Wherever the Dart Lands: Toward the Ideal Trauma System

A Brent Eastman, MD, FACS

I can't express strongly enough how honored I am to be standing before you, my peers and friends and patients, to speak about an issue that has absorbed my professional life: the development of trauma systems in North America and beyond. I accept the responsibility of giving the Scudder Oration recognizing it is meant to be a seminal address on the care of the injured patient, meant to carry a message to the people in this room and to trauma surgeons and trauma teams in the United States, Canada and around the world.

This 77th Scudder Oration will be built around surgeons, patients, and maps. I'll begin with my mantra, which some have said may be engraved on my tombstone. My wife, Tica, who is my editor and a master of brevity, says it's too long for a mantra, or a tombstone, for that matter, but here it is: my concept of an inclusive trauma system is one that is designed to ensure expeditious transfer to the appropriate level of care commensurate with the patient's injuries wherever the geographic location. Let me emphasize *appropriate* level of care because trauma systems have been misconstrued as dealing with only the most critically injured, the patients who must be triaged to a Level I or II trauma center, but that is not correct. An inclusive trauma system is meant to encompass all injuries: minor, moderate, and major. If you're a patient with a relatively minor injury, you don't need to go to a Level I or II trauma center, but you do deserve access to a facility that is committed and equipped to give you optimal care for your injury. If the facility you reach is not prepared to provide the care you need, you must be expeditiously transferred to a level of care commensurate with your injury. Hence my title, "Wherever the Dart Lands."

I've chosen to bracket this lecture in a time frame that mirrors my own career in trauma and my own life. It's tempting, when speaking about trauma, to begin with ancient history, and others have done that extremely well. In reading nearly all of the 76 previous Scudder Orations, however, I found no one who started in Evanston, WY, so I thought, if nothing else, there's original material here. Evanston was my hometown, population 3,000. I was inspired by you, Anna Ledgerwood, when you began your Scudder Oration talking about your beginnings in rural America, and I wish to emulate your approach.

Evanston and southwest Wyoming, when I was growing up, had a trauma system that was mostly my uncle Gilbert. Gilbert was county coroner and owned the funeral home, but he also taught first aid, and whenever there were injuries on the roads or ranches, he and his mortuary helper could slip out the coffin rollers in his 1951 Cadillac combination hearse and ambulance, slip in a gurney, stick on the flashing red light, and be on their way. His son and sometime assistant told me they occasionally had to interrupt a funeral for a trauma call. It was a somewhat delicate maneuver to offload the casket and take off for the scene of the trauma, not to mention disconcerting to bystanders, when the hearse arrived. No doubt some of them wondered about a conflict of interest; would they turn left to the mortuary or right to the hospital?

Evanston also had a disaster plan, born out of civil defense in World War II, and Gilbert organized the town's response to The Great Train Wreck of November 1951, in which one passenger train slammed into the back of another during what would turn out to be the worst blizzard of the winter. That year the Annual Clinical Congress of the American College of Surgeons (ACS) met in San Francisco, November 5 to 9, at the Fairmont Hotel. On Sunday, November 11 at 5 PM, several of the attending surgeons and their wives boarded the streamliner *City of San Francisco* bound for Chicago. Eighteen hours later at Evanston, WY, the *City of San Francisco* ran a red light covered over by new snow and hit the back of the halted *City of Los Angeles* with such force that the mangled cars took out a freight train on the sideline. Some of the surgeons died; others acted quickly to help the wounded, including one orthopaedist who made his way into the kitchen car and carried out smashed orange crates to serve as splints for broken limbs—perhaps inspired by the Annual Oration on Fractures, at that year's Clinical Congress, which would be renamed The Scudder Oration, the next year. Figure 1 shows pictures from the local newspaper about the worst rail accident in many years. As an 11-year-old boy, I was taken by my father, a locomotive engineer running the great steam engines, and my hero, to see this crash because

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Figure 1. Train wreck, Evanston, WY, November 1951. From the *Unita County Herald*, Evanston, WY, November 16, 1951.

the engineer was a next-door neighbor and friend. This was my first exposure to mass casualty, and it awakened my interest in trauma.

Thanks to Rollo Hanlon, MD, FACS, I was able to go further in my research and find the program of the 1951 Clinical Congress of the American College of Surgeons (Fig. 2). You can see the names of some stellar surgeons leading us at that time: Blalock and Wangenstein and Frank Glenn, among others. Figure 3 shows the Oration on Fractures, given that year by the British Sir Reginald Watson Jones.

Now, if I might fast forward in time 11 years, again using my own experience in the world of trauma to bracket this lecture, I started my internship in 1966 under Dr J Englebert Dunphy, as did several others in this room as you'll see, and under Dr William Blaisdell. I would point out that before 1966 there were no formal trauma centers and certainly no trauma systems in the United States. However, as my good friend J David Richardson points out, there may not have been formal trauma centers in those years, but there were hospitals with surgeons dedicated to the care of injured patients, including his own in Louisville. I think that's an important point because one of the central themes of this lecture is the importance of surgical volunteerism. Trauma centers and trauma systems here and around the world are successful only because of the volunteerism, commitment, and passion of trauma surgeons such as those sitting in this room. The year 1966 was an important one; the monograph, *Accidental Death and Disability: The Neglected Disease of Modern Society* was written.[1] Today, I worry that we may not have come far enough, fast enough, that we will fail to recognize trauma as the neglected disease of the 21st century; this recognition will be part of my call to action.

I had the opportunity to interview Dr Blaisdell at the 2009 Pacific Coast Surgical Association Meeting (Fig. 4) at the Fairmont Hotel in San Francisco, the same hotel that hosted the 1951 Clinical Congress, and I asked him about 1966. He had told us many times, "Everything changed then." It was the advent of Medicaid and Medicare, and psychiatry units closed and emptied their disturbed patients onto the streets. There were drugs and violence. At the time of the Vietnam protests, crimes of violence doubled, which Dr Blaisdell said was the impetus to create a more formal trauma center at the San Francisco General Hospital. If you haven't read it, I would highly recommend Dr. Blaisdell's 1991 Presidential address at the American Association for the Surgery of Trauma on the pre-Medicare role of the city and county hospitals in education and health care.[2] There were 12 great public hospitals; almost all of the first hospitals in the United States developed as a result of the need for indigent care. These were the primary institu-

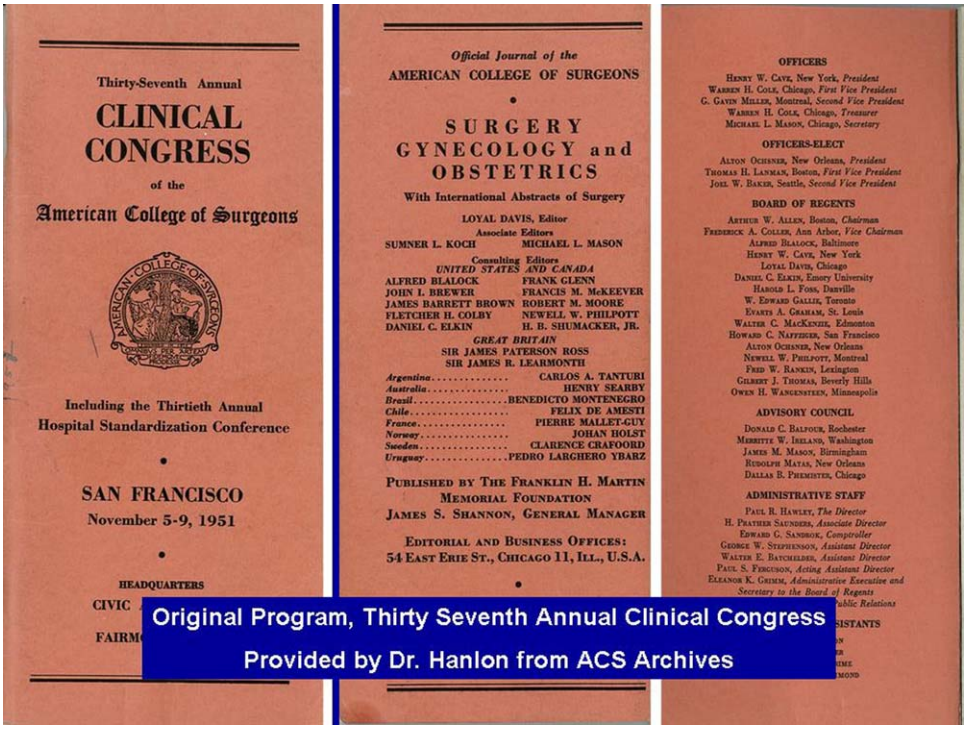

Figure 2. Original program, 37th Annual Regional Clinical Congress. (Courtesy of Dr C Rollins Hanlon, American College of Surgeons Archives).

tions for the care of the injured during most of our country's history, and the vast majority of advances in trauma care arose from these great public hospitals (Fig. 5). I'm sure there are surgeons in this audience who may see their own beginnings in trauma in one of these hospitals. But the two that are considered to be the first two trauma centers, San Francisco General with Dr Blaisdell, who, was the Scudder orator in 1982, and Cook County, in Chicago with Dr Robert Freeark, who was the orator in 1985. Dr Freeark talked about an "accident hospital," but he proposed a different kind of hospital: one that would be the focal point of a *system* of care.

I can't resist commenting on being a boy from Wyoming, going to San Francisco in the 1960s. It was culture shock, with the Grateful Dead, the peace marches, LBJ as President; we were embroiled in the Vietnam War, drugs were rampant, and, as somebody said, "If you remember San Francisco in the 60s, you weren't there." I'm using this opportunity to tell you that I do remember San Francisco and I was there. It's just that I was spending most of my time, like all the other surgical residents with no work hour restrictions, at the San Francisco General Hospital. Our trauma team during the period 1966 to 1972 consisted of George Sheldon and Don Trunkey, Frank Lewis and myself (Fig. 6). Don Trunkey and George Sheldon, being ahead of Frank and me, were chief residents when we were junior residents, but we too evolved to the position of chief residents at UCSF.

Time doesn't allow me to talk about all the people who have made seminal contributions to trauma system development in this country but I would be remiss not to mention Dr David Boyd, who made the first effort toward founding trauma systems at a federal level, when he was appointed by the Secretary of Health Education and Welfare to head up the Emergency Medical Services (EMS). There was funding in the 1970s, we had momentum, and David Boyd took advantage of that and had us on our way until the 1980s, when all of that funding and that enabling legislation were eliminated and we went into a slump from which we're still trying to recover. Dr R Adams Cowley trained some of you at Maryland Shock Trauma, which we acknowledge as the first statewide trauma *system*.

In "Systems of Trauma Care: A Study of Two Counties,"[3] by Drs Donald Trunkey and John West, they compared San Francisco and Orange counties after we all had finished our surgical training in San Francisco. This is a foundational paper because they did the first preventable death study. They showed that the preventable death rate in Orange County was significantly greater than in San Francisco, which had a *de facto* trauma system because all trauma patients in the city and county were taken to the San Francisco General Hospital. It was that paper and the influence

Figure 3. The 37th American College of Surgeons Clinical Congress Oration on Fractures, Sir Reginald Watson-Jones.

of Drs Trunkey and West that led us in San Diego to do our own preventable death study, called "The Amherst Study," which, incidentally, was funded by the County Board of Supervisors to determine whether we needed a trauma system in San Diego County. When we did our study, we found we had the same unacceptably high preventable death rate, 22%. But guess what? It wasn't because of one or two bad hospitals. Every one of our hospitals was striving to do the best it could but shared this 22% preventable death rate because we had no trauma system. We did not always have surgeons available; we didn't always have blood available, or experienced triage nurses, or specialists. However, once the system was instituted, the preventable death rate fell to 1% to 2% and remains there through today. Evidence of the efficacy of a trauma system.

Fortunately, we had surgical champions because no trauma center, let alone system, can ever be created without them. In a slightly biblical reference, let me say that in the beginning there were trauma surgeons. In San Diego those were Richard Virgilio, David Hoyt, and Steve Shackford, and I had the honor of working with them at that time. We were followed by a legion of others who created the San Diego trauma system. Dr Richard Virgilio had come back from Vietnam and made a statement before the Board of Supervisors that a soldier wounded in the rice field in Vietnam has a better chance of survival than a trauma patient in San Diego, and that launched us. From the beginning, our Medical Audit Committee (MAC) had delegates from the entire system—the 5 designated adult centers, the 1 pediatric center, as well as the medical examiner, surgical specialties, anesthesia, nontrauma hospitals, and county officials—and all gathered on a monthly basis. This has continued uninterrupted for 25 years and is now chaired by Dr Raul Coimbra; it continues to do the work of peer review and quality improvement that I believe holds our system together.

Some of us had the opportunity to participate in creating "The Model Trauma Care System Plan" in 1992.[4] Drs Ronald Maier and Bill Schwab were two of the key people, and in that document the term *inclusive trauma system* was first used. Emergency room physician Dr Ricardo Martinez was on that committee and later became director of the National Highway Traffic Safety Administration. I give Ricardo credit for coming to one of our breakfast meetings with a napkin on which he had drawn a curve depicting the relationship of the volume of trauma patients stratified by their severity of injury. He said, "You know what we've done is focused only on the severely injured patients and only the Level I and II trauma centers." We had neglected those patients with moderate and minor injuries. An inclusive system must encompass the entire continuum of care including all injured patients. It must go beyond the hos-

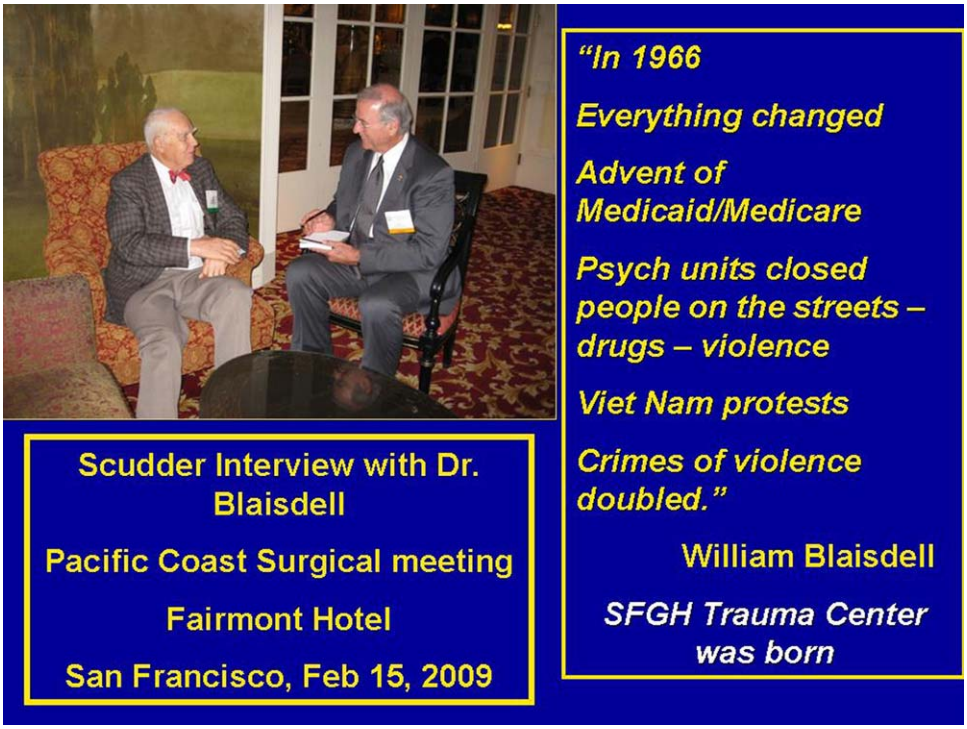

Figure 4. Scudder interview with Dr William Blaisdell, February 15, 2009.

pital, must include prevention, prevention, prevention, and it must address the critical element of rehabilitation and even end of life care.

In 1998, the Skamania Symposium in Washington was organized by Dr Trunkey and his colleagues. This was a search for evidence supporting trauma system development, which led to the writing, in 2006, of the "Model Trauma System Planning and Evaluation."[5] Many of the

Figure 5. The great public hospitals.

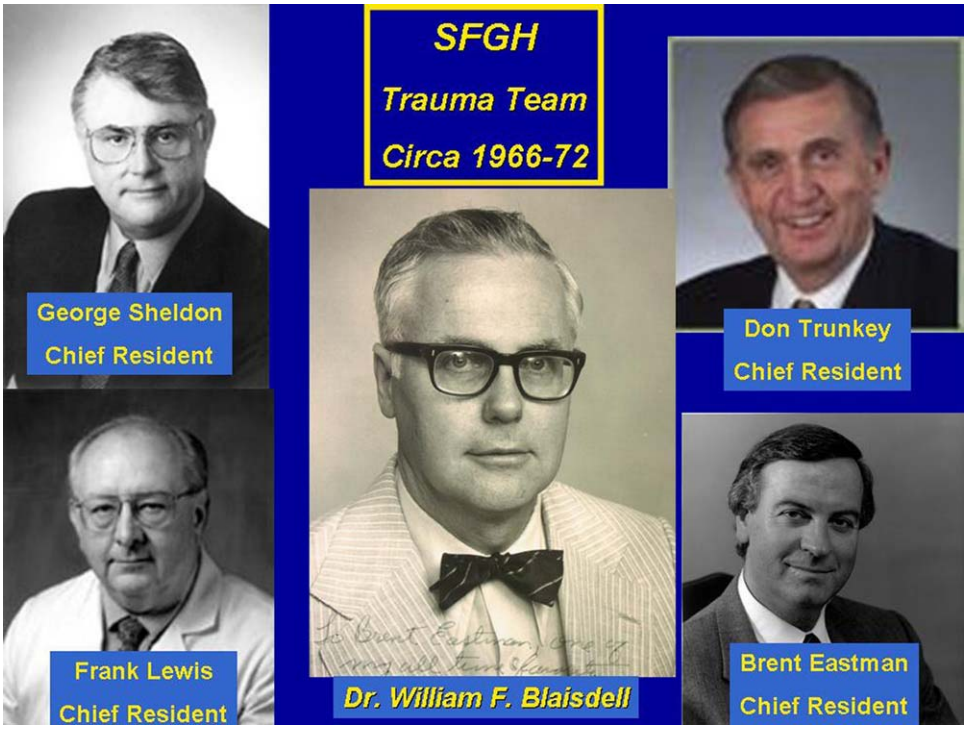

Figure 6. San Francisco General Hospital trauma team circa 1966 to 1972.

people in this room participated in this, which was an extension of the 1992 document. The important thing for you to know about this paper is that it is fundamental to the development of trauma systems today because it incorporates the concept that *injury is a public health problem.* In fact, it may be our worst public health program; it may be our worst global public health problem. So this helps us design systems to take that into account.

What is the current status of trauma systems in the United States? The map in Figure 7 is an update on trauma *center* status, courtesy of Anthony Carlini from the American Trauma Society, Trauma Information Exchange Program. It shows the distribution of trauma centers and was updated within the last few months, and Anthony was willing to share this. He also provided data to show the progress we've made: a big jump, for example, in Level I and II trauma centers between 1991 and 1992 and then a leveling off.

I realized that we had not had an update on which states in the US had a trauma *system* so I embarked on a survey with the aid of Dr Peggy Knudson, vice-chair of the Committee on Trauma (COT), who assisted me in asking all 50 state chairs of the COT 3 questions:

1. Does your state have a **state-wide trauma system**?
2. If not, does your state have any **regional systems** or any verified or designated centers?
3. Does your state **collaborate with any other state** in a system of care?

Figure 8 shows the results. This, I believe, is the most current look at this country in terms of states with trauma systems and those who are in the progress of trying to develop trauma systems. Dr Sheldon and his colleagues at the ACS Sheps Health Policy Institute put this into a pie graph, which shows that about two-thirds of the states today have some type of trauma system, which, I would hasten to add, could be a trauma system at the most basic level. All the respondents had to show for a "yes" answer was that their state had a trauma plan and existence of the imperative enabling legislation. On the other hand, they almost all lacked adequate funding for sustainable trauma systems. However, this survey has provided a valuable database because the answers to those 3 questions provide important and useful material from trauma surgeons about their challenges in building systems in their respective states. These data will be shared with the Committee on Trauma for their continued efforts in trauma system development.

Among all of the responses, over 90% said inadequate funding is a major problem because of a lack of support both at state and federal levels. This was particularly emphasized in some of our western states, where, as one state chairman said, "Personal freedom is cherished above all."

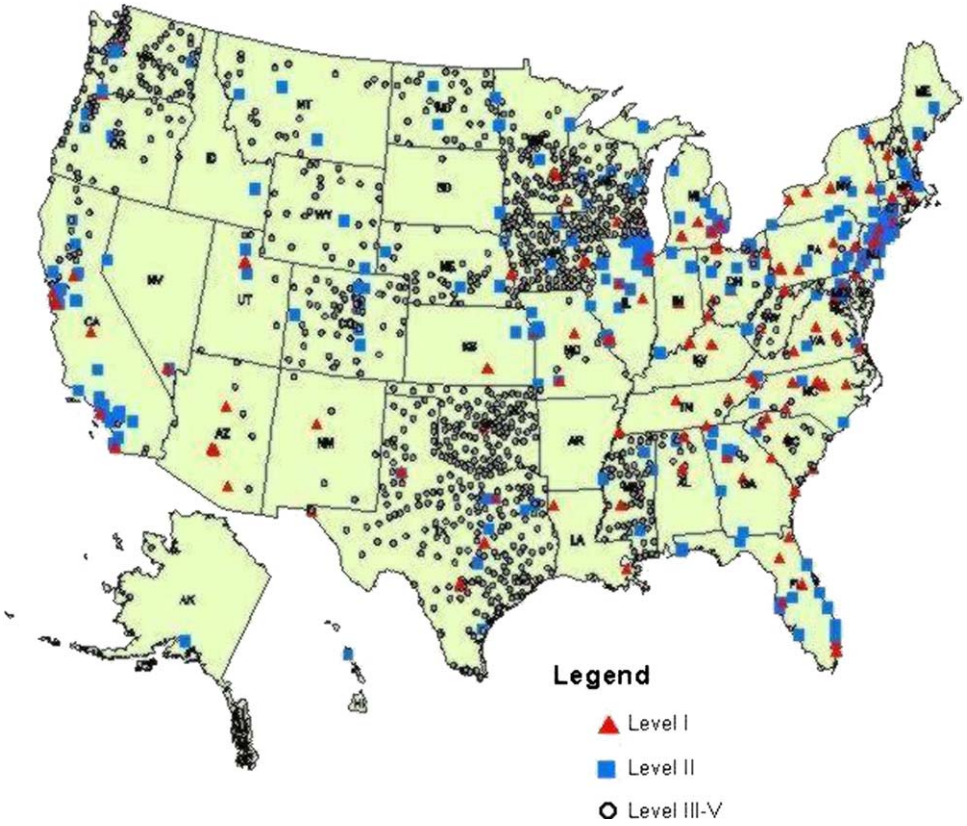

Figure 7. Updated trauma center status, July 2009. (Courtesy of Anthony Carlini, American Trauma Society, Trauma Information Exchange Program).

He said, "We have no trauma system, we have no seatbelt laws, we have no helmet laws." So there are still tremendous barriers to overcome to accomplish what we need to do in establishing trauma systems everywhere in the country—wherever the dart lands.

The other important thing these data speak to is the need for surgical leadership in the development of any trauma system. We also found that states vary greatly in what they are doing with the development of trauma systems. Some states have only a few verified trauma centers and, by contrast, a state like California has several regions with functioning systems and a plan to merge these regional systems into a state plan. Figure 9 shows the regions — it's a big state. I acknowledge Jonathan Jones for providing this map, which was meant to represent these 5 regions working together. Dr Coimbra is the leader in our southernmost region, including San Diego; Dr Hoyt is the leader in his region just to the north, and is the person who has led the development of the state-wide plan for California, which will, in the near future, bring these 5 systems together for a truly state wide system (a "system of systems") comprehensive statewide system or a "system of systems".

The map in Figure 10 is the centerpiece of this lecture. It is based on unpublished data provided to me by Lee Annest, PhD National Center for Injury Prevention and Control, CDC. I am a member of the CDC's Scientific Advisory Board and was there a few months ago, saw this map, and asked Dr. Annest if I could use it for this lecture. I would ask you to look carefully and see that this is, first of all, not the returns from the last Presidential election, although the red and blue distribution is similar. This is the death rate per 100,000, which is smoothed, meaning that they took into account the disparity and the discrepancy between counties with varying populations. It's age adjusted, and this particular map is looking at the death rate per 100,000 for people who die on our roads—not just occupants of cars, but pedestrians and bicyclists as well. I believed that we could do something with these data, and I spoke to Charlie Branas and his colleague, Dr. William Schwab at the University of Pennsylvania, who had done some remarkable work in which they mapped the time to a Level I or II trauma center. I asked if they had ever thought about overlaying their map on death rates to see if there's any correlation. So they did that, and we have this map, courtesy of the cartographers at the University of Pennsyl-

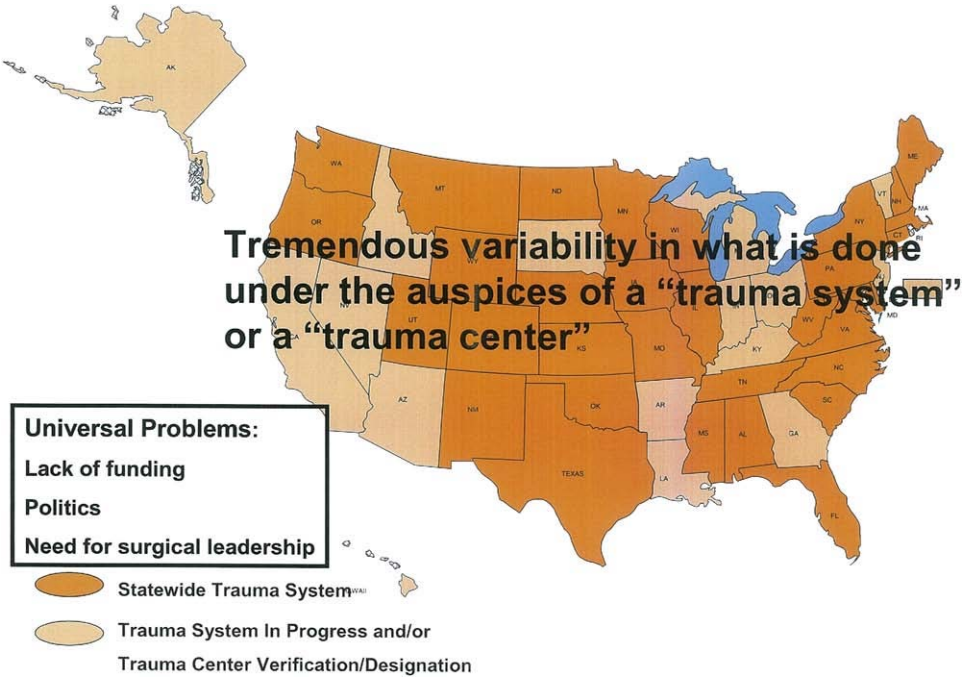

Figure 8. Status of trauma systems in the US, 2009. Based on the American College of Surgeons (ACS) State Chair Survey. (Courtesy of Tom Ricketts, PhD, George Sheldon, MD, FACS, and ACS Sheps Health Policy Institute).

vania (Fig. 11), showing us what we intuitively know: that long travel times equal high death rates. Lack of proximity to a trauma center or the appropriate level of care results in high death rates.

I thought we would take the next step and look at the issue that George Sheldon has made us so aware of: that we have a shortage of surgeons in this country. Some of you remember that Richard Cooper gave the opening address, the American Urological Association Lecture, "The Coming Era of Too Few Physicians," at the ACS Clinical Congress in 2007 in New Orleans, and he talked about the physician shortage. The striking thing is that we are going to be short 200,000 physicians by the year 2020 and, contrary to much of what is being said in discussions today about health care reform, which is that "we're only going to be short of primary care physicians," I submit we're going to be short of specialists, we're going to be short of surgeons of every specialty, and we'd better do something about that. One thing I propose we do about it is take the work of George Sheldon and Tom Ricketts demonstrating where we have surgeons and where we don't (Fig. 12). Big circles are good, little circles are bad. At my request they did the same thing, they took the data from Lee Annest at the CDC; he allowed them to take his map and superimpose the distribution of surgeons in the United States on death rate. Look carefully, there is a lot of dark brown in the center of the country and that means the highest death rates. These death rates tell us that it is not good to be hurt in rural America. This is added impetus for us to support our surgeons who work diligently in the less populated regions of our country, often without the support and resources of those working in urban and suburban regions. Conversely, we have a concentration of surgeons on both coasts. In Washington D.C. today, some argue that this is just a maldistribution problem, but we disagree. There is going to be an absolute shortage of surgeons in this country, and yes, we must be part of the solution for this surgical problem. For example, we must determine how to provide neurosurgical coverage when there are only 3,000 or 4,000 neurosurgeons in the entire country. I believe this is our responsibility as surgeons. I submit that trauma care in the United States needs a surgeon. We must never let this message die.

We must strongly bring this message to the health care reform debate. One of the central things we have to convey is what we tried to do on the Institute of Medicine Committee on the Future of Emergency Systems. That message is that we have the model for much of what is being debated in the halls of Congress today regarding access, quality, and evidence based medicine-that solution is called an Inclusive Trauma System.

We are the American College of Surgeons of the United States and Canada and, although I haven't focused on Canada, with the help of Drs Richard Simmons and Sandro

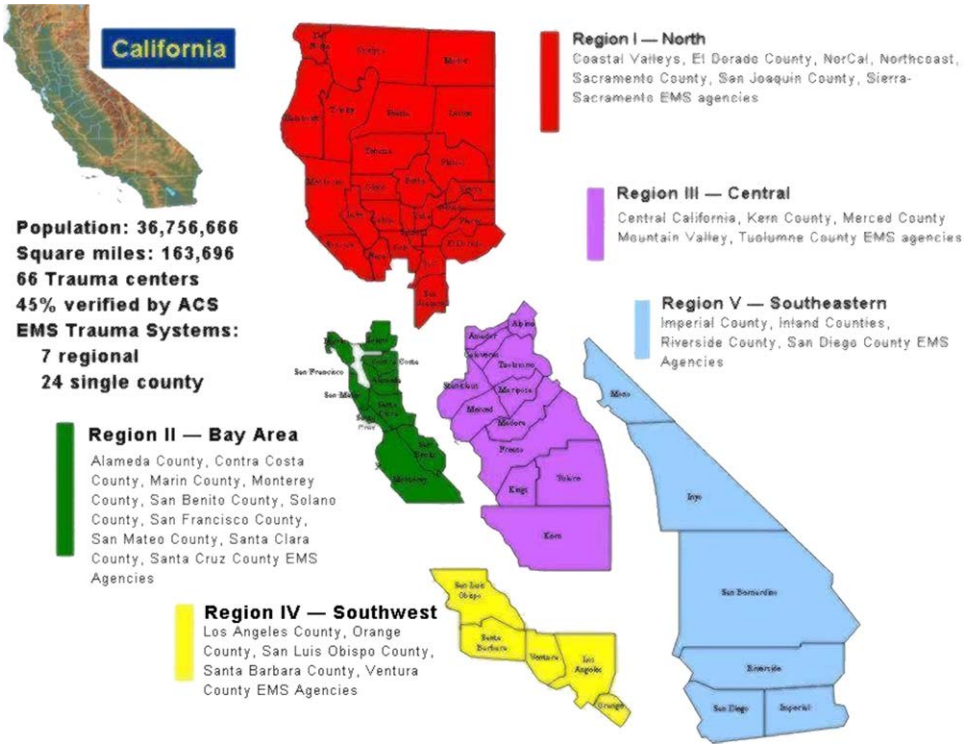

Figure 9. California regional traumas systems. (Courtesy of Jonathan Jones, California Emergency Medical Services (EMS) Agency).

Rizoli, the Canadian regions chiefs of Regions 11 and 12, I was able to get current information on the status of trauma systems and centers in Canada. Those in the audience who are from Canada, and many of us traveling in Canada, should know they, too, have a skew in the distribution of their trauma centers, which tend to mainly lie along the United States border. Dr Simmons was able to give me this information and I won't go into detail except to say that most of the provinces in Canada do have province-wide regionalization or a trauma system. Most of them also have designated and certified trauma centers. The exceptions are the provinces of Saskatchewan and Manitoba. There they have 3 university centers that are *de facto* trauma centers, where seriously injured patients are transported, however they do not have organized provincial trauma systems. Canada has done a superb job with trauma care and has very strong leadership with people like Drs Richard Simmons and Sandro Rizoli as the Canadian region chiefs. Thank you both for providing these data to me. Invoking my metaphor, *wherever the dart lands*, we see the same problems that we have in the US. If that dart happens to land in rural Canada or the Territories, the death rate is unacceptably high and the only solution to that is establishment of a Canadian trauma system(s).

The Trauma System Consultation Committee of the ACS is critical to the solution of this problem. We formed this committee in 1994, with Dr Wayne Meredith as a founding member. Dr Robert Mackersie took over the chair from me and Dr Michael Rotondo leads it today. The document we put together was fairly basic and was based on the Health Resources and Services Administration (HRSA) document, the 1992 "Model Care Trauma Plan." More recently the Committee on Trauma, led by Avery Nathan and his team, have done an excellent job of creating a more sophisticated document to help our teams when they do state trauma system consultation visits. The goal is to help move any systems, whatever their stage of development, to the next level. In Figure 13, you see the states that have had an ACS Trauma System consultation, those that are lacking, and those that were recently done. This is a significant accomplishment, but it is very labor intensive. We must find a way to do it more efficiently because it's something that the United States desperately needs. We must be available to states like Idaho, if they request our help, to aid them in establishing a trauma system. Dr Winchell did an analysis of this process and concluded that consultations had not managed to solve the funding problem, one of our major challenges, but they have been very helpful in many other areas of trauma system development. I'll not dwell on the many lessons learned from the consul-

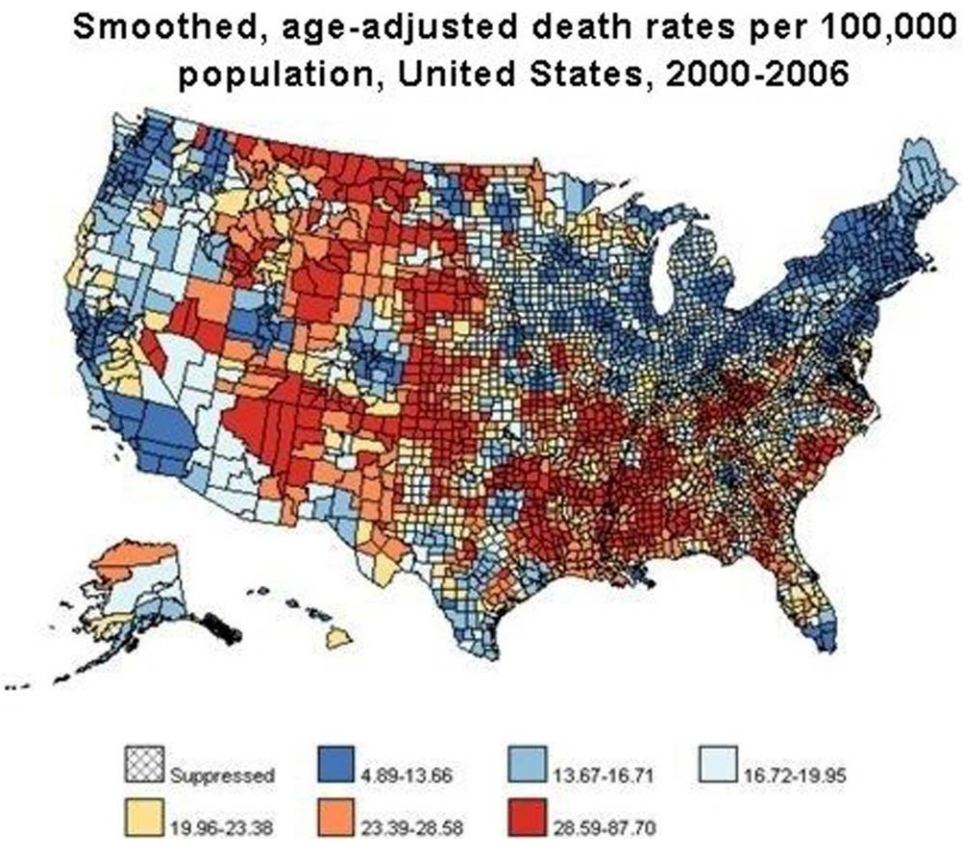

Figure 10. Motor vehicle traffic deaths per 100,000; 2000 to 2006. Smoothed, age-adjusted death rates per 100,000 population (motor vehicle, traffic, unintentional, all races, all ethnicity, both genders, all ages). Age-adjusted rate for United States: 15.31 per 100,000 population. (Unpublished data reproduced with permission of Lee Annest, PhD, Office of Statistics and Programming; National Center for Injury Prevention and Control, Centers for Disease Control).

tation visits except to say that there is important information gleaned, catalogued, and then shared during other consultation visits.

Do trauma systems make a difference? To ask this question would, with this audience, be preaching to the choir, as would my answer when I say, they do and they must make a difference. If we are to decrease the unacceptably high death rates that you have seen in Figure 10, we must establish trauma systems. If we don't do this we run the risk of trauma being "the neglected disease of the 21st century." Ellen McKenzie and colleagues[6] published an elegant paper in the *New England Journal of Medicine* showing that the risk of death is 25% lower if you have a system that gets you to a trauma center.

So now, with maps and tables and data, I would like to depart from the format of many other Scudder Orations and tell a patient story. According to Carlos Pellegrini, MD, FACS, Chair Department Surgery, University of Washington, the WWAMI system—Washington, Wyoming, Alaska, Montana, and Idaho—started out as an educational system in 1972, but it evolved into a trauma system under the leadership of Drs. Carrico, Maier, Jurkovich, and others. I posed the question, "What if the dart landed in this system that's been in place for 25 years? Would the trauma system make any difference to the injured people?" I'll answer my own question and tell you it did make a difference for Johan and Jenna Otter. Johan is an employee at our Scripps Health system in San Diego. He is one of our most valued and beloved managers. Johan came to me a couple of years ago and said that his daughter Jenna, for her high school graduation trip, wanted to take a hike with him and asked where they should go. I suggested my home state and specifically, Jackson Hole, WY. He took my advice partially and they went to Jackson Hole, WY, but they also went on to Glacier National Park, MT. This is going to be the story of the Kalispell Regional Medical Center, a small and excellent hospital in Montana, and the Harborview Medical Center, the WWAMI regional Level I trauma center in Seattle.

Johan and Jenna, hiking alone on a cold morning with

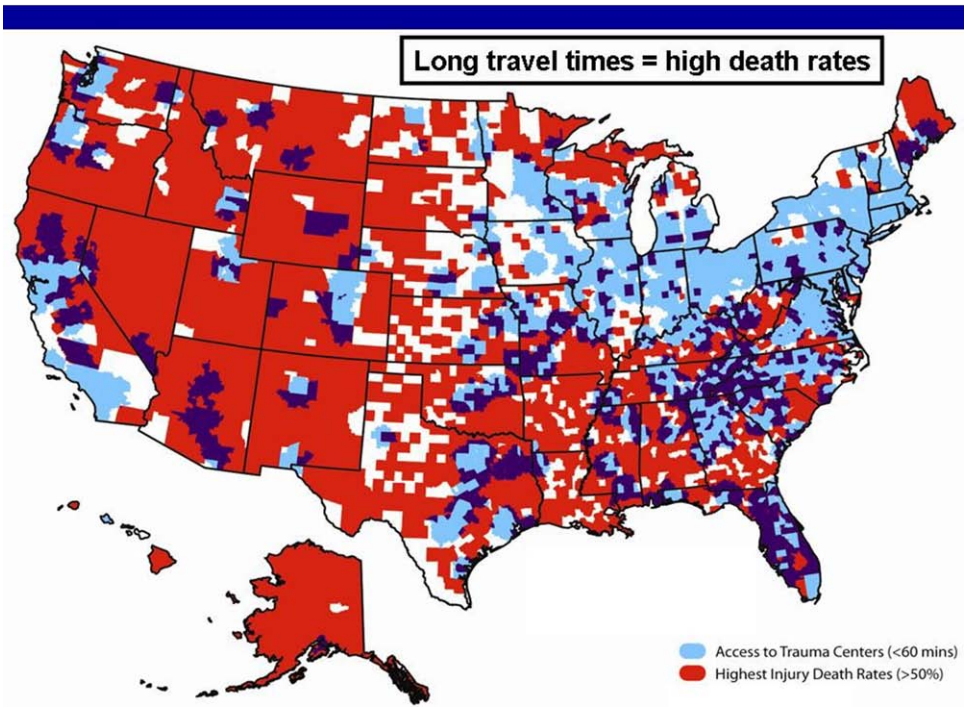

Figure 11. Access to trauma centers. (Courtesy of Charles Branas, PhD, Cartographic Modeling Laboratory, University of Pennsylvania, 2009).

fresh snow, encountered a sow grizzly bear with 2 cubs. Jenna, who is very fit and was bound for a career as a classical/modern dancer, was leading when the mother grizzly came around a bend in the trail. Johan heroically got himself between the bear and his daughter and took the brunt of the attack. Although Jenna was also badly mauled. In trying to escape Jenna fell 50 feet to a ledge below. Johan, fighting with the bear, fell, with the bear, to the same ledge. The bear continued to maul him then moved to Jenna, mauled her, and then returned to the trail and to her cubs.

This trauma scenario demonstrates an inclusive trauma system at its finest. First there was the prehospital component, including a 6-hour heroic helicopter rescue to get both victims off the ledge. Johan and Jenna couldn't see one another, but were talking after they finally established that the bear had left and they were both alive. Johan had a 60% scalp avulsion, an unstable C-spine fracture, multiple vertebral fractures, bites, a claw injury to his right eye with the rectus muscle lacerated, fractured orbit, and some psychological trauma. Jenna had a severe laceration to the right side of her face, fortunately missing the facial nerve, a deep bite in her shoulder, and on and on. They were resuscitated and stabilized at the Kalispell Regional Medical Center. I had a call from Dr Iwerson, the trauma surgeon there, who told me that one of our employees, Johan Otter, was in his emergency room, and was one of the most badly injured survivors of a grizzly bear attack he had ever treated. He said Johan was awake and told him to call his trauma surgeon, Dr Eastman. I have to tell you Dr Iwerson didn't sound too pleased to call me and in fact, allowed that he thought perhaps he, in Kalispell, MT, had taken care of more grizzly bear attacks than I had in San Diego. I, of course, agreed with that. We also agreed on the next course of action, which was that Jenna could stay in Kalispell, but Johan had to get to the Harborview Level I trauma center. This story has a happy ending and demonstrates the triumph of an inclusive trauma system from rescue to recovery and rehabilitation. Today, we can celebrate one of our exemplary inclusive trauma systems. There are other great trauma systems, but what they've done in the Northwest with leadership from the trauma surgeons at Harborview is a model, especially in the area of rural trauma care. By the way, Johan and Jenna returned to Glacier to finish their hike in August of 2007 with their rescuer, Gary Mosley, who was named Ranger of the Year for his team's heroic effort. Also, far from being defeated by this tragic event, Jenna has now decided to pursue a career in medicine as well as dance. Johan and Jenna Otter are here today as a tribute to all of you who are dedicating your lives, your volunteerism to creating and staffing trauma systems. I'd like to ask Johan and Jenna to please stand, lest anyone still questions whether trauma systems make a difference.

I will not have the time to go into any detail about the global epidemic of trauma, but at that same Pacific Coast

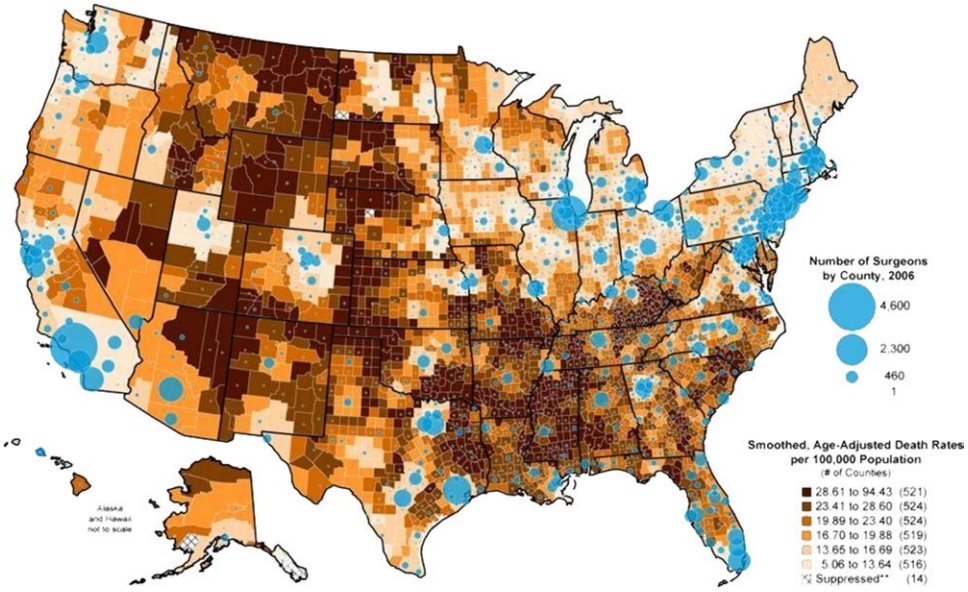

Figure 12. Number of surgeons by county in 2006 combined with smoothed, age-adjusted death rates per 100,000 population (motor vehicle, traffic, unintentional, all races, all ethnicity, both genders, all ages). American College of Surgeons Sheps Health Policy Research Institute – Chapel Hill. (Courtesy of Thomas Ricketts, MD and George Sheldon, MD, 2006).

Surgical Association meeting in San Francisco in February 2009, where I interviewed Dr William Blaisdell, I also had the opportunity to interview Dr Haile Debas, Executive Director, UCSF Global Health Sciences (Fig. 14). He said that "we do have a global endemic of trauma, greater than AIDS or malaria. Trauma care is rudimentary in sub-Saharan Africa." "We need trauma systems," he said, with no prompting from me. "We need to use cell phones, wireless networks, new technology. Global health should be the pillar of our US foreign policy and we should have a *diplo-*

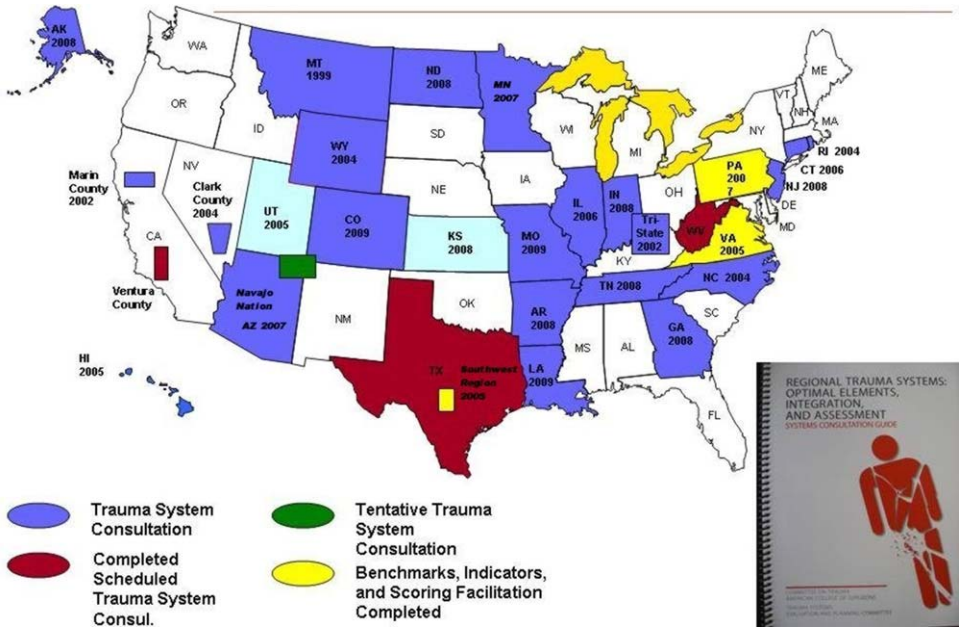

Figure 13. Trauma Systems Evaluation and Planning Committee consultations and facilitations. (Courtesy of Holly Michaels, American College of Surgeons, September 2009).

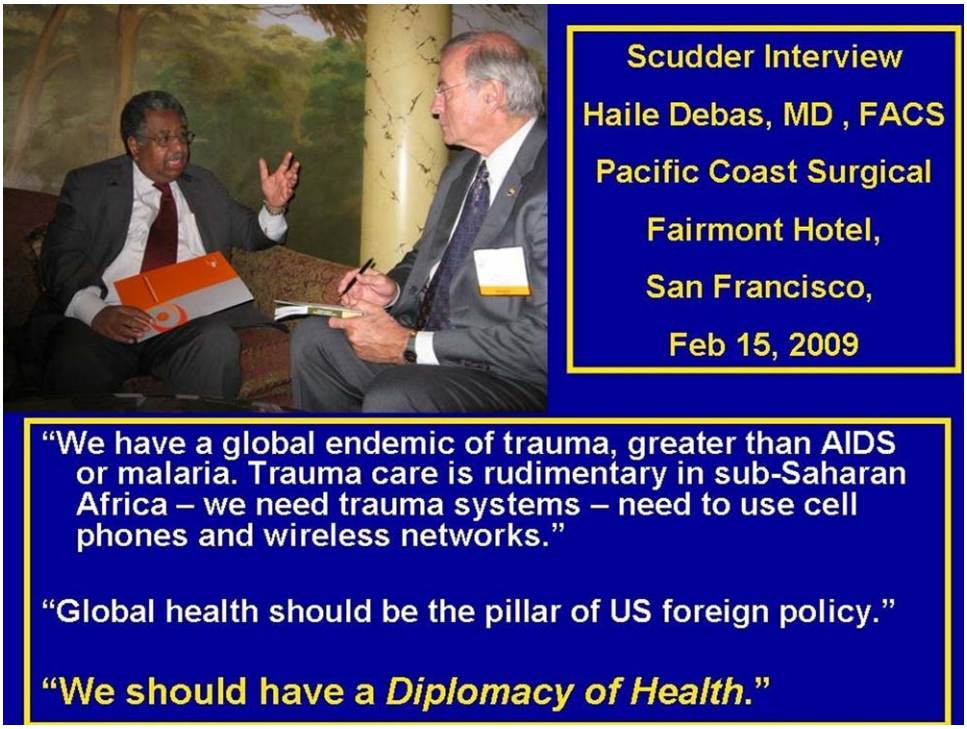

Figure 14. Interview with Dr Haile Debase, MD, FACS, February 15, 2009, regarding the global epidemic of trauma.

macy of health." I think that our ACS Advanced Trauma Life Support program embodies that principle beautifully.

I had the opportunity, thanks to Dr Richard Hunt, who is here today, to join the team from the CDC to travel twice to the subcontinent of India. India is establishing a trauma system for their vast population. They have extraordinary issues with their roads, such as sharing them with camels, cows, and elephants, which result in the highest road traffic mortality rate in the world: more than 200,000 road deaths per year. India intends to build a new road system the entire length of the subcontinent and, with help from the CDC and the World Health Organization, according to Richard Hunt, CDC, Center for Injury Prevention and Control, National Highways Development Project, (December 31, 2006). In addition to the new road system, they are also building a trauma system. Their communications will be based principally on cell phones because they are not encumbered by landlines; they've skipped that whole technology. More than half the people in India and in Pakistan have cell phones along with the other four billion cell phones in the world today. We met with a Pakistani neurosurgeon, Dr Juma, when we went to India last time. We actually had to meet in Dubai because our state department would not allow us to travel into Pakistan. One of the things Dr Juma told us is that Pakistan, too, is depending on new technology in order to have a trauma system. Dr Juma runs a 3,000-bed hospital in Karachi that sees 2,000 patients a day, including 500 bombing victims a week. So they have a trauma problem of a different magnitude than most of us do.

I will conclude by speaking to what we have learned from our military operations throughout history. We have had surgical leaders and surgical lessons from the Civil War to World War I, World War II, Korea, and Vietnam, but it is important to note what we are relearning in the war in Iraq and Afghanistan today, which is that survival is dependent on the time to definitive care. I, like some of you, have had the opportunity to participate in the Senior Visiting Surgeon Combat Care Program of the ACS and American Association for the Surgery of Trauma (AAST) at the Landstuhl Regional Medical Center in Germany, where I had the privilege of attending in July 2007. Landstuhl Regional Medical Center is an integral part of the Joint Theater Trauma System and we have some surgeons in the audience today who are absolutely central to the development of that system.

This military trauma system provides a model for our civilian systems in this country, particularly in rural America. Remember the map, remember where it's red (Fig. 10); there are important lessons to learn from this war. In the Joint Theater Trauma System they have critical air

Figure 15. Joint Theater Trauma System.

transport—the Critical Care Air Transport Teams—and they also use video conferencing (Fig. 15), which is technology that must be embraced in our civilian trauma systems. This is one of those technologies that can link us, who are privileged to work in a trauma center, with resources and help us extend ourselves out to others. Every week they have a video trauma conference at the Landstuhl Regional Medical Center, and they review every patient from the previous week: what happened in Iraq? What happened in Afghanistan? What happened in Africa? What was done during the soldier's brief length of stay, usually only 3 to 4 days in Landstuhl, Germany and then on to CONUS (the continental United States), to Bethesda if they're Marines, or to Walter Reed for the Army, or Brooke Air Force Base in San Antonio for the severely burned. Two of the many impressive components of the Joint Theater Trauma System are transport and video conferencing.

So let me conclude with another patient story. I hesitated whether to tell this because I was involved in the care of Corporal William Gadsby only because I happened to be in Landstuhl the night he came in. It was my first night. He came in on a C-17 and was reported to have some serious vascular injuries. Because of my interest in vascular trauma I was asked to help care for this patient. Let me point out that by the time I saw this Marine, his life had already been saved by a Navy Corpsman named Kyle who under fire put on tourniquets while Corporal Gadsby was down and bleeding to death in the kill zone. Then he was quickly taken to a forward surgical unit, where an immediate, life-saving, right above-knee amputation was performed and a shunt placed in his left superficial femoral artery. Within an hour the patient was moved on to Balad, a combat support hospital where a very good vascular surgeon (I know he was good because I had the opportunity to close the wounds over his graft) did a reverse saphenous vein interposition graft that would have gratified the vascular surgeons in the audience, including Prof Averil Mansfield from England. It was pointed out to me when I saw Corporal Gatsby in Landstuhl, 23 hours postinjury, that he had already had 2 operations and I was strongly advised to reoperate on the patient that night, and not the next morning, because I would be the first surgeon operating on this Marine who was not under fire. We did operate that night, the patient did very well, was transferred back to Bethesda and then on to the San Diego Naval Medical Center for rehabilitation. There I met Corporal Gadsby again, as you'll see, and met his mother, Cheryl Huffman, who later sent me an article in *Reader's Digest* showing her son with his devastating injuries, receiving the last rites in Iraq. However, when I saw him in San Diego he was in so much better shape than he had been in Landstuhl, Germany the first night on the operating table, when he was shaking violently and I asked him if he was cold. One of the more senior surgeons said, "Dr. Eastman the man's not

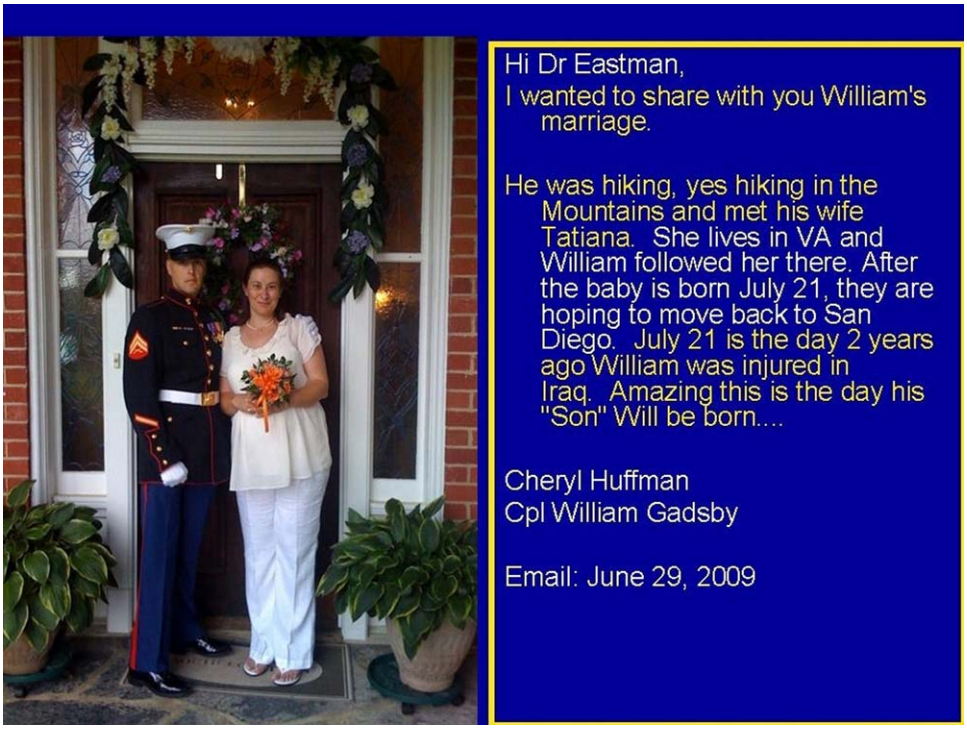

Figure 16. Corporal William Gadsby's marriage. (Courtesy of his mother, Cheryl Huffman).

Figure 17. Our challenge: develop inclusive trauma systems in the US, Canada, and around the globe.

cold, he's frightened." But when I asked, "Corporal Gadsby, are you frightened?" he said, "No sir, I haven't been frightened since I was bleeding to death in the kill zone. I'm cold, could you get me a blanket please?" I knew that I was always going to admire and want to stay in touch with Corporal Gadsby. His mother sent me another email last June, saying, "Dr Eastman, I wanted to share with you William's marriage. He was hiking, yes, hiking, in the mountains and met his wife-to-be Tatiana, who lived in Virginia; and William followed her there and they fell in love (Fig. 16). They're expecting a baby and are hoping to move back to San Diego." And here was the most striking part of the message. "William's baby will be born July 21, 2 years to the day after William was injured in Iraq."

To end this lecture on trauma on a happy note, baby Kyle Gadsby, named for the Navy Corpsman who had saved his father's life, was born on July 21, 2009, exactly 2 years to the day his father nearly died in Iraq. I would submit that Kyle looks like a Marine-to-be. I would also say that the Joint Theater Trauma System has components that we should embrace, that we should study, and we should bring into play in the civilian population, just as we're bringing in clinical lessons such as the use of tourniquets, factor VII and the treatment of traumatic brain injury. Equally important are the systems lessons, such as C-CAT and video conferencing.

While I was at Landstuhl, Brigadier General David Rubenstein came over and met with me, and I'd like to share this final quote, which Dr Rubenstein told me is kept in his office. It is a quote from the Mayo brothers, which says, "The only victor in war is medicine." I would certainly concur that most of what we know as trauma surgeons today has been learned from military conflicts. If we must have war, let us continue to learn.

And now I would like to pay tribute to Corporal William Gadsby, a brave Marine and a brave patient. At the same time I wish to recognize all the military surgeons in the audience who continue to care for and save our wounded warriors in Iraq and Afghanistan every single day. So first I would like to ask Corporal William Gadsby, who came today; he had a heck of a time trying to find this room, but I'll tell you he ambulates so well on his above-knee prosthesis that he got here right on time. I asked him if he would come and be a tribute to the military trauma surgeons, and to all trauma surgeons in this audience, who care for grievously injured patients every day. So it's really my great, great pleasure to ask William to stand and be recognized.

I now ask all the surgeons who have helped take care of our troops in this war, thousands of William Gadsbys, to also stand, and William, please turn around, because you'll see the people that you most dmire. Would all the surgeons here who are the regular military surgeons or who have served in Iraq through the visiting surgeon program please stand?

I'll conclude by saying that our challenge as trauma surgeons of the United States and Canada is to persuade the powers that be to support the development of inclusive trauma systems for every citizen and traveler, in every state and province, wherever the dart lands, and, when asked, to share our knowledge around the globe (Fig. 17), as the American College of Surgeons is doing so well in such areas as Advanced Trauma Life Support. Thank you for allowing me the privilege of presenting this Scudder Oration.

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