

After action report
Musings
From
Landstuhl Regional Medical Center
July 8-30, 20007
Norman McSwain, Jr MD, FAC S

This was the most enjoyable, educational and, yes, awesome 3 weeks of my life. Why? Two reasons: **Dedication** of the medical personal in caring for some very severely injured warriors, and **efficient** medical care under unusual conditions. The care of these individuals would be awesome in a single hospital. However, to provide such care, in a string of hospitals with a minimum of two flights lasting long hours each is unprecedented to my knowledge. Often there were 4-5 flights in fixed wing and rotor-wing aircraft, and up to 30 hours for each flight. Add this to the turn over of patients to a different group of caregivers every 8 to 48 hours while the patients are provided continuous excellent ICU care. This is impressive

The efficiency of the system at Landstuhl Regional Medical Center (LRMC) and the dedication of the medical care personnel there are major reasons that so many severely injured patients can be treated so quickly and so well. This report centers on LRMC and the care provided.

The scenario goes something like this:

- Injury
- Field care by well trained corpsmen
 - Tactical Combat Casualty Care (TCCC) as developed by the committee on Tactical Combat Casualty Care (CoTCCC)
- Helicopter flight and hospital arrival during the first hour;
- Forward Surgical Team (FST) assessment, operation and forward movement (12 hours);
- Combat Support Hospital(CSH) reassessment and additional surgery (12-36 hours);
- Transportation and in-flight critical care provided by Critical Care Acute Transport Team (CCATT) composed of a critical care physician, critical care nurse, and a respiratory technician (5-8 hours)
- Reassessment, operation, critical care & further stabilization at the only Echelon IV facility on three continents (Landstuhl Regional Medical Center) (24-72 hours)
- Transportation and in-flight critical care CCATT to Continental United States(CONUS) (10-30 hours)
- Reassessment, operation, critical care & definitive care at one of the Echelon V facilities. These are the National Naval Medical Center (NNMC) in Bethesda, the Walter Reed Army Hospital (WRAMC) in Washington DC, and the US Army Burn Center at Brook Army Medical Center (BAMC) in San Antonio

These severely injured patients arrive at an Echelon V center, in the United States, in 4-7 days after they are injured.

In the military, the increasing echelon level designates increasing complexity of medical facilities

- I - field care,
- II - Forward Surgical Team (FST)
- III - Combat Support Hospital (CSH)
- IV - LRMC
- V – WRAMC, NNMC, BAMC, etc

The "Region" served by Landstuhl 'Regional' Medical Center (a Level II trauma center) is 92 countries on 3 continents.

My responsibilities as the Senior Visiting Surgeon (SVS) were as a consultant, a teacher and as a clinician.

Efficiency in patient care

The level of care, personnel, equipment, and resources increases as the designation changes. Most, but not, all of the patients come from a Level II or III that is "down range". The patients arrive on a CCATT flight. Most of the CCATT teams that bring patients to LRMC are stationed downrange at the CSH. Then return for the next needed flight. Occasionally, the CCATT flight originates at LRMC to go to an area not usually served by a team stationed there. It is like a giant spoked wheel. On the incoming spokes are all of the echelon II & III facilities as well as the other medical care facilities in military and non-military hospitals in the 92 countries on 3 continents. LRMC is the hub and the echelon V facilities in the US are at the end of the outgoing spokes.

Another unique aspect of LRMC is almost no primary trauma patients arrive. However, all of the patients that arrive on the trauma service are severely ill/injured critical care patients who have had one or more operations in the last 24- 36 hours and that will need another operation within 3 to 12 hours after arrival, by a surgeon different from the one who performed the primary surgery. AND, they have just traveled 5-8 hours at an altitude of >30,000 feet and at an ambient pressure of 1/2 an atmosphere, strapped to a stretcher while receiving continuous in-hospital level critical care en route.

Their electronic medical records from downrange have preceded approximately 80% of the patients that arrive. The rest of the time, information is available written on their surgical wound dressings or passed off by the CATT team or both. In either case, it is better than most of the trauma patients that arrive in the United States trauma centers off the street. To assure the accuracy and completeness of the information, the critical care physicians interview the CATT team as they are off-loading the patient for the care and the patient condition during the flight, and then reassess the patient after they

are in a bed. This includes a complete history and detailed physical examination as if the patient had not been seen before.

The critical care physicians are pulmonary/critical care and trauma/critical care. These two diversely trained physicians work extremely well as a critical care team and demonstrate a strong camaraderie. The antagonism typically seen in a civilian hospital of medicine vs. surgery does not exist.

After assessment (if the initial operation or washout has not been done in the past 24 hours), the patient is carried directly to the operating room where their wounds are inspected, washed and re-dressed. Multi-specialty providers (trauma, orthopedic, neurosurgery) will inspect and care for the wounds as is necessary. The patients with open wounds arrive from downrange in a vacuum-foam-suction wound dressing. This is removed, wounds are cleaned, and a similar suction dressing replaced while in the operating room. Re-exploration of the abdominal, intracranial and extremity wounds are done as required by patient conditions. Most patients require about 48-72 hours of care to complete the resuscitation and to insure that they can do well, what with perhaps 30 hours of travel time back to a CONUS hospital. The need for longer resuscitation and stabilization is occasionally be required. The average turnover of the entire 12 bed ICU is every 48 hours.

Each 24 hours, the patient is carried back to the operating room with appropriate wound care. The wounds are extremely clean and apparently heal well. Some are closed at Landstuhl, some are left open. My personal impression after seeing these very clean pus-free wounds is that we, in the civilian hospitals do not wash out our wounds frequently enough. They should be washed out every 24 hours.

In my hospital the patient load is so great for other operative procedures, fresh trauma and the lack of OR personnel and surgeons, that such frequency is very difficult to achieve. We must work to change this. This is another lesson, like the use of tourniquets, that we must learn from our combat counterparts.

There is a concern among the surgeons at WRAMC that the vacuum-foam-suction dressing does not work well on long med-evac flights. Consequently, the wounds are not kept clean enough during flight. Therefore, prior to moving the patient to CONUS, wounds that cannot be closed are converted from vacuum-foam-suction dressing to wet-to-dry dressings. A research project by one of the military trauma/critical care surgeons (Fang) is being started to assess this concern.

Guidelines for patients to leave LRMC include a stable condition as determined by several variables according to the following standards: These are guidelines for the patient leaving LRMC

- Hemoglobin > 8.0,
 - o if 8.0, blood must be available for flight
- Feeding tube if present must be below the ligament of Treitz
 - o Radiograph within 12 hours of flight,
- ET tube, if present, must be properly positioned

- o Radiograph within 12 hours of flight
- Blood studies stable
- Ventilation studies stable
- If extubated, must be >24 hours

They do not apply to patients being moved out of the downrange hospitals.

If the above criteria and above minimums are met, transport is planned. Considerations include that the patient will be immobilized on a NATO litter for up to 30 hours; fluids (IV, medication and nutrition) will be administered by pumps attached to the litter, vital signs and other physiologic variables will be monitored, ventilation controlled and point of care testing (POCT) for blood value assessment must be accomplished. Arrangements are planned the day before transport after consultation with the CCATT physician, manifests are completed, transfer orders are written and all the other appropriate paperwork is completed. Also included is completion of the electronic medical record for the receiving hospital and medical personnel.

As stated, the patients will spend up to 30 hours strapped to a NATO litter en route to a CONUS facility. This interesting process starts when the patient is moved to the litter at LRMC after evaluation by the CCATT team. A tray type device is placed onto the NATO military stretcher that has a POCT, a monitor, ventilator (if the patient is intubated) and pumps for tube feedings and IV's. All the necessary fluid, medication, blood, etc. for the patient is taken with them. There is the ambulance/bus ride to the airport, time on the flight line, 9-13 hours of flight time to Andrews AFB, and a long ambulance ride through traffic in Washington DC to WRAMC or NNMC. .

The morning of transfer, the CCATT personnel arrive. This team has been specifically trained to care for the patients at the Center for Sustainment of Trauma And Readiness Skills CSTARS program in Cincinnati under Dr Jay Johannigman. They are responsible for all patient care from hospital to hospital (bus, air, ambulance) transportation. The patient is allowed to stabilize for 30 to 60 minutes on the stretcher prior to moving to the bus for transportation to the airport and the flight line on the C-7. This culminates the patient's care at LRMC, but does not terminate of the QA and educational process.

A weekly teleconference with the downrange (in theatre sending) facilities, LRMC and the up range (receiving) facilities is held. Discussion of each of the patient transferred is conducted. Despite changing physicians three or four times, there is an educational continuity of care. The physicians in the initial hospitals downrange become aware of the care that the patient was given on route, at LRMC, when they finally arrived in the United States, and the outcome of the entire medical care process care. Could it have been done differently? Better? Even more efficiently? This course of action closes the loop. In civilian trauma, the patient arrives, is cared for and is discharged with follow-up, under the care of a single physician. Knowledge of patient care is continuous. This lack of continuous care in the military system could be a defect but has been solved in this unique way by this video teleconference exchange of information. Another lesson learned.

This is the most efficient hospital patient care system I have seen, especially in regard to continuity of care. The designers, as well as the physicians, nurses, and other health care providers actively participate in this process and are to be highly congratulated.

Dedication to patient care

The second outstanding characteristic at the ICU at Landstuhl Regional Medical Center is the dedication to patient care by the medical care providers. The ICU turns over on an average of every 48 hours; that means 12 new patients to be assessed, operated on and otherwise cared for every two days. The medical care team provides this care for the patients for more than 12 hours per day, all the while constantly asking new scientific questions, developing new ideas and techniques, and beginning research projects.

A typical day begins with 'check out' rounds at 0700. This is a review of the ICU and floor patients, what happened over night along with any PI issues during the last 24 hours. There is a review of planned outgoing patients for that day and any issues that could change this status. These seriously ill patients have conditions that are so fluid and acute last minute changes are not unusual. . There is a review of the expected incoming patients and the plans for their care on arrival. OR's are notified of potential cases even before the patients arrive.

Attending this meeting is the Trauma Program Director/Chief of Surgery, the trauma surgeon on call that day, 2-4 other trauma surgeons, one of the general surgeons, the Physician Assistant (PA) from the floor, the off going and oncoming critical care physicians (these may be pulmonary critical care or trauma critical care), the surgeon in charge of all transportation from downrange to here and back to CONUS and the Trauma Program Nurse Director.

At 0800 the trauma ICU rounds begin. The above personnel plus, the pharmacist, the Infectious Disease physician, a nutritionist, any other critical care physicians that are assigned to the ICU and the charge nurse for that day are all in attendance. There are no surgery residents here.

Elective surgery and washout procedures are hopefully completed prior to the arrival of new patients. Arrival of patients is usually from 1300-1400 hours on 1-3 CCATT flights. Flights come in with patients up to three times a day. There can be 8 or more ICU patients on each flight. This does not count the 'floor" type patients and the walking wounded. Patients will frequently get one, up to three operations "downrange" before they get to LRMC. It not unusual for a patient to get operated on within an hour or so after being wounded. Total patient assessment begins immediately on arrival with wound assessment and washout surgery. This makes the average day at LRMC begin at 7:00 a.m. and finishing up between 8:00 p.m. to 10:00 p.m.

The on-call critical care physicians remain in the ICU all night. This process goes on seven days a week. While not everyone works seven days a week, some must and all are

available. My hat goes off to a group of medical care providers taking care of severely injured warriors because they need it.

LRMC is the only American College of Surgeons (ACS) verified trauma center in Europe. This was a recent accomplishment led by Kathie Martin, RN, MSN, Dr's (Col's) Warren Dorlac and Steve Flaherty. In the US neither Walter Reed Medical Center nor the National Naval Medical Centers are verified as trauma centers. The only military verified ACS Trauma centers in the military are in BAMC and Madigan Army Medical Center.

Process improvement

As noted above, the Trauma Program Nurse Director is present for the checkout rounds each morning to identify PI problems. In addition, she makes frequent visits to the ICU and talks regularly to the staff. The trauma registry developed specifically for the military needs has >392 data points and 35 filters. These results are reviewed weekly in trauma conference and available for the multi-site weekly videoconference as well. Loop closure is obtained at these conferences. Also the PI process is used to identify research projects for the faculty.

In my personal opinion, this is one of the major accomplishments that was critical in the development of the Level II trauma center. It allows quality assurance of patient care spread over several hospitals separated by great distances. This process is unique in the methods of PI and its use to assess the patient care in these various facilities.

Research

There are many opportunities for unusual research at LRMC, just as there are in the down range facilities. Facilities down range have the chance to look at unique injuries, and their repair and to develop unique methods of providing such care. The deficiency is there is minimal opportunity for follow up, as the patients are shipped out so quickly. On the other hand, the physicians at LRMC can bring these lost ends together using more patients to compare the outcome. Hyper coagulopathy state in long flight and use of foam-suction open wound care (mentioned earlier) are examples of this unique situation.

The outcome of these studies could provide an important knowledge base (as military situations have always done) except for one major defect. These hard working physicians do not have enough time to put the project together and the Institutional Research Board (IRB) is awkwardly located on another continent (WRAMC). There are not enough support personnel to take advantage of this excellent situation or opportunity. I believe this to be a major military scientific failing.

Once again, I am very impressed by the **very high level of care given to these warriors who have given of their bodies for our freedom**

Vignettes

On Saturday morning (7-21-07) we were in the ICU at (LRMC) making rounds. General Peter Pace, Chairman of the Joint Chiefs of Staff, came down the hall to give one of the patients a Purple Heart. He shook hands with all of us and thanked each for being part of the Landstuhl Health care team for the wounded troops.

After he gave the award and was on the way out, Colonel Brian Lein, Commander of the LRMC introduced me to GENERAL Pace as the current Senior Visiting Surgeon. He thanked me, for all the work that has been done and the major contributions of the SVS program to the care of the injured warriors. I told him we were all honored to help out in any way possible. He added that the volunteer effort and the importance of the SVS program have been critical to LRMC in education, research and patient care. I expressed the hard work that has been accomplished by all of the physicians, nurses and other health care providers who work here and that we were pleased to work with them.

This conversation was perhaps 2 minutes, but was said reverently by him, after having just come out of the Purple Heart Ceremony. He said it very sincerely with eye-to-eye and hand-to-hand contact at a distance of no more than a foot. I felt that it came from deep within him and that it was directed to all who have been here or are going to come and to those who have organized this program. He spoke to me quietly. No one outside of 3 feet heard what he said. It was not for sound bites or PR from the podium, it was from his heart.

It is good that this program has been noted from the very top of the military

One patient arrived by a CCATT flight after having been tossed about in a windstorm receiving bruises in several parts of the body including the buttocks. When he arrived at LRMC he was beginning to develop renal failure. Over the next couple of days his potassium rose to 9 and required 24 hours of continuously dialysis before his kidneys returned to normal function. Compartment syndrome and rhabdomyolitis developed not only in the compartments of his lower legs but also in both buttocks and Gluteus. This is a very unusual injury.

A young warrior had been carrying a M240 Bravo out of a house when he was shot in the chest. It was above his SAPI. He had been explored downrange, his injuries repaired and he was doing well, when we made rounds. He talked about his mother and going home but also was upset to be leaving his buddies still downrange. Wanting to go back to his buddies was not an unusual feeling. In fact more of the warriors wanted to return to the war rather than go back to the United States. This was to be with their buddies, to return to the defense of the peace and the protection of the US, and to feel a part of the war effort.

It makes me very proud of having contributed the small amount that I have for the effort.

A young warrior hit with IED, had one leg blown off below the knee, other with multiple open fractures and vascular injury. He knew that he was severely bleeding but was “lying in the kill zone”. A medic crawled out to him, put on two tourniquets, stopped the bleeding and “saved my life”

“Doc, when can I go back to my buddies?”

Two important medical events: 1) Medic crawled to him; 2) tourniquets were available

Outstanding Aspects of Landstuhl Regional Medical Center Trauma/Critical Care program

- Efficiency of the entire medical care operation
- Dedication of the personnel taking care of these wounded warriors
- Performance Improvement
- Unique conditions associated with long term flight and different injury patterns
- Research interests

Defects in the Landstuhl Regional Medical Center Trauma/Critical Care program

- Lack of research support
 - No research personnel for data gathering
 - No clerical support for research
 - No research office
- Lack of clerical assistance
 - Dictation systems for clinical reports
 - Significant delay for operation reports
 - Not available for H&P
 - Physicians spend too much time doing clerical jobs both in the hospital and in the administrative offices.
- Downrange medical records
 - Lack of medical records on many patients
 - Use of wound dressings used for operation reports
 - Many records are incomplete
 - Missing mechanism of injury
 - Missing initial care in the field and the FAT
 - Electronic medical records are only about 80% complete
- Mid level clinical support personnel are needed
- Additional trauma/critical care personnel needed to free up time for clinical research.
- Neither Walter Reed Medical Center nor the National Naval Medical Centers are verified as trauma centers. This shortfall should be immediately solved.

‘Nuff said.

If you think that I am impressed with the medical care providers and the level of medical care given to these patients, you are correct. The job that they do is awesome. I am VERY impressed by what they do and their positive attitude while doing it.

***Norman McSwain, MD FACS
Senior Visiting Surgeon
July 2007***