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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.