of what I'm seeing, that is it, the surgicalist.

LUCHETTE

What are the facets of your job that you find are the most rewarding and bring you the most personal joy?

FABIAN

Training, teaching programs and clinical research, those are the most interesting things to me. I like to be around students, residents, fellows. It's always stimulating. You can never get mentally lazy because of it. It's very gratifying to see people progress along the years in their residency from being a clumsy intern that you wonder why the hell they went into surgery to the fifth year they turn out and you say, "Damn, they're pretty good."

And then the research aspect is really—if it wasn't for that I would probably have done something else, too. It's fun to ask simple questions and stick with it and find answers that I think are meaningful. I don't denigrate basic science, but I think we can make a lot more contributions for a lot less money spent with sophisticated clinical research. And that's an area that I think is tremendously under-appreciated.

LUCHETTE

How many fellows have you trained over the years?

FABIAN

That's a good question. It's between 35 and 40. I should know the exact number but I don't know.

LUCHETTE

I mean that's got to be personally very gratifying?

FABIAN

I don't think I've had over three fellows that have just gotten completely out of an academic career. And many of them have come along and taken leadership positions. It gets back to what do I enjoy. Well, I enjoy training surgeons and those are some of the reasons.

LUCHETTE

What about the future of trauma care and acute care surgery keeps you up at night?

FABIAN

I guess the corporatization issue that we talked about and physicians being employees of health care systems. I realize there are many health care systems, some of the larger in the country, that have done it successfully for years, but those have been based on elective practices. I'm not sure that it is going to translate quite as well to the trauma and acute care surgical approaches that are necessary. And I just worry that it's going to become less of a profession and more of a job, punching the clock and so on and so forth.

You know, whatever happens, I guess it's always going to be fun taking care of sick people. This is my solace whenever I get a little cynical about where the hell the future is. I think with good leadership we can probably keep the cart in the middle of the road, but it's going to take a lot of work. And, of course the unknowns are where health care really is heading over the next 10 or 15 years.

LUCHETTE

What kind of advice would you give to the young people in training that are interested in pursuing an academic/trauma/acute care surgery career? How should they approach it? What are some do's and don'ts according to Tim Fabian?

FABIAN

Well, I think there are a couple of things. One is get some real research ideas and not "pie in the sky" stuff. Ask some simple questions and sit down and figure out a way to get either local funding from the hospital or from professional organizations. Do something and don't just talk about it. I've seen people talk about an idea for ten years and never do a damn thing.

The second thing I would say is stay as clinically involved as you possibly can. I was criticized as a resident because I would never leave the operating room. Well, that's where most of the fun is. Get in the operating room as much as you can. You know if you are going to be any good, you've got to be clinically and technically an expert. Establish some area of surgical expertise. So I guess those are important pieces of advice from my perspective.

I would suggest that to get around some of the perils we've discussed associated with corporatization as it relates to emergency surgical care, I think where we should go is regionalization of emergency surgical services, similar to what we have done with trauma care. Except now, instead of a regional trauma center, it needs to be a regional emergency surgical hospital. And I would encourage young people to push and think along those lines.

You know, the manpower shortage in neurosurgery is a great example. They don't want to take call on two or three or four hospitals. It would make sense from a manpower concern to regionalize neurosurgical care. And the orthopedic community, now that we are having big toe doctors and little toe doctors, there are not too many really broad-based orthopaedic guys available for call. So just for manpower alone I think we ought to be regionalizing surgical services. That doesn't mean every case of acute appendicitis needs to be taken care of at a regional center but, sick critically ill patients should be cared for in a regional center.

I think that is the future. And it makes so much sense independent of the manpower is-

sues because of the economic efficiencies and quality of care efficiencies regionalization offers. I think we should really push towards that. And I think that will go a long way to fostering the practice of acute care surgery and trauma care where it should be, in leading and taking care of sick people.

You know, the surgicalist can take care of the appendicitis and drain simple abscesses and stuff like that. And ruptured aneurysms and all the care for emergency neurosurgical diseases would be appropriately centralized. It needs to be more than just trauma surgeons. It needs to be surgical specialists managing nearly all surgical emergencies. And I believe that's going to happen. It just makes too much sense. It's sort of like the vascular thing we talked about a few minutes ago. It may take another 10–15 years, but it just makes so much sense I can't imagine that healthcare won't move in this direction. I don't think there is going to be much of an argument, really. So I think it could happen a lot quicker than the nearest-hospital concept of taking care of somebody that was in a wreck with a couple of fractures.

LUCHETTE

What you think are the greatest challenges and opportunities for the future of trauma and acute care surgery?

FABIAN

The greatest challenges, I suppose, are appropriate funding to develop these concepts that I'm considering, like the regionalization of emergency surgical care. I suppose I am assuming that we're going to have a cadre of young people that really like to do this and like the lifestyle.

I suppose there is a threat that if they perceive it's not as much fun as I think it is, that could be a problem. But I don't think that's going to happen. I think it's too much fun that there is not going to be a risk of people not wanting to practice as an acute care surgeon. I guess there are two challenges I see: concern for manpower and making sure there is enough money for salaries so that people don't feel punished for doing this.

LUCHETTE

And the other part of that was the opportunities for the future of trauma and acute care surgery?

FABIAN

I think there are two opportunities. First, young surgeons are able to participate in something that you can actually see societal benefit from—you can actually save lives and have the personal satisfaction that you're making contributions to help care for the reasons we took the Hippocratic oath, not the hypocritic oath. Second, I just think that if we get more and more organization in the way we're delivering trauma and emergency surgical care it's just going to be a lot of fun *that works*.

LUCHETTE

What things would you change related to your professional career as you look back?

FABIAN

Oh, I guess seeing the way academic surgery and medicine in general has developed it is clear to me that the very best jobs are division chief-level jobs. I've been a chairman now for, I guess, going on 13 years. And it has taken me more and more into administrative responsibilities and further away from the things that I really enjoy doing which is, again, teaching and operating and research. And as a chairman, you find out that about 80% of the activities, administrative activities that you participate in have almost no substantial impact but they take up a lot of time. And it's frustrating. So I guess I question whether I should have just stayed at the division chief level.

You know, in all honesty one reason that people like me do this is the threat of the unknown, that "If I don't do it, who will?" and then you're at risk there, too. But just being honest, I think I sort of wish, in many ways, that I had been able to stay a division chief.

See, things have changed a lot. I guess even 13 years ago the administrative responsibilities weren't quite as bad as today. And you had a little bit more authority to go with the responsibility. The way most academic medical centers are changing today, the hospital administrators have more and more clout. They control the dollars and who controls the dollars controls most everything else. And I see this around the country. It is not just here in Memphis. I don't know if this needs to make it into, you know, anything written on paper but I would advise young people to choose very carefully.

I offer this advice for anybody that does do something like this, a recommendation that you surround yourself with good people and then pretty much leave them alone as much as you can. Do not micromanage. I've seen too many people, smart people, make the mistake of not doing that. It makes the department run much better if you get good people and get the hell out of their way and be there to support them when they need you.

LUCHETTE

How it is with your busy professional life that you have a life outside the hospital is beyond me, but if there was one thing you would change in your life outside the hospital, what might that be?

FABIAN

Nothing, really. I can't think of anything I would do any differently. We like to travel a lot and we actually do. I don't know. I can't think of anything I would do differently.

LUCHETTE

So what does the future hold for you, both professionally and personally?

FABIAN

Oh, I'm going to work a few more years. I've got to pay for those kids' educations! So of the five kids, four of them have moved back to Memphis which I guess speaks for the quality of life that we have. Professionally I will continue to try to provide leadership here at the University of Tennessee and stay involved nationally and would like to continue involvement with the AAST. Right now I'm serving on the AAST Foundation. I'll continue that for a while and provide any help I can to the organization through research or other things. But otherwise I'm going to continue pretty much doing what I'm doing for a while.

LUCHETTE

Any last words you want to leave or something that you feel like you would like to contribute that I haven't asked you or you haven't had the opportunity to put in words?

FABIAN

I guess I would just say that of the various areas of surgery, trauma is probably one of the most gratifying. It offers the opportunity to provide care and to teach and to do research and there is always something different. You know it's a cliché that you're always learning something new every day but it's pretty much true. Many days I'll see something that I've never seen before.

So I would strongly recommend the young people to look into a career in trauma surgery for those reasons. It's a lot of fun. You can really make a difference in the lives of a lot of people, not just one at a time. I mean you run a trauma center and you can have some impacts on huge numbers of patients. You do some research, you can affect not only the patients you care for, but the patients that others care for by providing good research answers to sometimes not very overly complex problems.



GREGORY J. “JERRY” JURKOVICH, MD
PRESIDENT 2008–2009

DR. DAVID H. LIVINGSTON

The classic and most obvious question is about your choice of career in trauma, critical care and now acute care surgery. How did you get there? At what point in your training did you decide?

DR. GREGORY J. “JERRY” JURKOVICH

During elementary and middle school I definitely thought I was going to be an astronaut. That was the time when the Mercury program and Apollo moon shots were capturing the imagination of the nation, and people were influenced by their success. People were talking about what just seemed to be the future direction of the world. I was attracted to that and since I was naturally good at the math and sciences I thought I was on the way. But then I ran into one of those big disappointments in life: you had to be a perfect human specimen in terms of vision and physical stature. At that time you also had to become a pilot first, and join the military. The harsh reality of all of those issues made it obvious that this not going to work out very well.

So I went to college to study math and sciences. I was going to be an engineer. I still hadn't completely given up on the whole astronaut thing and thought maybe a way through NASA was on the engineering side. I did mix it with medicine and got a degree in biomedical engineering. By the end of the degree I realized I enjoyed and wanted more people contact than I was getting in engineering so I decided to go to medical school.

In medical school, I thought I was going to be an internist or family practitioner because that's the role model I knew about. To me that was what doctors were like and I think this gets at the essence of this question. It really is all about role models and being exposed to something that seems exciting. One reason I went to medical school was because our family practitioner was a good guy and well admired and I thought he did cool stuff so that's what I going to be. But I hated internal medicine. Rounds took forever. You never made a decision. The decisions were obvious, yet no one ever acted on them. It was interminably difficult for me.

But once again I was struck by someone who would become a mentor—this time it was John Najarian who was the chief of transplant surgery at the University of Minnesota. It was a time when transplant surgery was taking off. It seemed like being able to transplant organs was the most avant-garde, coolest, thing that had ever happened. So I was going to be a transplant surgeon. I ended up coming to Colorado for my residency because Tom Starzl was the chief of transplant surgery here, and he was doing the world's first liver transplant. I thought, this will be spectacularly fun and great and I will be a transplant surgeon. Once again, reality struck when I realized what it took to do transplant versus how much work they did versus how much fun they looked like they were having. I thought it was very discordant and just didn't fit.

One more time I was influenced by mentors and advisors who looked like they were having a lot of fun and very energetic and very enthusiastic and just loved what they were doing. That was the trauma group at Denver General. That group was just taking on all-comers, doing anything and everything, all sorts of surgery, and seemed to have a great time of it. Ben Eiseman and Gene Moore were the real mentors there at that time.

So I followed that pathway, David, and it's really much more a pathway. Finding and following a mentor or mentors, seeing what they're doing and thinking what you would like to do it. It's feeling that it's exciting and avant-garde and something that captures your imagination and your attention.

My mentors during residency were Ben Eiseman and Gene Moore. Tom Starzl falls in that category, too, because he was the chairman. Mainly it was the trauma group. During that time period all the disciples of G. Tom Shires were running sections and departments working on shock and resuscitation. That's one reason I took my first job at the University of South Alabama in Mobile when Bill Curreri was chairman. Bill was one of G. Tom Shires' faculty members, along with Jim Carrico. The whole concept of being a surgeon who was a physiologist and someone who was into the science of resuscitation fit with my math and science background and interest, coupled with the fact they were operating surgeons. If you're not exposed to some things it's really hard to know if you would like it or not. For me I was exposed to transplant surgery or trauma surgery. Those were the two for me that motivated and excited me most.

LIVINGSTON

So of all the mentorship advice you got, what was some of the best?

JURKOVICH

Oh, that's a great question. Pick something and focus on it. The advice was: "I know you like to do everything, Jerry, but you've got to pick something and focus on it." The other good advice was if you go to a big place that has a lot of resources, you will be able to find someone who is interested in the same thing you are, and collaboration makes both of you stronger. That was good advice.

LIVINGSTON

What about bad advice?

JURKOVICH

Let me think of some more good advice before I get to the bad advice. The issue of not being afraid to be a small fish in a big pond—that you will grow—was good advice. Because I've done it both ways. Other good advice: Well, I've always had this advice which is the basic golden rule of doing unto others as you would have them to do unto you. It applies to so many things. I hear that over and over again but it is just good advice.

Bad advice. I don't think I've had much, actually.

Here is another good piece of advice I've always stuck with. I was once told not to do something in the following way. A boss of mine once said, "Jerry, don't put me in a position where I am forced to choose. You might not like what I opt for." This gets at the issue of ultimatums. I use that a lot now, saying, "You really shouldn't put me in a position where you are forcing me to choose because you might not like what decision I make."

The only other advice I never got was to take a year off. Whenever I thought about doing it, the advice I always got was that if you just keep focusing early, you will get further ahead. I actually wish I would have taken time off.

LIVINGSTON

Of all your scientific contributions, what are you the most proud of and how did it influence trauma/critical care?

JURKOVICH

Three things come to mind. The first one is the work on developing the concept of acute care surgery and being the new type of trauma surgeon. I think the work through the AAST on developing the Acute Care Surgery Committee, on developing the training protocol, developing the curriculum, getting the training programs in place and pushing the concept of the new trauma surgeon. Watching that develop into an actual common language and to see resident applicants come through and say that they want to be an acute care surgeon is quite rewarding. That is the terminology they are using and it's been very satisfying. It's not been on the scientific side, but it's been in the field development/career choice side.

The second most rewarding thing has been my collaboration with Ellen MacKenzie and Fred Rivara, two disparate people. Fred is a pediatrician in injury prevention and Ellen is an

epidemiologist. For whatever reason, the three of us have worked together so well and have done work on a whole variety of injury-related topics, including alcohol and its influence in trauma, the national study on costs and outcomes of trauma care, lower extremity fractures and return-to-work issues, and pediatric trauma, to name a few. They have made me so much more than I ever could have been myself. The collaboration has been very rewarding and satisfying simply fun. This leads back to the advice about finding colleagues in different disciplines who are interested in the same things.

The third one is something I've done fairly recently with Doug Zatzick, a psychiatrist with an special interest in PTSD and alcohol and drugs and its important role in trauma centers. Our goal is to get trauma centers to incorporate mandatory drug and alcohol screening and interventions as part of the trauma center designation. I really think that has added a whole other dimension to trauma care. It's really added to the field, not just caring for the injured individual but caring for the entire population. It is why we are here in the first place. We know that many of these people have a lot of psycho-social problems, which is how they get to us in the first place. So those are the three I would point to.

LIVINGSTON

Anything you've championed and then go, "Oh, why did we do that?" or "That wasn't such a good idea"?

JURKOVICH

What have I changed my mind on how I used to do something? That's fascinating. Well, I don't know that I've changed my mind, but I've been disappointed at the disappearance of DPL and the disappearance of a physical examination and the reliance on technological imaging before we do anything. I've been very slow to embrace that change.

LIVINGSTON

ABC is now "Admit, begin CT scan."

JURKOVICH

Exactly. So that's one. I've been slow to give up some of the old techniques, and DPL would be one of them. I still don't believe in FAST. I'm probably wrong about it but I'm just having a hard time figuring out why the heck we're doing it so much.

Let's see, what else have I thought was a really good idea and it turned out to be not such a good idea? There was actually a time when I really bought into the anti-ICAM, white-cell blocking adhesion-molecule blocking technology as the key to cure sepsis. I really did think that we could shut down the whole inflammatory response by blocking white cells sticking to things, and subsequently actively pursued this research line. I was really sold on that concept and it failed miserably. As a result of that I've become rather cynical about any new product.

Whatever the latest greatest thing. Whether it is Factor VIIA or tranexamic acid or 1:1

blood resuscitation or hemostatic packs or whatever is out there that is going to help everything, I am skeptical about the latest greatest new fad. I think as a result that I am probably slow in accepting new things. I never bought into Xigris because it came shortly after it. Some more advice I received—back to the advice part—was this concept of being an early versus a late adopter. The advice I received from a surgeon was never be the first to jump on the bandwagon and never be the last to try to get on the train that's long left the station. Maybe I've been erring toward the trains leaving the station.

LIVINGSTON

Well, you shot FAST down. So, during your career, what do you think the two or three biggest advances in trauma and acute care surgery have been?

JURKOVICH

Well, I do think that the cross-sectional imaging which has allowed us to adopt successfully non-operative management has been the single biggest advance from a clinical care standpoint.

I think injury prevention being incorporated into trauma care and adopting strategies to decrease injury, whether it is safer automobiles or decreasing violence. Violence has really dramatically dropped off in this country in 20–30 years. I don't know that that's our doing necessarily, but it's a societal doing that been quite dramatic for us.

I think the next thing that we're seeing right now is the entire spectrum of endovascular techniques. I think we may not be adopting them very rapidly because they are so technical, but I think that's a huge advancement and will change in medicine. Ruptured aortas have been first, but it will extend to anything else where we're going to be slipping in an intravascular balloon and occluding other blood vessels. I don't think we are far from the day when the whole concept of a resuscitative thoracotomy to cross-clamp the aorta will be replaced with an occluding intra-aortic balloon—forget the fact that it doesn't work almost ever anyway. You also can't ignore the entire explosion of laparoscopic capabilities at first used to treat elective conditions but now it has totally changed how we would deal with an acute gallbladder with perforated diverticulitis or even perforated duodenal ulcer. The necessity and use of endoscopic skills and possibly endovascular skills is an essential component of acute care surgery.

LIVINGSTON

What are the major practice pattern changes? Obviously, and I'll say it for you, a big one would be the move to acute care surgery.

JURKOVICH

Yes, that's been tremendous. For trauma surgeons to take the concept of doing the emergency general surgery, for us to be the experts, and to develop that into a really practice specialty paradigm is huge. And it has been a natural extension of our surgical heritage to become sur-

gical intensivists as well. Not just for us as surgeons in making a career attractive alternative, but also for hospitals and health care delivery in providing coverage. It has really worked.

LIVINGSTON

What parts of the job are the most rewarding parts for you?

JURKOVICH

The patients and their families. I think on a one-on-one basis it's having someone say "thank you." That would be number one. What I mean by that is not the getting an actual "thank you," but from the sense that you actually made a difference and helped somebody. To me, being allowed into people's lives at their most challenging, difficult times, remains an honor and something very special—a sacred privilege of being a professional in the field that we do. Those are very satisfying. You know the operating room still is a fun, creative, enjoyable, satisfying environment when it all goes well.

Another part which is still satisfying is showing a trick or a technique or just explaining something to a naïve resident or student and forgetting that they've never heard that before and never seen that before and that they look at it in wonder is always—still amazes me. Because you can get pretty repetitive and used to it and thinking that you've done this all before. Finding an interested student who shares your enthusiasm and you can see your past self in their enthusiasm is still quite rewarding. But the beauty is that you can do it again with the next resident. When you do it so many times, you sort of forget that it is still amazing to them. Then once it sinks in it's still amazing, that's quite rewarding.

LIVINGSTON

What is the most difficult or challenging part of the job?

JURKOVICH

Well, call is becoming harder. Just hard to stay up at night. I just get worn out. I think the most challenging part of the job is when someone dies. There are a lot of people that come in dead, but there are not many people that actually end up dying on the service.

I mean those that come in and after you provided care, whether it is just the emergency room or just an operating room or weeks in the ICU, and they end up dying. The first thought of which we surgeons should be rightfully proud of is asking, "Could you have done better?" It's problematic both externally and internally. There is the internal one which is, "Am I losing it? Am I slipping? Should I have done more?" There is that.

But there is also the external challenge, the institutional or environmental challenge. The frustration is not with the people we work with as a rule, but the environment or setting. Like most or perhaps every surgeon, I am a perfectionist. The environment that we're all working in and the way we're doing things could and should be better, but it is just not going to happen without an incredible amount of work and it still might not happen. That's very frustrating.

It is the issue that you know what you want things to be like, but you can't move the entire institution and practice and culture of your environment in that direction no matter how hard you try. Or they're not moving fast enough for you. Or you're running out of energy to move them. Or the struggle not to give up on trying to change stuff is very hard, very frustrating.

LIVINGSTON

You're supposed to be the captain of the ship and the ship is not moving where you want it to move?

JURKOVICH

Yes. Well, that's the other part. I think accepting that there may not be a captain of the ship is hard. I find that hard because it is not totally true and there is more than a bit of a mixed message. Organized medicine doesn't really want a captain of the ship unless the shit really hits the fan—then they want somebody to blame.

LIVINGSTON

What is the advice you give to your trainees, your medical students? What's your life advice to them?

JURKOVICH

Pick something you love and go for it. Follow your gut. Read Malcolm Gladwell's book, *Blink*, and follow your initial instincts. They're usually right. Do something you love. There is that great adage that if you find a job or a career doing something you love to do you never feel like you're working a day. I've felt that way my entire life. It's really true.

LIVINGSTON

Anything specific on being an academic surgeon?

JURKOVICH

Yes, pick a topic and focus. Oh, and don't give your boss an option where he is forced to choose, you might not like the decision. I'll stick with those two. They are pretty good. Don't be afraid to change your mind. I would really say go down a pathway and if you really, really get to the point you don't think it is right for you, change. Within academics it doesn't matter what you pick. Honestly, it doesn't matter whether you pick—it could be as weird as say, "I'm going to study the role of copper in the water and wound healing in the population of Ethiopian immigrants into the high plains mesa of the desert Southwest." It doesn't matter what you pick. Just pick something and really focus on it.

Be nice to others. Assume that they're trying to do their best and that they want the same things that you want and give them a chance to prove you wrong about that. Remember that surgery is a profession and, as such, it is a privilege to be let into peoples' lives the way

we are, and do not abuse that privilege.

LIVINGSTON

There are huge opportunities in acute care surgery and it wouldn't have gotten anywhere near where it is today without a lot of your pushing and effort. Where do you still think the challenges are? The opportunities are pretty obvious in some respects.

JURKOVICH

Yes, great question. The challenges are convincing the all-purpose general surgeons that acute care surgery is not a threat to their existence, that it's more their ally than a competitor. I think that's point number one.

Point number two would be to not accept the role of a surgical hospitalist as the same as a career in acute care surgery. Acute care surgery combines in our practice trauma, emergency general surgery, and surgical critical care. It is not doing the things that others don't want to do at night. They need to be kept distinctly different. The third thing would be the challenge of an acute care surgery service in a major university hospital. I think that's a huge challenge because fundamentally I don't think university hospitals are naturally inclined to be good Level I trauma centers.

LIVINGSTON

So the trauma centers should be separate from the university hospitals?

JURKOVICH

Yes. This idea needs a more examination and contemplation on my part, as I have only recently begun to think my way through the concept of acute care surgery in a tertiary referral university hospital.

Acute care surgery has really shown its worth and mettle in the urban safety-net hospitals where, in fact, that is the practice paradigm of what they've always been doing. They've been doing emergency general surgery call, trauma call, running the surgical ICUs. They just now have a better name for it and a better definition of what their practice is like, and it has had wide appeal for other hospitals.

Bits and pieces of that have been nibbled off in other hospitals where the ICU is all run by pulmonologists or they don't have an ICU and yet the general surgeons are no longer broad general surgeons. They don't want to take hospital call because they're too busy doing their specialized elective practice.

These hospitals are trying to hire surgeons who don't have an elective practice to provide their in-house emergency surgical coverage—I have heard them called “nocturnalists, or “on-call-ogists”. That's not acute care surgery. That is a surgical hospitalist program which I think in the long run is not good for surgery and certainly not good for acute care surgery because, once again, it puts the acute care surgeon into the box of being the surgeon who does what nobody else wants to do. That's our biggest challenge. Our biggest challenge is to not

have acute care surgery be a definition for a practice pattern or caring for patients that nobody else wants to take care of. That's what it can't become.

The challenge is most dramatic in community hospitals where the general surgeons no longer want to take call and in university hospitals where all the specialists think that being on-call is too disruptive and beneath them, yet they expect the bigger cases that come at night to be referred to them the next day. This is certainly not an issue in the rural acute care hospital where there are only one or two or three general surgeons to take all the call that exists in the hospital, always have and always will. They're our heroes.

LIVINGSTON

They *are* acute care surgeons.

JURKOVICH

Agree. The other extremes are the urban/suburban hospital where the general surgeons aren't taking call because they don't want to because they've got a busy enough practice. So the ones that are taking call are the providers that everybody considers newcomers or those without a practice, and by nature this is a disparaging assessment. Lastly, in the university hospital are all of the people who once were general surgeons are now super-subspecialists. They don't want to do it, figure they don't have to, but yet they still want whatever cases are in their domain to be transferred to them in the morning. That's a disaster.

LIVINGSTON

What are the next great things in the next decade? How are we going to cure trauma, acute care surgery?

JURKOVICH

Well, I think we will adopt some level of endovascular technology into acute care surgery, just like we've adopted some level of endoscopic surgery, minimally-invasive surgery into our acute care surgery practice. I think there will be more advances in cross-sectional imaging. Whether the machines will get faster or use less or no radiation or be able to generate 3-D constructions more rapidly so you can put up a hologram of a person. I envision that, not so far off, the time will come where you will be able to put someone through a whole body scanner without concerns for radiation, the time it takes to acquire the images or not having to send them to CT "death row" far from the trauma bay.

I would also hope that we will make some inroad on neurotrauma. We certainly haven't. I don't know what it will take but we have to do a better job of managing the brain injured than we have been.

Elderly trauma care is another area where I know changes in care are bound to happen, yet I cannot foresee what they will be. Perhaps we will have geriatric trauma services that are focused on older patients that will incorporate internists or geriatricians into the trauma team. I think the concept of geriatric trauma care will be a next-decade push.

LIVINGSTON

Anything you would change in your professional career?

JURKOVICH

Let's see, I would have taken time off between college and medical school to tend bar in Jackson Hole. I would have done that. I would have taken a sabbatical and gotten my MPH. Either my MPH or an MBA, but I think given my interests and collaborations it would have been an MPH. I would have done that first and now I should take a sabbatical and get my MBA. I think the concept of doing something for a solid block of time and then coming back energized in a new direction is valid. The whole concept of the original sabbatical which you took time off and you reestablished expertise in a different line and then went after it is great. Basic scientists take time off and learn new techniques that they want to use in the lab. As surgeons, I don't think we've constructed our lives where we are afforded that opportunity. Whether it is to take time off and become a really expert endoscopic surgeon, get a degree in public health or epidemiology, or learn more business skills. Not embracing the concept of a sabbatical—I have often thought was a shortcoming of our profession so that we could reinvigorate and reinvest and reenergize ourselves and take a different pathway. I think if I could have done that once in the middle, it would have been good.

LIVINGSTON

Any other words of wisdom on the 75th anniversary of the AAST? Any other parting shots?

JURKOVICH

Yes, I have to say that I love my friends in the AAST. I love going to the meetings. I love looking forward to seeing them. They are more than professional colleagues and they are more than professional friends. They are real friends. They are real lifelong, emotionally bonding friendships that came out of this career. And I am forever in debt to that and find that extraordinarily valuable.



ANDREW B. PEITZMAN, MD
PRESIDENT 2009–2010

DR. FREDERICK A. LUCHETTE

How and when did you decide to choose a career in surgery? And a follow up question would then be your decision to specialize in trauma surgery?

DR. ANDREW B. PEITZMAN

Obviously, a couple of different questions there. So I was one of those students who, for better or worse, loved almost every rotation I was on in medical school and was going to go into that field.

But even back then, whatever field it was, it was always the complex patients. It was high-risk pregnancy with neonatology so, you know, whatever my gene makeup is, from the get-go it was pretty clear I wanted to take care of sick people.

But surgery was really, largely a role model and it's just funny how these things happen. And I liked medicine a lot. That was my first clinical rotation. I loved the medicine service and the residents were great but the attending was just so condescending it just really impacted me. However, on the surgical service, the fellow who was—that was back when we had a super chief service—was just a humble, incredibly talented, good guy. And he left a big impact and is still practicing as a community surgeon. He actually is one of my community surgeons so it's sort of ironic that it worked out that way. But I tell him over and over he is one of the main reasons I went into surgery.

Trauma was a little bit more subtle. I liked a lot of other specialties when I was a sur-

gical resident. I liked cardiac a lot. But you know, trauma wasn't really a field back then. You know you've got to remember we're going back to the early '70s when it was really nascent and there weren't separate services. I mean we were general surgeons and we did everything.

And there was one case that really just sort of piqued my interest. I was an intern and the medics brought in a twenty-some-year-old girl who had jumped 100 feet off a bridge. And back in those days, there weren't trauma centers in the state of Pennsylvania. There weren't trauma services in the hospital. After patients arrived to the hospital, we resuscitated them literally in the radiology room which, as most radiology rooms are now, was dingy and dark. There was no equipment there. So it was me and a third-year resident trying to take care of this poor girl with essentially no equipment. And it just struck me that there had to be a better way to do what we were doing.

I think what ultimately made me decide on trauma as a field in surgery is the diversity. You never know what you are going to get into when you come in every day. But, at the same time, it's not a patient with a terminal disease. You can take a 19-year-old kid who is absolutely dying in front of your eyes and have them walk out of the hospital and lead a normal life. That degree of gratification is pretty hard to come by in other areas, so I think that's a long answer to your question.

LUCHETTE

So you decided very early in your general surgery residency to commit your career to trauma surgery?

PEITZMAN

I did. And it's interesting how these things happen. So we did our research after our third clinical year of residency. And people were dabbling in research at Pitt and really one of the guys was sort of studying hemorrhagic shock. Unbeknownst to me, our chairman knew of my interest and actually picked up the phone and called Tom Shires in New York. I didn't know any of this until Tom Shires and I spoke actually about six months before he died and he told me the story that Dr. Bahnson had called him and said, "We have this guy you need to take in your laboratory." And he arranged that opportunity for me to go and spend a couple of years doing shock research with Tom Shires. But I did decide pretty early-on, and was given opportunities from the people around me to do the things I wanted to do.

LUCHETTE

So it's fair to say that Bahnson and Shires were probably two pivotal mentors for you?

PEITZMAN

Absolutely. It's just interesting how these things happen. So Bahnson was one of the people who really brought cardiac surgery and vascular surgery to where it is today. He was that whole generation of brand-new heart surgeons.

And, in fact, when he was a third-year resident at John Hopkins, Blalock was teaching

everybody how to do the BT shunts and Bahnson was a third-year resident who traveled with him and actually did the operations.

I mean, he was always technically just extraordinary so that was his expectation as the chairman—that you were a surgeon who could do everything. And he demanded clinical, surgical and operative excellence. It was pretty clear what Dr. Bahnson expected of you. Whether you were a resident or a junior faculty member, you were expected to be an outstanding operative surgeon.

So that was his model, and then obviously the time I spent with Dr. Shires learning how to do research. And then the other two people that really had a huge impact on my career were Mark Ravitch and Dick Simmons. As you know, the Ravitch Chair is a endowed professorship that I hold, so it's kind of cool that I worked with him when I was a resident. He did everything in surgery and had 1,400 publications. There was nothing you could do or read about that he hadn't written a paper on. Whether you're talking about imperforate anus in a kid or cardiac tamponade, he had written about it. So he was the third mentor. And the fourth person was Dick Simmons because he really brought a completely different academic model to the University of Pittsburgh.

On faculty here, my jacket said that I'm a general surgeon; it doesn't say that I am a trauma surgeon. I have always viewed myself as a general surgeon who has a passion and academic interest in trauma, but I am a general surgeon and have always been a general surgeon. And that was Bahnson's model, so we did everything. I did elective vascular for my first five years in practice. I did all of that because that was the model at the time.

And when Dick Simmons arrived, he asked, "Why is the vascular surgeon doing hernias and gallbladders?" So he really made everybody take a much more deliberate academic focus which was obviously the right way to do it. So he really changed the whole paradigm here and it was obviously for the better. But those are the four people that really influenced me the most, who were and are my mentors.

LUCHETTE

Do you still have a relationship with Dr. Simmons?

PEITZMAN

Yes, absolutely. He is still here and is very active. You know, I am the vice chairman of the department. He is the patient safety director for the hospital so we have a scheduled meeting once a month and talk business for five minutes and then life for an hour after that. So he is a dear friend and still has a huge influence. He is one of those people who is scary smart and has tremendous insight into things. He is still somebody I talk to every day.

LUCHETTE

You know, a couple of minutes ago, you mentioned a pivotal point for your decision to go into general surgery was a community surgeon that is now working with you.

PEITZMAN

Yes, so he trained at Pitt. You know, we had the old Hopkins model where one of the chief residents was chosen to be a super chief. And he was a super chief at Pitt when I was a third-year medical student. And so he, when he finished training at Pitt—his dad had been chief of surgery at one of the community hospitals—that's where he went. And now he is chief of surgery at that community hospital as well. But he trained at Pitt.

LUCHETTE

Do you think he would mind if you shared his name with the readership?

PEITZMAN

No, not at all. It's Dick Bondi. Every time I tell him he is the reason I went into surgery he sort of pooh-poohs it, but it's a true statement.

LUCHETTE

But you decided to go off into trauma surgery. How did Bahnson, Shires, and Simmons view that?

PEITZMAN

Well, it's funny. When I began, I literally had written down ten things I wanted to accomplish in my first five years. And number one on the list was to develop a Level I trauma center. That was number one on my list. This was in 1983–84 when I finished my residency. And Bahnson's job description for new faculty was a brief discussion. In the OR lounge he asked me, "What are you doing next year?" "I'm looking for work." He said, "Do you want to start a trauma center?" I said, "Sure." And that was my job offer. It was literally no more than that. But that was really how it worked. He just hired the people that he wanted. And I've been blessed to have people who let their faculty do what they need to do. You know, nobody has been a micromanager. But when you need them, they are there, so I have been really lucky.

And with my current chair, Tim Billiar, it's the same thing. You know, he just lets his guys and girls do their thing and doesn't micromanage what we do. And part of the reason, one of the major reasons I've been at Pitt so long, is I have been able to do whatever I want and gotten the resources I needed and it's just a really unique environment for faculty to grow and develop.

When I joined the department, there were 12 or 15 faculty members. It was a pretty small department. There are now over 200 faculty members so the change has been just incredible. What Dr. Bahnson had was a very strong clinical program and what Dr. Simmons did was make it the research juggernaut that it is right now. Dr. Starzl was also critical to what happened here because he came three years before we were trying to start the trauma center. And the resources that he needed to do transplant were basically the same resources we needed to have a trauma program: OR availability, ICU beds, and blood banking.

I give this talk about our trauma center and I have a picture of a minesweeper— and Dr.

Starzl was our minesweeper. He kicked down so many doors that would have been a fight for me, but he had already done the hard work and opened them for me. So that made our lives much, much easier. And, obviously the expertise that the transplant surgeons bring with liver surgery and just having them around to learn from was a great asset. But he was indirectly and unintentionally a huge help to the trauma program.

LUCHETTE

What is your next accomplishment at this time in your career with your trauma program?

PEITZMAN

So, the answer is easy but implementing it is hard. The University of Pittsburgh Medical Center is sort of a freakish system because we have 23 hospitals in our system and basically cover the entire western third of Pennsylvania. There are two Level I trauma centers in our system, a pediatric Level I trauma center, a Level II trauma center 200 miles away, plus we have close working relationships with some of the other state-designated trauma centers. So we have the opportunity to build a trauma system that covers a huge area. And, you know, we're in the process of doing that. We have conference calls with hashing out protocols and making sure everybody has the same protocols. We admit 12,000 trauma patients a year amongst our trauma centers, so it's a huge opportunity to really do something special and have, truly, a regional system for a large area.

I think the other thing that is clearly in the future is acute care surgery. And I think you know what we have done for trauma, building trauma systems over the past 20 years and doing the research to really change how trauma is delivered, that's what we have to do for acute care surgery for the next 20 years. So there has been that little bit of a shift in practices where the ship is going to try to do for acute care surgery what we've done for trauma.

That being said, without changing how dedicated we are to trauma, we just need to add resources so we can duplicate that dedication with a separate service for acute surgery, a registry, PI program, and research. So that's the future of what we're trying to do here. All the things we are talking about are "bread and butter" surgery but it's—nobody has really made a science out of it—a specialty, so that's what we have the opportunity to do which is incredibly exciting. A brand-new area where you can do almost whatever you want with it. And, you know, that's where we are. We're right on the doorstep of doing that.

LUCHETTE

Is there one single scientific contribution that you are most proud of?

PEITZMAN

I've done okay for myself. I don't view myself as a highly prolific researcher. I think I've done all right. I think our program has done really well. And I think that's really the key and what Dr. Simmons taught us is that if you have 14 or 18 or 20 faculty in your group not everybody can be a triple-threat. It's just not an achievable goal. But that pie that comprises your section

of trauma/acute care surgery has to hit all the marks. One of your faculty needs to win the golden apple for teaching every couple of years. You need to have a great clinical program. And you need to do the research and get the NIH grants. So I think the long answer to your question has really been a programmatic approach to what we do and a team game. And I think that has been critical to our success.

I once had a faculty member come in—this is years ago—who was doing a great job, had been with us for about four months. And he sat down and just said, “I don’t belong here. I feel like a fish out of water.” I said, “Whoa. What are you talking about? You’re doing a great job.” And he said, “I will never get an NIH grant.” And I said, “Well, what do you like to do?” He said, “Teach and take care of patients.” And I said, “Well, that’s your job and you do it well.”

So it’s funny, if you don’t clearly tell people what their jobs are and make sure that you put square pegs in square holes and round pegs in round holes, then people will get frustrated. So, again, this is sort of a long answer, but I think it is critical to make sure you play to everybody’s talent and do it as a team game. And you have people that are going to get NIH grants and those that aren’t and just play to everybody’s strengths and then everybody is happy.

LUCHETTE

What brought you to focus on the management of splenic injuries and study it?

PEITZMAN

Well, so first of all when we began our trauma program 25 years ago—and I told you about our list of goals—there were two major goals. One was to build a great clinical trauma program. And the second was to do the research that would change how trauma care was delivered. Those were our two goals out of the box. And, obviously, grandiose goals, but that’s what we were trying to do.

So the multi-institutional trials group at EAST—and this is truly how it happened—Tim Fabian was the president and basically said, “Peitzman, you are chair of the MITC Committee, go do some research.” And I mean that’s how it went down. And so I don’t know how we specifically came to the spleen but that study and then Samir Fakhry’s studies on small bowel injury actually, came out of that simple command from Tim Fabian.

I just think it was a common injury and nobody knew the answer. I think—actually one of the things that sort of prompted it was just how all over-the-board the research was at that time. And the two confounding issues at the time were everybody was talking about non-operative management of spleens and livers as a single entity, which we now know the natural history is not the same. Most of the papers had kids and adults lumped into the same paper, and we obviously know now that kids behave differently and that skews how the spleen behaves.

So I think those two observations are probably what prompted me to go after the spleen because the hypothesis generation was pretty easy. You know, you take kids out of the equation and you just look at adults and you say, “Okay, what are the things that predict who needs an operation and who doesn’t?” And the other thing was the high-grade splenic injuries

are relatively uncommon. And then you have single institutional papers that say you can treat all splenic injuries non-operatively and they've got four Grade V's and another paper is six Grade V's. So there was a need to do that study based on the literature we had at the time.

And it's just funny. So the two recent studies that have looked at the National Trauma Data Bank, you know, showed that we're trying to treat 40% to 50% of Grade V injuries non-operatively and our failure rate is over 50%. So even now we haven't learned what is already out there, which is kind of interesting.

LUCHETTE

Tell me about maybe one or two things that you originally embraced and thought were great, but in retrospect you think were probably not the best things to champion.

PEITZMAN

You know I don't have an easy answer for you. Really there is nothing that came to mind, so I don't have a good answer, even though I've sort of thought about it last night and this morning.

LUCHETTE

What do you consider the two to three greatest advances in trauma care that have occurred during your career?

PEITZMAN

Well, this is an easy one to answer. I think the laparoscope and endovascular techniques have revolutionized everything we do in general surgery and in trauma care. So I think if we try to make that a more narrow question I would put damage control in that list as well. It has really revolutionized how we take care of sick patients. But it's hard to deny that the change toward minimally-invasive technology and surgeons skilled in these techniques have had the most profound impact in how things have changed.

LUCHETTE

What do you think is the single most important change in practice that occurred during your career?

PEITZMAN

Well, I think that would be the super-specialization of medicine. You know, we sort of intimidated that as we've talked. I have mentioned several times that, first and foremost, I consider myself to be a general surgeon and will always be a general surgeon. As I see the residents coming through and my junior faculty, what they have become comfortable doing has decreased just because of the specialization. It's a necessary change but I think that specialization has obviously impacted the entire face of surgery, not only in the U.S. but internationally. When we started practicing surgery, we did not have vascular surgeons. We did not have endocrine

surgeons. So I think the super-specialization has really been the thing that has changed most dramatically.

LUCHETTE

And how has that impacted practice patterns or the practice of surgery?

PEITZMAN

I think the most simple example is vascular trauma, where there is a huge range in the experience a general surgery resident experiences during their training. If they've been exposed to vascular trauma, the likelihood is that the high proportion was managed with endovascular techniques. And you have trauma surgeons and vascular surgeons who are performing either zero or five vascular injuries in their training, so you have vascular surgeons who don't know anything about trauma and know little about general surgery.

So with the vascular injuries, there is a new generation of trauma surgeons who are not comfortable with vascular surgery and then vascular surgeons who know little about management of traumatic injuries. So that's the one area that to me most glaringly demonstrates how the specialization of surgical care has impacted what we do.

LUCHETTE

As you look back over your career, what have you found to be the most rewarding part of your job, what brings you the most joy?

PEITZMAN

Well, there is no doubt my partners are like my second family. And I just think that is incredible when you come to work and basically are coming to be with your friends. I think there aren't many professions where that is true, and there are a lot of medical centers where that is not a true statement. So I think my junior partners and seeing them grow up and mature and become skilled surgeons has been incredibly gratifying. I think with everything that has happened in medicine, the two things I still like best are taking care of patients and teaching, so that has not changed even over the past 30 years.

LUCHETTE

What have you found to be the most challenging or difficult aspects of the practice of trauma care and acute care surgery?

PEITZMAN

Well, I'm going to give you a narrow answer just because it's the one thing that I haven't been able to figure out. So it's in a situation where you have a clinical scenario where you identify the problem and come up with a perfect Plan A and you implement Plan A, and it doesn't work and you need a Plan B right this second. It's amazingly difficult to teach people how to recognize promptly Plan A is not working and you need a Plan B and you need it right this

second. Whether you are talking about failed attempts at intubating somebody or whatever, it's the one specific issue that I think some people have the gene that they can do it and some people actually don't have the gene to do that, to change a plan on their feet instantly.

And so that's my narrow answer to the question but I think that's the one issue that keeps coming up over the years that I've been doing this. You had a great Plan A but, boy, it took a long time to figure out that's not where the bleeding site was and you had to go somewhere else.

LUCHETTE

You've seen just about everything that comes along clinically and professionally. Is there anything that keeps you up at night any more?

PEITZMAN

I think just what is on the horizon for all of us with the health care reforms and that nebulous "black box" and not knowing where we are going and what the future is going to be and what is going to control what we do. So I think that – yes, that keeps me up at night. And you know, I work at a great place and it's a great health care system, but I just think what we do and the good things we do, some of that may be at risk with what is going to happen over the next couple of years.

LUCHETTE

What would be some advice you give the young surgeons interested in a career in either trauma or acute care surgery?

PEITZMAN

I tell both my students and faculty to do what you're going to have a passion for the rest of your life. Pick a niche that's a little bit different than everybody else's. Again, I think that's part of our success, that we don't have people competing for the same ring and everybody has a little bit different academic focus.

Also, to obviously realize that their lives at home are more important, if not equally important, to what we do in the hospital every day. So maintaining that balance and being with your kids and, having outside interests—whether it's going to the gym every day or wood-working. You have to have balance and it's really the same thing as I've tried to teach my kids. You need to work hard but you need to play at least as hard. That would be my advice.

LUCHETTE

You've had a hugely successful career. I know you're a proud family man. And you're also a passionate Penguins fan. But how do you do that? I mean is it time management skills? Is it something gives in exchange for the other? How do you do that?

PEITZMAN

So, I'm not sure I'm the guy to talk about time management. I usually sleep five hours a night, which helps a little bit, that I don't need eight hours of sleep. There is no doubt early in my career that I spent more time away from home than I, in retrospect, probably would have or should have. I do think it's critical that we have within each of our hospitals, our sections, a critical mass so people can protect the families at home.

I do think that is vitally important. But you just have to keep your priorities straight and work hard and then realize you've got good people around you. I think the other thing that is important is you really need to undergo a metamorphosis about every ten years. If you just come to work and keep doing the same thing you've done every day for 30 years, you're going to stagnate.

I think as you add things to your plate, you do need to make decisions that there is something I need to give up—I just can't do everything that is on my plate now. And those are the hard things. When you talk about time management, we all come to work every day and there are ten things that are great things that we should do, but you can only do four. And you have to pick four.

Recognizing that is how life works and knowing that you're not going to get everything done every day, those are just the realities that you have to learn. You have to learn that you're not going to solve everything every day and it will be there tomorrow and you can come back tomorrow and that's okay.

LUCHETTE

What do you see in the future for trauma and acute care surgery during the next 10–20 years?

PEITZMAN

Well, as I mentioned earlier, I think it's wide open. There is obviously a need for us. There is a shortage nationally, so job security is not going to be an issue. I think we have to do the science for acute care surgery, for the emergency general surgery as we have for trauma. If I were a junior faculty member right now I'd be tremendously excited about this opportunity .

LUCHETTE

If you had to predict where trauma and acute care surgery would be in 20 years, what would be your prediction?

PEITZMAN

I think it will be a recognized specialty. I'm not sure if it's going to have board certification. We could debate about that a long time. But I do think we will be a real field and be the—as we have always been—the surgeons who take care of sick patients. You know this is what we have done forever. We have just put a label on it so it's not that we're doing anything differently.

LUCHETTE

Is there anything looking back after an illustrious career of 25–30 years now, anything you would change in your professional career?

PEITZMAN

No, I don't think I would. As I mentioned, I've been blessed to be at a place that has been kind to me, surrounded by great partners, and we have a blue-collar work ethic at Pitt. Nobody is impressed by themselves, nobody is pretentious, which makes it a fun place to work, and an institution that has resources to help us do what we want to do, and obviously a wife and kids who are tolerant of what we do and how we do it. But, no, I really wouldn't change anything. I've been pretty lucky that way.

LUCHETTE

What are your future plans? You said just a minute ago that you try to retool every seven to ten years, so what is next for Andrew Peitzman?

PEITZMAN

Again, the science of emergency surgery, of acute care surgery, number one. And, number two, really bringing the opportunity to have a regional trauma system for the entire third of the state to maturity. Those goals are pretty clearly set in my mind. Obviously, carrying them out is going to be hard, but what I hope to accomplish is pretty clear. I'm just doing what I'm doing. I think I am being more drawn to the system-wide growth and development and less at the "mother ship" now. That has been sort of a subtle shift. With the number of trauma centers that we are running, I need to shift in where I actually physically spend my time every day.

So from the get-go, when we added each of the trauma centers to our system, it was pretty clear that the CEO of the hospital system called me up and he said, "Go work with those guys and girls." And the advantage of being at Pitt so long is I knew everybody and had an established relationship, so it just made it a lot of fun. It's been incredibly gratifying actually bringing the other hospitals into our system and standardizing protocols and expectations.

And it's funny, when I visited one of the hospitals for the first time and was meeting with the CEO he said, "What is your title?" I sat there dumbfounded and I said, "I don't have one." And I never thought about it so my retort was, "You can say I'm the czar of trauma." And that's just how it works here. I mean it's just like my job offer was so many years ago. It's just here is the opportunity and go deal with it and that's just how we work. It's a very goal-oriented place.

LUCHETTE

Are there any other important points you'd like to comment on or any last parting words?

PEITZMAN

I would like to mention just the international part of the world because I've spent so much

time there and it's actually occupied a lot of my time and energy. I do think we have to not be provincial as we talk about trauma care and trauma systems. There are huge opportunities to help and learn globally. And one of those opportunities I just stumbled into, it wasn't planned.

I think my parting comments would be to remember that we are a global village and all the things that we are dealing with our friends around the world are with resources that aren't as great as ours. I think we have an obligation to learn from them and help teach them. So that actually would be something we haven't talked about that I do think is critical for all of us as we sort of look where we want to go and what we want to do.

I think what people need to remember is that there are five million deaths globally from trauma every year. The issues and needs are different in differing parts of the world but even bigger than that, or equally big, is just the need for "bread and butter" general surgery.

You know, 500,000 women die from pregnancy-related complications every year, and it's simple things like nobody is there to do a C-section, nobody is there to fix a torn rectal wall. So there are a lot of things that we can do to help. And it's trauma but it's really surgical diseases more globally. And even the World Health Organization has acknowledged that this is a problem and we need to do something about it.

So I think we need to be part of it. And it's not simply trauma. It is all of acute care surgery that we ought to be involved with.



L.D. BRITT, MD, MPH
PRESIDENT 2010–2011

DR. FREDERICK A. LUCHETTE

How it was that you decided to pursue a career in surgery, and, then what was the impetus for your interest in trauma surgery?

DR. L.D. BRITT

Well, I became interested in surgery as a high school football star. I got an injury and I went to my family medicine doctor. He said, you know, “I want my son to see you.” His son was Dr. O.W. Hoffer, one of the last residents of Charles Drew, and he was impressive. He was definitive. He certainly took care of my extremity injury. I knew then that I wanted to be a surgeon. I knew I was going to medical school and I knew then I wanted to be a surgeon.

As far as trauma, when I got into medical school, I thought I was going to do pancreatic transplantation. Then I realized that we would never be able to circumvent the need for immunosuppression for islet cell transplantation. If you’ve seen my CV, you’ve seen some of my earlier work was on neonatal islet cell formation. In fact, we did some of the leading work down at Wash U with Paul Lacy and David Scharpe. But I knew that we would not be able to circumvent that because no one who is diabetic is going to say, “Give me islet cells and also I will take immunosuppression the rest of my life.” No one is going to do that. However, if they have a kidney transplant, that’s different.

Then I became fascinated with trauma. I was fortunate to get in with what I felt was nation’s premier trauma program at Cook County Hospital. Cook County was the first trauma

center and that was a rich environment. I was totally hooked because it's benefit management. It's high stakes. It requires a high performance team so you have to work as a team. I never looked back.

LUCHETTE

Was that in the middle of your residency that you made that decision?

BRITT

Yes. I did two years of research and was very well published at Wash U, which had the premier islet cell/transplant program. Because of the likely need for immunosuppression, I had concerns about the future of islet cell transplantation. Then I fell in love with trauma, and the rest is history. There was not a better place than Chicago.

LUCHETTE

So who are some of your early mentors? And how did they influence you to do trauma and maybe try to sway you away from doing trauma?

BRITT

Well, they were the godfathers. You had Bob Baker who worked with Bob Freeark. At that time, Bob Freeark had already gone to Loyola. In addition, Sam Apparau who was a trauma/ICU guru. He is probably the most well, the most knowledgeable ICU person even today. And then I had obviously John Barrett who was the chief of trauma back then. The Chicago guys got me hooked on trauma. Then I had other mentors: Lloyd Nyhus who was the chairman of the department of surgery at the University of Chicago at Illinois [UIC].

Back at that time that was one of the largest programs in the country, the UIC/Cook County program, because it was combined. I kept finding mentors. I give Kimball Maull a lot of credit for developing the early part of my career, followed by Lew Flint. I have had mentors throughout, so I've been very blessed. Maybe you remember my presidential address. I really thanked a lot of folks, and I meant it. I mean some people couldn't even spell "L.D." And those folks supported me. They saw something in me and they gave me encouragement and confidence and the rest is history. I try to do the same thing.

LUCHETTE

How did your peers and your colleagues in during residency view your decision to go down the road of trauma versus something else?

BRITT

It's amazing. I think people liked trauma but they thought it was too demanding, as they looked down the road as far as a career choice. They never said it but I could tell that that special compilation was not something they wanted to deal with when they were 30, 40 and 50 and my age now of 60. They never said it but it was well understood. I picked up on that very

quickly. In all fairness, they didn't feel that it was as "prestigious" back then as being a cardiac surgeon.

It is amazing how the tables are turned. Right now, for a quarter and a cup of coffee you can probably get a cardiac fellowship. But they didn't think trauma was prestigious enough. So those are the things that for my colleagues. They didn't want to go through the hard work and know that this is it because trauma knows no holiday. It knows no weekend or nighttime.

You know vascular is certainly great to do. It's a great population of patients. But at the end of the day you have that patient that comes in and you have to obviously do a major, a definitive reconstruction of their circulation. Then it clots off and then you have to debride and then you have to get into an amputation, so I did not find that to be satisfying for me. Even today, I don't think I would find it satisfying. Today, ninety percent of vascular is catheterization. Well, hell, if I wanted to do catheterization management I would go into cardiology and interventional radiology. But I want to be a surgeon. I want to be able to open—you know the good thing about acute care surgery is it is time sensitive and sometimes we have to operate. Patients necessitating emergency surgery have diffuse peritonitis obviously or they're hemodynamically labile. Such a presentation is an absolute contraindication to minimally-invasive. So the open approach is going to always be there. So that's one thing. I didn't predict the future of vascular back then, but I was not that interested in recidivism, and those patients coming back and grafts clotting off and all that, having to do amputations. It was not fascinating to me.

LUCHETTE

When you look at your scientific contributions, which are you most proud of and how do you feel it influenced the field of trauma care?

BRITT

Well, first of all, shock. The whole emphasis of my research, particularly my basic science research, has been on shock, whether it's ischemia reperfusion. We had a definitive collective review in *Annals* a few years ago (*Ann Surg.* 2008 Jun;247(6):929-37). I felt that we had not made much progress in shock, particularly ischemia reperfusion. I still think we have made some progress but back then not much at all. I had a chance to look at how everything happened at the cellular level. Before I got interested in basic science, I felt most things could be handled clinically. Then I realized we're going to have to go to the ditch for a lot of these answers. As you know, most things happen at the endothelial level. Seeing a reperfusion injury, you're not going to have that if you don't have a problem with leukocytes, and we have a problem with leukocytes. Leukocytes become adherent to the endothelial cell, and then the next thing you know, you have this cascade of mediators and adverse cytokine occurring. So what we did in our lab, we were able to block such an adherence. There was only a partial response which suggested that just blocking at the CD-18 component endothelial level was not enough and, perhaps, that there were other mediators contributing to this cascade.

That's the problem: there are a lot of reasons for somebody to be in shock, whether it

is septic shock or ischemia reperfusion. There are a lot of reasons for people to get in trouble. Although you might block one pathway, there are other pathways you're going to have to deal with, too. Sometimes you can block things so much that there is a toll effect, there is an advantage sometimes with these pathways and then you end up, obviously, hurting the patient more.

I'm still fascinated. Look at my lab now. It's concentrating on the membrane vesicles, the little out pouches that inform intracellular messengers. Well, we're looking at that now. We feel that that might be the scud missile for septic shock. So we're trying to characterize it. I actually spent in our lab \$375,000 for an atomic force microscope just to look at it and try to define the carrot and see if we can find some sort of cognitive therapy, if indeed the membrane does function as the true scud missile of this true virulent component in septic shock. If I have to admit, I wish I had a good ending to say I'm on my way to Stockholm for a Nobel Prize, but I just think that we have to just keep chipping away at it. Ischemia reperfusion is still a major problem. I don't think we've made a major impact on septic shock for those who are in true septic shock. I think the mortality is still very high.

The only reason I am bringing it up is because you look at the recently implemented duty-hour limitations in graduate medical education. The major casualty has been research. The bragging rights for this country has been research. This is how we have advanced medicine. If you take that away, I'm not sure we are going to remain the leader in medicine. But that's a discussion for another time.

LUCHETTE

If you had one thing that you championed and campaigned for in your career that you wish you hadn't, what would it be?

BRITT

I got to tell you, Dr. Luchette, I drank the Shoemaker Kool-aid on supernormal oxygenation. I thought that if you could maximize oxygenation patients would have a better outcome. That was absolutely, categorically wrong, that our aggressive resuscitation, particularly with oxygenation, was not the right course. I think a lot of people went down that road.

Another mistake was not recognizing the importance of when not to close an abdomen. I was one who was saying that I'm not going to leave this table without closing the abdomen. I felt that I could close any abdomen. I think we all should be embarrassed that we were not aware of the deleterious effects of intraabdominal hypertension and abdominal compartment syndrome sooner.

LUCHETTE

What do you consider the greatest two to three advances in trauma care and science during your career?

BRITT

Well, during my career—now I'm not 90 years old, like Dr. DeBakey, I'm just 60—But in my career it has to be non-operative management, with the beneficiary being the patient. Right now that is a gold standard. I am not drinking the Kool-aid for non-operative management aggressively with gunshot wounds. But certainly for solid organ injury, that was a major advance for the patient.

And, also, resuscitation. I think we've gotten it right. Supporting a blood pressure of 40 and you're not resuscitating the patient, not giving them adequate fluids is not ideal. But I do think that we are at the point now of being a little more conservative. In my career, I think those were the two major things that had a positive impact on the patient. But as far as advancing our cause in helping patients, I think those were the two major things. Being aware of the need for, obviously, more than just blood, the coag products and platelets and all of that.

LUCHETTE

What do you feel are the major changes in practice patterns that occurred during your career?

BRITT

I'll give you the positive side of the issue and the negative side of the issue.

What was good I think was system development. You know, when we first started off, when trauma developed as a young specialty, we didn't have systems. Here we have the greatest country of all time. And even if you compare us to the Roman Empire—the United States—we're certainly the wealthiest and greatest country. Brent Eastman said it best in his Scudder Oration, we have areas still in this country where if you get injured, there is a good chance you're not going to get state-of-the-art management. So I have to say development of systems and regionalization would be the positive in my career. That helps the population base, more than just one patient. It helps a multitude of people.

On the downside, from the changes I see, surgeons feeling that they have to be hospital-employed. I don't think that's necessarily a good thing across the board, because some hospitals define quality differently. Some hospitals, once you sign that contract and then when you have to renegotiate, then they start ratcheting down your compensation and telling you how many patients you have to see and all that. I don't see that as good for patient care nor do I see that as good for American surgery. So I see this trend as the downside as far as the change in practice. What has been pivotal is the system development, regionalization, particularly with the acute care surgery of trauma.

LUCHETTE

I'm sure you have many things that at the end of the day you feel proud about that you have achieved in your career. But what brings you the most reward? What gives you the most joy?

BRITT

Well, you and I both have had good careers. I would still have to say patient management. I

still enjoy seeing patients. I see patients every Thursday all day. I operate on Wednesday. I like patient management and patient care. That's the most satisfying thing for me, followed by teaching. You know I've been influenced as far as education because my mother was a school teacher in the public school system, and that was a segregated public school system back then, for 53 years. I got the bug of being a teacher a long time ago. So I enjoy teaching and I enjoy patient care. Those are the two things. If you take those two things from me, I would be a miserable person as far as the profession.

LUCHETTE

What do you find are the most challenging and difficult things in your career? What keeps you up at night?

BRITT

I can tell you what I found difficult. I'm not blaming anyone, but I think we let a lot of our specialty go. We weren't as bad as cardiac surgery. I think cardiac surgeons opened up the garage and said take everything. They gave away everything. But I think we are giving away critical care. I think we made a mistake in having silos in our specialty. Remember, our specialty was acute care surgery before. Our specialty took care of critical care, trauma, and emergency general surgery, but for some reason they became separate silos. Somebody decided that we should have a dichotomy, we should have critical care separate—that was a mistake in our specialty, in my opinion. If I could press the rewind button and change the course of our discipline I would have made sure those silos would never have been established because they were all under our umbrella.

The first ICU was a surgical ICU. And our greatest shortage now is in critical care. There are a lot of founding fathers and mothers of acute care surgery, but when I came up with the brand and name "acute care surgery," I wanted that name because it clearly incorporates critical care. People say, well, you can go to Europe, or Asia and the surgeons are not doing critical care. That's a mistake because I think the next generation operating room is going to be an ICU room. If patients are going to be in the ICU setting and people walk away from critical care, I think it is going to hurt us.

But I think the acute care surgery model will address that. I think it's fixable but I think we will never be able to command it. Maybe we shouldn't, but we were the founders of critical care. I've seen a sick surgical patient, cared for by a person who was a very advanced pulmonologist caring for a critically ill surgical patient and he was lost. He really didn't know the nuances of how to take care of a sick surgical patient. We need to still have surgeons at the critical care table. What I'm the most concerned about and it keeps me up at night, is that we might lose critical care. We've been so charitable, American surgery, in fact they should call us the Salvation Army. We gave away GI. We didn't embrace emergency medicine. They knocked on our door and they wanted to be with the American College of Surgeons and we weren't interested so they established the American College of Emergency Physicians.

But let me just say this now: we can ill afford to give away critical care. We need to

have a presence in critical care.

LUCHETTE

So my next question is about what advice would you give to young surgeons interested in an academic trauma/acute care surgery career, if you were to be their life coach.

BRITT

They need to do two things. I call it S&D. They need to make the sacrifices and they need to be disciplined. You've got bright students. Some of them are brighter than any of us. But for some reason they don't want to make the sacrifices. Now, don't get me wrong. I know everyone likes to be home at five o'clock. Everyone likes to look at the NBC news and all of that. But you've got to make sacrifices. You cannot do everything, get the top dollar, go to all the shows, have vacation and all that and still be a great surgeon or a great acute care surgeon. So I've told the young people, enjoy your family. But you still have to make sacrifices. You have to be disciplined because there are so many distractions along the way. There are so many other inviting avenues you can take, and then you find out that while you enjoyed it, it is not amounting to anything. So being disciplined and making the sacrifices, if I had to give them some advice, that's what I would tell them.

LUCHETTE

What do you perceive are the greatest challenges and opportunities—two questions there, challenges and opportunities—for the future of trauma and acute care surgery?

BRITT

Well, I think acute care surgery will do what I said we needed to not do in the past. In other words, it will keep us from having silos. In acute care surgery, you have the critical care component, you have the trauma component, and you have the emergency general surgery component. That is an advantage.

The major challenge is that there is a tendency for us to embrace silos. I don't know of any silo strategy that works in anything. I don't think it works in the military. I don't think it works in business. You have to have a collaborative sort of network, team-type approach if you're going to be successful. But for some reason, we have a tendency to have specialty interests that are embraced as mutually exclusive. You can have your specialty interests but you have to also be able to have some sort of cohesive network. I think acute care surgery does that. So I think acute care surgery as a model addresses a major challenge to our discipline.

LUCHETTE

What you feel are the major set backs that have happened in the past 10 to 20 years for surgical critical care as you look back?

BRITT

I think the worst things that have happened is that we have fallen behind in the workforce. I mean we have a major shortage now, as you know, just in surgery. I think the worst thing that has happened to us are similar to most of the acute care surgery problems. If you look at the cornerstone of management, it is not being done by, you know, the Luchettes and the Britts, it's being done by general surgeons that are not necessarily trauma-trained.

Most of the general surgeons completing training want to subspecialize or have a niche and not many of them are embracing, obviously, the full spectrum of general surgery which includes the acute care surgery component. To me, that is a major problem. We have a shortage in the workforce that will take care of patients who are critically ill and injured.

So at the end of the day, we have a shortage of personnel. I'm talking about the high performance personnel which are us, who are taking care of the critically ill and acutely injured patients. And for some reason, we have to build up that pipeline again. We're not going to build it with acute care surgery. Remember right now we have, approximately 15 ACS fellowships. We will probably have 40 fellowships, which I will be proud of. That's how many surgical oncology fellowships they have. They don't have but 40 fellowships in pediatric surgery.

But that's not going to be enough to provide the workforce needed throughout the country. I know most acute care surgeons are going to be in tertiary centers. What is going to help is that we end up trying to reshape or to unveil the general surgeons that we used to have years ago. So what I am trying to do now is make general surgery a more attractive specialty.

LUCHETTE

What do you think trauma and acute care surgery and critical care are going to look like in 20 years, L.D.?

BRITT

I am going to say acute care surgery because that includes all of that. I think it is going to look like a general surgeon, a little bit more, a more advanced general surgeon, as was the case 50, 60, 70 years ago. It is going to be a person who can do the full spectrum of general surgery and the full spectrum of trauma. So I am encouraged that this is going to be our high performance profession. And that, to me, it is going to be the next generation general surgeon. But I'm not calling a general surgeon somebody who does breast. Nothing against them. And I'm not calling general surgery someone who only does endocrine. The next generation general surgeon is going to be an acute care surgeon. So that's how I would summarize that and answer that question.

LUCHETTE

What things, if any, would you change related to your professional career as you look back?

BRITT

I probably would have had a family sooner. My daughter is eight years old. I sometimes have to take Advil just to keep up with her. So I probably would have had a family sooner. It's tough running and all that when you're 60 and you've got joint aches and all of that. So if I had to do it again, I would have probably started a family sooner.

LUCHETTE

How about your professional career? Would you do anything different?

BRITT

I think I would prepare myself better. And, again, when people say, "I would do the same," I think they need to be a little more critical. I think we can all prepare ourselves better. Remember, there is so much knowledge, there are so many things that you have to know. As they said last century, they said knowledge doubles every decade. In the twenty-first century, they say it will triple every decade. You obviously have to have IT to help you, but you have to be able to prepare yourself. I would have prepared myself better than I did if I had to do it over again, professionally. Personally, I would have started a family sooner.

LUCHETTE

What are your plans for the future, both clinically, academically and personally?

BRITT

I would like to just continue to mentor people, mentor colleagues, and mentor residents. I enjoy that because that's the teacher in me. So mentoring is what I see myself doing. I don't see myself walking away from the specialty. I probably will slow up a little bit but I still want to play a role as far as teaching and mentoring and guiding.

On the social side, I'm spending more time helping my daughter develop along with my wife. My wife and I are enjoying each other more and just helping Avery Marie. I don't care whether she goes into surgery or not. But I just want her to be the best and happy in what she is doing. My daughter, I think, has inherited my wife's genius because on her side her baby sister was a top PhD student at Berkley in chemistry and her big sister got a PhD from the Kennedy School at Harvard. All her sisters and mother are PhDs. Her father was a principal. So I'm hoping that my daughter has all those genes and didn't get any of mine.

LUCHETTE

Is there anything that we haven't covered that you would like comment on for the readership of the 75th anniversary of the AAST?

BRITT

Well, I want the readership to know that we have a vibrant organization. The administration, under the direction of Ms. Sharon Gautschy, has been superb. In addition, we have good lead-

ership. And I look at you. I think we have good future! I think the organization is moving in the right direction. I just hope that we don't get to the point where we give away things. We have a discipline and we need to be good stewards of this discipline.



J. WAYNE MEREDITH, MD
PRESIDENT 2011–2012

DR. FREDERICK A. LUCHETTE

So Wayne, my first question deals with how it was that you decided to pursue a career in surgery and what it was that made you pursue trauma surgery?

DR. J. WAYNE MEREDITH

In college, I majored in physics and I was interested in electrical engineering. That's what I was going to do. I wanted to devise medical instrumentation. So I was going to get an electrical engineering degree and an MD degree and design stuff. And so I decided that the smartest way to do that was, the most training you could get, the better off you are. So if I got a medical degree, I would know what was needed and I would understand the language and I would be able to do all the stuff, so I was going to get an EE degree and then a medical degree.

And my folks, my dad, said, "How about getting your medical degree first? Then you can moonlight and come off the payroll"—his payroll—while I went to engineering school, right? Because he had three boys that are all coming through and likely to stay in school. I did that and I discovered that, unbeknownst to me or him, I had been raised to be a doctor my whole life. Then I started doing medicine. So once I got into medical school and started doing all the rotations, it was totally obvious I'd been raised to be a surgeon my whole life. I mean there was, it was just totally obvious.

My instincts were good. I never had to think about stuff, figure things out. It was just, I was just taught to think like a surgeon from the time I was a little kid. He worked all the time,

but when we had time, we spent time together. And we spent time doing things, you know, fixing cars or working around the house. And he is a very, very great diagnostician. He is a very great problem solver.

He is very analytical. And he taught all three of his sons to solve problems in a way that turns out to be the type of decision making, the type of problem solving that is associated with master clinicians and surgeons. He said, “Well, okay, it’s pretty simple, boys. You’ve got to figure out is it getting fuel? Is it getting electricity? You’ve got to figure out is it timed? Is the timing on the cylinder off? Here is how you do some of those checks now go figure it out.”

LUCHETTE

Sounds like your Dad had a very practical and basic approach to problem solving.

MEREDITH

Yes. And that’s just how he grew up and that’s how he thought and that’s how he taught us all to think.

LUCHETTE

What was the motivation to go from just general surgery to trauma surgery?

MEREDITH

I loved the excitement of trauma and I loved the intensity. So I liked the heart surgery also because it had a lot of intensity. And I liked topics of research in trauma. I liked shock resuscitation research. And I liked patients sick enough to die—critical care—from very early. We had two great critical care professors here that were inspirational to a whole bunch of young people, myself included as a third- and fourth-year medical student. So I knew I wanted to take care of sick patients, not mostly well patients.

So I had a lot of trouble deciding. I liked CT surgery. I was really good at it, and I really liked doing it. But it wasn’t what I wanted to study. I was interested in studying extravascular lung water [EVLW] when I was in the lab. I was studying the effects of inhalation injury treated with a colloid solution versus a crystalloid solution, back in that era, right? Colloid versus crystalloid was a big deal. So I was studying that and the guys that were doing the best at that were Frank Lewis and this guy named Tranbaugh at UCSF. So I wanted to go, I was thinking I would study that, I would do heart surgery and study EVLW.

And so I had set up a time to go work with them during—I can’t remember if it was during my third and fourth year or fourth and fifth year of residency—go spend a year in their lab. In addition, I had already spent a year at a lab here doing stuff, but to learn those techniques on that and to learn from the masters. I had that pretty much arranged, and then things changed here at home so that one of our residents ahead of me was not going to be able to be a chief that year. He had to wait a year, and that made it a gap and I had to fill that gap, so I couldn’t go. And so my year away fell through and I just finished my residency. Then things lined up to where I could finish that and I could finish my CT residency, so I did that.

In the meantime, I kept hungering for it and so I was set to go back out there but Trunkey had moved. So I had to decide do I want to go with Trunkey to study trauma at a new place or do I want to go to UCSF and do a trauma fellowship there. And I decided to go with Trunkey. And that was big. That made all the difference. He brainwashed me or inspired me or enlightened me or all of the above, and I wanted to do trauma. Some of it had to do with trauma systems, which I had not really appreciated. Some of it had to do with developing a system of care and developing a trauma service and all those pieces which did not exist where I had trained, really.

And they needed it, I came back after working with Trunkey to start that here. And all that just, I could see it and I loved it. And he sent me all over the state of Oregon working on the Oregon Trauma System, which was being developed then. I'd call him all the time, "Okay, here is what they said. What should I say?" He'd say, "Well, here is what you say about that." Right? And those were real important concepts, straight from the horse's mouth, you know?

LUCHETTE

It sounds like to say your father and Don Trunkey were influential mentors is probably an understatement. Any other key people as your career unfolded that really were influential mentors?

MEREDITH

My chairman Dick Meyers in general surgery and my chairman Bob Cordell in CT surgery have been heroes to me. And then, when I first came back here, Dick Dean, who was the chair of surgery, recruited me to come back here to head up the trauma program and has been probably the most constant, longest-standing academic professional mentor I've had.

LUCHETTE

How did your peers and your non-trauma peers and mentors view your decision to pursue trauma surgery rather than cardiothoracic surgery?

MEREDITH

They just thought I was out of my mind. They couldn't understand it at all. They still loved me but they didn't understand me.

LUCHETTE

Do they acknowledge you made the right decision now, you know, 20-some years later, 30 years later?

MEREDITH

I'm not sure of that. I'm not sure. Dr. Cordell has since died. And I'm not sure he or my other peers with whom I was a cardiac resident at the time, I'm not sure even they understand that it was right. I mean they think I've been successful at it, but they don't—they think I'd have been

that successful or more doing the other.

LUCHETTE

And how did the leadership at your institution view your decision to push trauma more so than cardiothoracic surgery?

MEREDITH

They knew I had the interest because I had studied it a lot in the lab and I had shown an interest in it throughout my residency. And they knew they needed to build their trauma program. And then right at that time we changed chairs so we had the new chair. Dick Dean came in. And he knew he needed a trauma program and he knew he didn't know how to build one but needed a good one.

It seemed like a perfectly logical decision to me but at the time. But looking back on it now, I think that was a crazy decision on his part to bring this guy fresh out of a fellowship to start a trauma center. Right? I mean, I can't believe he did it.

LUCHETTE

Tell us about particular studies that you are most proud of and how you feel it influenced the field of trauma care?

MEREDITH

That's tough. These scientific papers are a little bit like love letters, you know? They make real sense at the time, but if you dig one up from 20 years ago... Probably for me, the main paper of my career to me was the extravascular lung water paper I described to you earlier (*Am Surg.* 1983 Dec;49(12):637-41). Because it was just a hard project to do. It required doing it all myself. It was just a whole lot of things personally that made it a really important paper.

LUCHETTE

So how did that work influence the care of injured patients?

MEREDITH

I don't think it did. I think it was very influential to me, but I don't think it was a big deal to the scientific community. I think of the papers that I wrote that foreshadowed or helped lead in changes was the paper called, "Non-operative Management of the Liver, the Exception or the Rule" (*J Trauma.* 1994;36(4):529-34), where we looked at our experience and stated for the first time in the literature that not only is it okay to manage liver injuries non-operatively, but that that's the main way we do it, you know, the main way we should do it. That was a AAST presentation. And that probably, if you look at—I don't think I'm famous for that or known for that at all—but I think that was the most prescient, substantive piece that I've played a part in.

LUCHETTE

Are there any things over the years that you were out championing and then you look back now and you say, “Whoa, probably a bad idea to champion that in retrospect.”

MEREDITH

I did think laparoscopic cholecystectomy was going to be a flop. That turned out to be pretty wrong.

LUCHETTE

Looking back over your career, as the immediate past president, what are the two or three greatest advances in trauma care that have occurred during your career?

MEREDITH

Imaging, so CT ultrasound, and the whole piece around focusing our operative and resuscitation efforts on developing homeostasis and not fixing holes. So that led to the entire open abdomen piece. That led to the entire damage control piece. That led to the entire philosophy that you work on establishing homeostasis not just fixing everything you can find. That was a huge thing to become popularized. And it is not—it really wasn’t first brought up during my career, but it certainly became popularized during the course of my career.

So it wasn’t invented during the time that I’ve been a trauma surgeon but it’s become the norm. It’s become a philosophy that’s bigger than the technique even, really. If you think about it, it influences how we treat head injury, how we treat fractures, how we treat all bullet holes—chest injuries, right? It’s a philosophy that our goal in the initial time is of achieving homeostasis, it’s not fixing injuries. That’s huge. Then that leads to a lot of different things—open abdomen, open chest, damage control, resuscitation techniques, all that stuff. But that’s big.

LUCHETTE

What changes in practice patterns have occurred during your career?

MEREDITH

You know, it was such an operative field when I started. It was just operations as fast as you could do them all night, every night. And that is trauma. Part of that has dramatically changed. That’s big.

Bringing emergency general surgery back and compiling acute care surgery, I think, is a very big thing in terms of training and philosophy and a group of people that are going to train the next generation of surgeons, very big. Those are probably the biggest things. You know, a lot of resuscitation techniques are different, think about it, since then. We’ve talked about imaging.

LUCHETTE

You wear many different hats. At the end of the day, though, what is the most rewarding and gratifying aspect of your career? What brings you the most joy?

MEREDITH

To me, the friends I make, the people I have helped. No question about it.

LUCHETTE

What aspects have you found to be the most challenging or difficult and distressing? What things keep you up at night?

MEREDITH

You know, right now I am really worried about the challenges in training surgeons in general, but in particular training surgeons to be full surgeons.

My heroes when I was growing up, your heroes when you were growing up, these were people who were not just great trauma surgeons but were great surgeons. David Richardson. Don Trunkey. These were people who were great surgeons, and they were great trauma surgeons *because* they were great surgeons, who could stop bleeding and think quickly and enjoyed, embraced that moment of chaos and that moment of having to make a decision without all the facts, right? Which many surgeons hate that feeling, but a few love it.

But we are not creating those people much any more. We're having a harder and harder time creating surgeons who are ready to go "out of the box," finish your residency, start practice, who are able to cover the breadth of general surgery in the community than we were 20 years ago. That worries me. We will need to figure out ways to make that happen because the public will need people who have that skill set, the skills of managing surgical diseases, and especially the diseases for which there is not enough time to get a referral, you know, go to the internet, get a family practitioner to refer you. There are a lot of diseases where you do not have that time. We've got to be training folks to do that. And the need is not going to go away. So I'm worried about that, probably more than anything.

LUCHETTE

Do you have any thoughts about how to solve that problem?

MEREDITH

Well, I think a couple of the layers, one is acute care surgery fellowships. I think acute care surgeons working in the training programs in this country will help so that the trainees who are coming through general surgery residencies will see emergency surgery, including trauma, as an exciting, viable, wonderful part of a general surgery career, not just the hard parts that are just inconvenient and hate it.

I think many residents graduating think disdainfully of emergency surgery because they're taught to see it that way by their mentors who are required against their will to take emergency surgery call. I think if they were trained to do emergency surgery by the people

who loved doing it, just like they're trained to do breast surgery by the people who love to do breast surgery and transplants by the people who love to do transplants and colon surgery by the people who love to do colon surgery, they will love to do it. Right? So it will be viewed as a good part of general surgery by more general surgeons, even though they may not spend their career in trauma surgery. So I think that's an important part of it.

And then we're investigating with folks looking at finding a way to train the general surgeon post-general surgery residency, that would be sort of a fellowship to prepare you to be a general surgeon. And we might need to do that. We can't fix the five. Right? If you could fix the five, then that will solve it. There is great reason to think you can't fix the five because we've pulled so much time out of that training and put so many restrictions on how you can do that training it is hard to imagine that you can do it with less. Right?

LUCHETTE

So in your department, are there any old-fashioned general surgeons still practicing?

MEREDITH

So I talked about this in one of my presidential addresses, that surgery residents are much less likely to see those role models than they used to be, if you think about it, much less likely.

And so we need to find those opportunities. And more and more in the general surgery residency programs and academic medical centers, those people are retiring and finishing and not doing that, and the places that trainees see it are if they go out into community practices where they get to go work with some people. Even in the community practices it is getting harder and harder because those surgeons are retiring, too. So we're going to have to find that again. But you know most places I go now, they have almost no one left who is doing what I grew up thinking was the breadth of general surgery in an academic medical center.

LUCHETTE

What career advice would you give to the young academic trauma acute care surgeons coming along?

MEREDITH

There are lots of pieces of advice to give young academic people. The first is, "It's the journey, not the destination." So many people think it's so important to have your career planned out correctly.

If you talk to people, my peers and the people above me, my seniors in this world and you get to talking to them—I bet you are discovering through these phone calls—that very few people have said, "Oh, yes, I'm exactly where I mapped it out to be from the time I was 21 years old. And I have just clicked every little click along the way and the reason I'm successful is that I didn't step off of that path." That's an extremely unusual story in my book from the people that I have met who are successful.

Most of the people that I have met that are successful have demonstrated intellect and

passion for what they're doing. They've spent their lives working in areas that they care about and that are important to them and that they are making a contribution to something that's important to them. And the point is the contribution, not what it does for your career, not for any of those things. The point to them is they are passionate about it and they enjoy making a contribution to a field. And those are the people that wind up successful.

It all comes from trying to make a contribution. And so I think focus on the contribution you can make and not what you want to do to build your career is the first thing. And enjoy it, right? That's the first step.

The second step is the piece of advice I give young people often is focus. Early-on you feel like when opportunities come along they're the last opportunity you will ever be offered again, if you don't take it you will never have another chance to do anything that will be fun or make a contribution. And that's not true. So take on things that you can succeed in, take on things you can do, but don't take on everything that you see. And I've made that mistake through multiple points in my career where I've found myself just so, so extended that I was running so fast I hardly had time to stop and think about it. And that's from an insecurity that you will never be asked to do anything ever again. Right? And that's really not true. If you do well in the things you are asked to do, you will get asked to do more.

LUCHETTE

And so what kind of advice can you give the young folks about their lives outside the hospital?

MEREDITH

Well, I wind up giving advice about this a lot. The first thing I think is part of the reward and the joy of being a surgeon is being a surgeon. In other words, we get to enjoy our work more than most people, and so we get to enjoy our profession. So some of our work, time at work, in my mind, counts as our fun time. So when I walk out of the hospital, I've already had some of my fun time.

Another piece of advice is that having balance in your life doesn't mean that you pick three areas in your life and you spend precisely a third of your time in each of those areas. Having balance in your life means you are able to put the emphasis in an area when it needs it in an amount that it needs it. There are times when your job, your patients, your professional associations need a lot of your time and attention, and there are times when your family, your friends, your partners, your church needs a lot of your attention. Achieving balance is about giving them all they need when they need it, not about the same amount all the time. And the secret to doing that is to show your family every day how important they are to you by genuinely paying real—real, actual—attention to them not just spending time with them. All right?

LUCHETTE

Now that ACS is a recognized specialty, what do you think the challenges and opportunities are for the future of trauma and acute care surgery?

MEREDITH

Well, the biggest challenges for us are going to be challenges of substantive products. The pressures on medicine, on health care for the next decade is going to be how to deliver the care of higher quality at lower cost. And frankly, there is a huge risk that it's actually lower-cost, lower-cost, lower-cost at a quality that the public will accept, not actually higher quality.

And that could lead to some perverse decisions in terms of how we staff all of our emergency care in our country. And we need to be thoughtful of that and watchful of that and make sure that we are providing the best that there can be for patients that need emergency care of all types.

LUCHETTE

As you look back on your career, is there any one thing that you would change?

MEREDITH

You know, I would not change a damn thing. I would just do it more. I really would. I would not change a thing in my career. It's way more than I deserve. It's way more than I expected.

LUCHETTE

Is there anything what would you change in your life outside the hospital?

MEREDITH

You know I would have to say very little there. I have great relationships with the people that I love. They're all strong and none of them, you know, my kids have grown up well. They have very high integrity, very good work ethic, still love me and their mom. I tell you, I'm not sure I would change it much because it would be easy for it to come out differently.

If you took the time machine back, it could easily come out differently. And I think of the possible futures there are a lot more worse, possible futures that are much better than the path I've actually had the chance to experience.

LUCHETTE

What are your plans for the next 10–20 years clinically, academically, and personally as you enter this new phase of your career?

MEREDITH

So what you're saying is now that you're a past president and we're planning on putting you out to pasture, what are you going to do in the pasture? I want to keep doing what I've been doing. You know when my son was 16 years old and I was looking at should I become a chair and I was being recruited to do this job, I wasn't sure that I wanted to do that job.

My life's vision had always been to be a trauma surgeon and a trauma director, not the chair of a department. Gail and I were talking about it and my son came in. He was 16 years old. He has always given me really good advice. But he said, "Dad, which of these jobs that

you're looking at can you make the most contribution in?"

And I sorted through that. And then I finally came to the conclusion that it was probably the chair job. He said, "Well, then you ought to do that job because your whole life is about making a contribution." And that's where the pleasure comes from. That's where the joy comes from. And so, "That's pretty damned cool," I thought. It kind of chokes me up to realize that he was that observant, smart. And he's, that's just how he is. You know. So that's what I'll do next. That's what I'll keep doing. Because it is the journey, it is not the destination.

LUCHETTE

Lazar Greenfield writes about retirement and transitioning and, I know it's premature, but have you ever even thought about that phase of your life?

MEREDITH

Barely. I just turned 60. And I'm really just beginning to admit to myself that I will need to retire someday. And I'm really just now sorting out what to do with that. I won't need to do it for quite a while, probably 10 years. I've saved well and all those things so I don't have a lot of financial decision-making to make about that, which is a blessing.

I think I will, as time goes on, find ways to do more and more clinical care. What made me do this in the first place. The patients. Absolutely right. And it was hugs. Right? That was a family saying, "Thank you, Dr. Meredith, you saved my baby." Yes. That's what got me going.

LUCHETTE

But I do want to give you the opportunity to make additional comments for the readership about anything that we haven't covered in our discussion on the 75th anniversary of the AAST.

MEREDITH

Probably not, but you know, look through the changing times, look through the people who have made contribution to this organization. It's been a dramatic contribution to our world if you think about it. The way that injured patients get treated today compared to the way injured patients got treated when this organization began is unrecognizable in terms of systems, in terms of the science behind what we do.

They're unrecognizable, probably more than many, many other fields in medicine. It's a big deal. And an awful lot of that has been the AAST. So it's been a great 75 years. It's a great organization. To the young people that are listening, get involved in the AAST. Send your papers here. Get your work published here. Get noticed. Go to the meetings. Work hard. Work for the contribution you can make, not for the recognition you can steal. And you will find out that the AAST needs a lot more people like you and lots more time from people like you.



ROBERT C. MACKERSIE, MD
PRESIDENT 2012–2013

DR. FREDERICK A. LUCHETTE

How did you decide to pursue a career in general surgery and then trauma and critical care? I would also like to hear about significant mentors and their specific influence on your decisions.

DR. ROBERT C. MACKERSIE

I would describe my path into surgery and trauma as a little bit of a ‘Forrest Gump’ type of experience. I was a young medical student who, having previously begun the PhD program in bioengineering at UC Berkley, wanted to come back to the Bay Area to do a little bit of work. As luck would have it, my PhD mentor, a fellow named Bob Eberhart, knew a young surgeon at San Francisco General Hospital by the name of Frank Lewis. Frank was looking for some computer programming expertise for a project of his, and one thing led to the next and I ended up coming out to San Francisco in the summers of 1975 and 1976 to work for Dr. Lewis doing some computer modeling.

I had previously been considering a career in pulmonology because where I went to medical school, the pulmonologists were the smartest of the bunch, took care of sick patients, and also did procedures. It seemed like a good fit. The surgeons could do technical things, but they didn’t seem to me to be the “brightest lights” in the field like the pulmonologists.

So imagine an impressionable young medical student finding himself in the midst of the surgical faculty at San Francisco General Hospital [SFGH] at that time. You have Bill Blaisdell,

Don Trunkey, George Sheldon, Frank Lewis, Bob Lim, Art Thomas, Jack McAninch, and others. What a group that was—the experience turned my head, that’s all I can say. I had no idea I was rubbing elbows with what was one of the most accomplished groups in American surgery.

These guys were smart, they had a broad range of interests, they could operate, and they had fun. After working for two summers at SFGH, I came for an externship on the trauma service at SFGH as a fourth-year medical student. One thing led to the next and I was fortunate enough to match at UCSF for my surgical residency.

That got me interested in surgery. It wasn’t until probably half-way through my residency that the same group of faculty at San Francisco General Hospital got me interested in a career in trauma. Like several residents in my year, I had become enamored of Paul Ebert’s practice in pediatric cardiac surgery, but recognized that only a small handful of surgeons would be doing this. I had a fleeting interest in vascular surgery, but became drawn more to curative versus palliative surgery.

LUCHETTE

So, at that time at UCSF, is it fair to say that that group of friends and mentors were the leaders of the department?

MACKERSIE

They were. But the department of surgery at UCSF had and continues to have a very well-rounded and distinguished faculty. It had leaders in the field in just about every area of surgery. All of them were a draw for residents in their own way. I think I still became more attached to the camaraderie and the well-roundedness of the faculty at SFGH.

LUCHETTE

Well, what did your peers think of your choice to pursue a career in trauma surgery?

MACKERSIE

I don’t think there was any particular judgmental feeling one way or another. You know, there had been several people, including Tony Meyer and Chip Baker, that had preceded us in that area who went on to have very successful careers.

LUCHETTE

At that time would you consider all of those individuals that you mentioned in the trauma group at San Francisco General Hospital as initially mentors and then friends?

MACKERSIE

I think it’s always a blessing when someone who is a mentor becomes a lifelong friend as well, and I would say that was certainly true of Frank Lewis. I’ve kept in close contact with Don Trunkey and have felt the watchful support of Dr. Blaisdell, Dr. Sheldon, and Dr. Lim as well. Jack McAninch has an office right next to mine and so I see him on a regular basis. Of the

SFGH faculty at that time, probably Drs. Lewis and Trunkey have played the greatest role in guiding my career.

LUCHETTE

Any other folks that were influential in your career?

MACKERSIE

Well, it turns out that I had a second ‘Forrest Gump’ experience—landing my first faculty position at UC San Diego with these two guys named Steve Shackford and David Hoyt. What a time we had, and I learned what a fantastic thing it was to work with individuals who also were good friends. San Diego had a new trauma system and we were always pushing the envelope a little. Jim Davis was recruited and completed our group in 1987. It was a very special time clinically, academically, and professionally.

LUCHETTE

So when you look back on your career, which of your scientific contributions are you most proud of and also tell me how it influenced patient care?

MACKERSIE

Well, it is hard to know. We chip away at problems over time and make small contributions. My interests have covered a wide range of clinical topics. I first got started investigating some of the elements involved with inflammatory lung dysfunction, ARDS, following traumatic injury, and went on to study a variety of other things, including epidural analgesia, some of the first analyses of errors made in a mature trauma system, one of the first papers using logistic regression, one of the first papers de-bunking the myth of the MAST suit, and some early work in organ procurement.

Some of the more impactful work I was involved with was not even recognized in the peer-reviewed literature. I had the privilege of participating, at its inception, with the development of the federal guidelines for trauma systems structure and development back in the mid 2000s. This work eventually became a federal document and has influenced the way trauma systems have developed throughout the United States.

LUCHETTE

Was there anything that you were endorsing or teaching the surgical residents 20 years ago and today you look back and say that was the wrong message?

MACKERSIE

There are probably a lot of things. You know, reading back over some of the Milestones sections that are a part of this commemorative book, you realize how much our thinking has changed, and many things that were regarded as state-of-the-art are not being done any more. Diverting colostomies for everything; closing every abdomen regardless of how difficult

or tight it was; high volume, high pressure mechanical ventilation; exploring almost every abdomen with a penetrating wound; resuscitating patients with massive amounts of crystalloid—the list goes on. We’re much smarter about a lot of things now, but no doubt still have a lot to learn.

LUCHETTE

As you look back over your many years of practicing trauma surgery, what do you feel are the two or three advances in patient care or the sciences that have occurred during your career and significantly changed the way we care for patients?

MACKERSIE

If you go back to when I was in training, there was pioneering work being done regarding the use of CT imaging in the diagnosis of blunt trauma. This allowed for a much more selective approach to blunt abdominal trauma, and less operating. Having been trained in an era where abdominal exploration was, to quote Don Trunkey at the time, simply “completing the physical examination,” this was quite a change.

I think the other thing that has changed the mortality curve dramatically is the combination of damage control laparotomy coupled with the open abdomen. I can remember those patients who would have major abdominal hemorrhage, usually with a vascular injury. They’d get massively transfused and would also receive far too much crystalloid. They’d blow up tight, but we’d close their abdomens despite the tension. They’d be admitted to the ICU and develop ARDS then renal failure and eventually die. That clinical scenario has all but gone away now. The open abdomen has revolutionized the survivability for many of these patients.

So those would be two things. The third is probably tied to that and has been a little more recent but the concept of hemostatic resuscitation. Crystalloid administration has been greatly de-emphasized and we now replace blood loss with packed cells and factors. The whole concept of hemostatic resuscitation I think has reduced abdominal compartment syndrome and also changed our practice.

LUCHETTE

I’d like to hear your thoughts about changes in practice patterns that have occurred and impacted care.

MACKERSIE

Well, the most dramatic change at a teaching hospital, of course, are the work hours restrictions. But along with that has come a cultural shift, a generational shift, which is not a bad thing. There is more attention paid to balance, lifestyle, family, where you live, etc., than there was in my generation and in the generation that preceded me. We grew up with 110–120 hour work weeks, every-other-night call, and lifestyles completely centered around professional commitments. That’s all changed now. While the change has a number of salutary aspects, I think it has compromised training and that the residents finishing their training now are sim-

ply not as experienced or confident as we were.

Another change that has been a satisfying one is the recognition that trauma and, more recently, acute care surgery is a legitimate specialty area of its own. Trauma has a realm of knowledge and experience that is increasingly unique. It is certainly a component of “general surgery,” but a general surgeon from a typical general surgery residency today, with their increasingly limited exposure to trauma, is not going to be able to practice confidently at a Level I or II trauma center without additional training.

LUCHETTE

During your tenure on the COT, you were the chair of the Trauma Systems Planning and Development Program and promulgated the activities of the committee with evaluation of state trauma systems. So from a 30,000-foot view of trauma systems, haven’t they had a role in improving care?

MACKERSIE

Unquestionably. The ongoing development of our trauma systems represents an enormous change that goes way beyond institutions. Trauma system development is not as easy as it sounds, but we’ve made steady progress by educating our legislators, our EMS colleagues, and the public about these systems of care. The growing recognition that trauma centers are an essential public service has gradually permeating the EMS culture, and this is very satisfying to see. The fact that stroke and STEMI programs have been modeled after trauma systems speaks volumes about the perceived efficacy of this model for emergency care.

What we do in our service to surgical organizations is to take on a project or program that we have a keen interest in, work hard at developing it, hopefully make it a little, and then pass it on to a colleague. I inherited the American College of Surgeons Trauma Systems program from Brent Eastman, who began it. I worked to improve it and passed it on to Mike Rotondo, who improved it further and then he passed it on to Bob Winchell who is doing the same. So it goes. With help from many others, it becomes a chronological team effort and is how we sustain progress. It’s also a source of great satisfaction for most of us.

LUCHETTE

You’ve had many gratifying experiences throughout your career. At the end of the day, what do you find to be the most rewarding activity that brings you the greatest joy at the end of the day?

MACKERSIE

I’ll call it “the company you keep.” There is not a day that goes by where I don’t feel grateful for being able to work alongside people like yourself, like some of the AAST past presidents and members, and others in this business. This community of ours, of trauma surgeons, is such an extraordinary group of people. They’re smart, they’re accomplished, they’re committed, they are not self-aggrandizing, and they have good hearts. It’s the fabulous group of people

that I work with. I often tell the residents when they are considering a career to look very carefully at the people you are going to be spending the rest of your professional life with, because it can be a source of frustration or a source of enduring joy and pleasure.

I have and will always relish the teaching of young surgical residents and fellows. They keep us young—and honest. Some of the operations we perform are perhaps not quite as thrilling as they once were, particularly at 3:00 in the morning. But the thrill of looking at a resident performing their first splenectomy or repairing a hole in the heart—wow, their feet don't touch the ground for the next few days. The patient then leaves the hospital in five days with their whole life ahead of them—what could be better in the world than that? Helping a resident or fellow to give someone their life back and watching these young surgeons grow and develop is incredibly rewarding. They come in a little green or a little bit gun shy and they walk out the door a couple of years later as confident, mature, seasoned trauma surgeons. What a great way to make a living.

LUCHETTE

With all the changes going on in health care, what kind of things keep you up at night?

MACKERSIE

Well, I practice in kind of a bubble I suppose. Although I practice at a public hospital with all of its own attendant problems, I don't worry about referrals or patient volume, and I don't worry about not having a job. As I've gotten older, I worry less about administrative issues. The one thing that keeps me up at night is a serious or unexpected complication. I think we all worry about that. In this business, you intervene to try to help people, and most of the time things work out and the results are good. But on occasion things don't work out and patients suffer. I find this fundamentally disturbing.

LUCHETTE

You mentioned your fellows—you've been training residents and fellows for at least 25–30 years now. If you were going to give some life coach advice to the readers of your interview in the commemorative book, what words of wisdom would you give them about a career in academic trauma/acute care surgery practice?

MACKERSIE

For the residents interested in surgery and having trouble picking a specialty I tell them pay close attention to both who your future colleagues will be as well as the type of work they'll be involved with, and the satisfaction of walking out of the hospital each day.

In terms of an academic practice, I recommend that they seek out persons that they enjoy working with in a very close practice, including patient care and research. There's nothing better than a trauma practice where your colleagues get along well and are like-minded in the way that you care for patients. It doesn't always work out that way, but when it does, it is a beautiful thing. I tell the fellows to identify role models and committed mentors. I will some-

times steer them away from faculty positions where it's apparent that this situation does not exist. That's vitally important, perhaps even more so now than it used to be, since there is a lot of on-the-job training still in a trauma/acute care surgery practice.

In terms of "life balance," I think it's going to get easier. The combination of the generational changes and the work hour restrictions has created a cultural environment where people are not necessarily going to stick around the hospital doing cases after a night on call. They're not going to put in 80-plus hour work weeks as a faculty member. They are going to have a better balance with more discretionary time—probably not a bad model, considering.

LUCHETTE

Speaking of challenges, you've been intimately involved with the development and roll-out of acute care surgery. What do you see are the greatest challenges and opportunities for the future of ACS and trauma care?

MACKERSIE

I am hopeful that we're past the "hump" now, and recruitment of young surgeons to a career in trauma/acute care surgery appears to be on the increase. There was a period of time where many of us were becoming quite concerned about the lack of ongoing recruitment to our field due in part to an increasingly non-operative practice. There was a discernible manpower void trailing us. David Hoyt as the chair of the Committee on Trauma was one of the first to identify this threat and take action at the national leadership level.

Now I am gratified to see that the number of applicants to acute care surgery (trauma, critical care and emergency surgery) fellowships are increasing. There seems to be a buzz out there that says this is an exciting specialty. I still see the challenges in recruitment and retention: getting these young people to structure a career track, and giving the field the recognition, status, and satisfaction it requires to retain surgeons for an entire career. The special expertise involved with providing definitive care to critically ill or injured surgical patients, and the scope of practice this entails is the essence of acute care surgery that encompasses trauma, complex emergency general surgery, and surgical critical care. This is quite distinct in my mind from the so-call "surgical hospitalist" or "nocturnist" or "call-taker" whose practice may be largely limited to providing coverage for basic emergency general surgery. This is not to say that these practitioners are not important or serve a need—they are and they do—but they do not represent the model for who we are trying to train, and will not meet the training and practice needs related to critical surgical illness.

We have not done a good job of distinguishing practice pattern from training paradigm. To help firmly establish the trauma/SCC/complex EGS training paradigm, I think that formal, well-recognized certification in trauma, and maybe complex EGS as well, will be critically important. Whether or not this means certification by the American Board of Surgery remains to be seen, but some formalized mechanism is needed to ensure that the next generation of trauma, surgical critical care, complex emergency surgery (acute care) surgeons are adequately trained and appropriately recognized and credentialed. I believe that this is the only way to

guarantee the future of our specialty.

There are many opportunities that go along with a trauma/acute care surgical practice, and this is probably one of the most job-secure areas of practice in American medicine. Access to trauma and emergency surgical care will be a growing problem. There is a cohesiveness of the trauma and acute care community I think that is a huge strength in approaching these problems.

LUCHETTE

I'd like to ask you to look forward 20 years into the future and tell me what you think acute care surgery and the practice of trauma surgery will look like in 10–20 years?

MACKERSIE

Well, I think some of the trends have become self-evident. There is a strong trend away from individual or small group practices and towards hospital-based practices. Physicians will be increasingly employed by hospitals, and I suppose the trauma/acute care surgeons are a kind of vanguard in that regard. Along with this change in practice pattern will come increasingly regular (and perhaps regulated) work hours as we discussed a few minutes ago.

Another challenge for us will be incorporating newer techniques into a trauma/acute care surgery practice. The role for laparoscopy has probably been under emphasized and under sold, a trend that will need to change. The incorporation of endovascular techniques into a trauma practice has already begun, but the role of the trauma/ACS surgeon in utilizing these techniques on a regular basis has just begun to be explored. Most trauma practices are characterized by a higher volume of less acute, simpler cases and a lower volume of critical, complex cases. Problems with skill acquisition and maintenance have yet to be addressed, and in many practices, this will be a big challenge.

Finally, I'm going to make a prediction that eventually there will be a trend towards regionalizing not just trauma but all complex emergency surgical care. I think the driving forces of limited physician availability, limited expertise and experience, and outcomes analysis is going to eventually overwhelm the obstacles of competing health care plans. Designated Level I and II trauma centers should be the hubs for this broader regionalization.

LUCHETTE

When you look back over your career, is there anything you would change in your professional career?

MACKERSIE

I feel extraordinarily fortunate—fortunate to have been provided the opportunities I was provided, fortunate to have had sense enough to take advantage of them, fortunate to have had the colleagues and friends and guidance I've had, and fortunate to have been in the right place at the right time. Of the things I would change, I would have made more of an effort to become proficient at another language. It seems I am surrounded by polyglots, with many of the resi-

dents and medical students speaking several languages. I am highly envious of this.

Another element I would have changed would have been to pursue more formal grounding or perhaps even a degree in research methodologies. When I came through doing my research fellowships, those kind of programs didn't really exist, so this may be just wishful thinking. For people that are seriously interested in a career involved in clinical research, it is something I would strongly encourage. A masters in public health might be an option for some, but a structured educational program that provides formal grounding in some of the methods and technologies that are going to be increasingly applicable in the performance of clinical and outcomes research and for the conduct of multi-institutional trials in the future.

LUCHETTE

Is there anything you would change outside the hospital in your personal life?

MACKERSIE

I've been conscious of maintaining a balance, which has been more difficult this past year, but overall I don't have many regrets (Katherine may differ with me on this one).

I would have enjoyed improving skills in areas I began in younger years. I did a lot of things when I was growing up. I skated, I played tennis and golf, swam, rode horses, and I still enjoy skiing. I learned to fly during my research fellowship, and I took studying the piano pretty seriously at one point. Most of these skills have suffered from disuse atrophy. Our day jobs can be pretty all-consuming. It would be nice to have more time to devote to these other things, and is something I am looking forward to as I start to gradually wind down the level of intensity of the professional activity over the next 10 years.

LUCHETTE

Tell me about your plans clinically, academically and personally for the next 10–20 years?

MACKERSIE

At 62, I still consider myself to be reasonably young—maybe 70 is the new 50—but also recognize that I won't have the physical stamina to sustain the energy output I did when I was 35 or 40. I would prefer not to be working at this pace beyond another five years or so. Today I'm post-call, and although I wasn't up the entire night, I didn't sleep much and the recovery period lengthens as one ages. It just isn't as easy as it was 25 years ago. While I don't think the psychological stress is particularly high in this job—we're all pretty comfortable doing what we're doing—I think we underestimate the physiologic stress.

I hope to stay clinically active at least into my late 60s, assuming that I stay sufficiently healthy and maintain all my faculties. What I don't want to do is to stay on past my ability to be safe and meticulous in the operating room and safe in the care of patients.

LUCHETTE

In closing, is there any particular comments that we haven't touched on that you would like to

leave for the readership on the 75th anniversary of the AAST?

MACKERSIE

I would hope that as we celebrate the anniversary of the AAST, we also celebrate the fact that we're surrounded by colleagues of such high caliber and commitment exemplified by the membership of this great organization. We share in the privilege of being able to affect people's lives in such a profound way, and in an academic career we are afforded the additional satisfaction of being able to contribute and serve in the realm of teaching, scholarship, and leadership. It's a great life and a great career—I'd recommend it to anyone with the skills, commitment, and interest.

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