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1982 A.A.S.T. Presidential Address: The Trauma Center: Its Hospitals, Head Injuries, Helicopters, and Heroes

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In March 1966 my colleagues and I opened what is generally regarded as the first trauma center in this country at Cook County Hospital in Chicago. Coincidentally, it was the same year the classic white paper was released from the National Academy of Sciences identifying trauma as "the neglected disease of modern society" (1). In the 16 years that followed, remarkable changes have occurred in the care of the injured in this country. It is my intention this morning to review briefly some of the changes as they relate to what I believe is the hub of the nation's emergency care system—the trauma center.

Before addressing several specific issues, let me briefly set the stage by making four assumptions that will underlie the remainder of my remarks:

1) First, I believe trauma centers and, indeed, the entire regional emergency medical system are here to stay. They have proven their effectiveness, and the public, the politicians, and the profession will soon insist that they be readily available and perform in an acceptable manner (10, 11).

2) The important decisions regarding location, categorization, and designation of trauma centers relate primarily to advanced, regional, or so-called Level I centers. Once high quality Level I centers are operational the need for and the role of additional less sophisticated centers will be easy to define.

3) Level I centers exist to take care of the 5% of injuries that are urgent, life-threatening, and require skills, equipment, and staff not available in most hospitals. In order for them to function efficiently, we probably need far fewer than the 350 originally proposed, and we need to expand the individual capabilities and workload of each Level I center.

4) The problems of designation, or the decision as to which hospitals should be recognized as trauma centers, will soon be resolved as ego, pride, and avarice are brought face to face with economics, expertise, demonstrated commitment, and enlightened governmental influence.

In short, we need I's before II's, fewer and better I's, and more economics and less ego in the designation process.

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With these totally unsubstantiated assumptions as a background, I would like to direct your attention to four specific issues important to the future of trauma centers. For convenience, I will identify them as the four H's—hospitals, head injuries, helicopters, and heroes.

HOSPITALS

Historically, the concept of an entire hospital or unit dedicated largely or exclusively to the care of the injured was well established in the earliest of military conflicts and in several centers in Europe. The assumption that a single physician could encompass all of the skills and knowledge necessary to care for the injured was quite alien to the American system of surgical specialization.

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Early U.S. traumatologists were most often general surgeons who had a special interest in fractures. By the 1950's, however, they found that the automobile and urban violence had imposed a spectrum of injuries that required the diagnostic and therapeutic skills of colleagues from other disciplines and trauma was no longer their exclusive province.

Cook County Hospital, Chicago's only public hospital, like its counterparts in most of the other large cities, had an immense patient load, heavily weighted in the direction of emergencies and trauma. In 1966, there was an average of 1,000 emergency department visits each day with close to 30% requiring admission to the hospital. About 100 admissions each day were to 14 different surgical services of approximately 60 beds each, located throughout the five buildings in the hospital complex. The hospital's 2,500 beds were usually filled, and it was the awesome responsibility of a lone and lowly intern working in the emergency department to decide which patients required admission and to what specialty service they would be assigned. Once patients were admitted to the general surgical, neurosurgical, orthopedic, or urology unit a second intern, masquerading as a specialist by virtue of his several weeks on the particular service, would be entrusted with initial resuscitation, diagnosis, and the important decision as to when to seek the advice and assistance of the residency staff. Attending supervision was provided by volunteer faculty who visited once or twice a week. With the often repeated scenario of the patient with a ruptured spleen dying unrecognized on the neurosurgical ward, it did not take unusual insight to appreciate the need for a unit equipped and staffed solely for the care of the injured.

The trauma center consisted of 21 beds and was located on the third floor above the emergency department and five floors below the main operating rooms. Adult patients were admitted to the unit, evaluated by house staff now assigned exclusively to this area. In the case of single system injury, patients were stabilized and reassigned to the appropriate specialty unit. Multiple-injury patients and those with general surgical problems remained in the trauma center and, if surgery was required, they were returned to the unit for postoperative care. The avoidance of error, improved records and data collection, educational environment, and improved results made the unit an instant success and squelched most of its early critics. Nurses were attracted to the unit, given broad responsibilities previously unheard of, and house officers quickly responded to the team concept and the mandatory use of specialty consultation. Supervision was provided by full-time surgeons who, either as a result of their research interest, a liking for trauma, or as a means of academic achievement, concentrated all of their energies on this unit. Four of Chicago's five medical schools were represented on the full-time staff but provided no financial support. The trauma unit provided both the hospital's own surgical residencies, as well as the four undergraduate education programs, an in-depth exposure to the care of the injured.

Having indulged in these reminiscences, let me now turn to the issue of hospitals and their relations with trauma centers. My particular concern is with the two types of hospitals with which I am most familiar, the public, city-county, tax-supported hospital, and the university-owned or closely affiliated one.

In spite of rapidly expanding interest and involvement in trauma care by the private sector, our large public hospitals still remain as a principal provider of education and research in trauma, and in addition care for vast numbers of injured patients. With a few notable exceptions, these institutions have fallen on bad times and the situation is likely to get worse. The decline in the number of admissions that followed the arrival of federally subsidized Medicaid and Medicare programs is graphically illustrated in Figure 1 for Cook County Hospital. The dramatic reduction in census of such public hospitals decreased the necessity to maintain these facilities and indeed some were closed entirely. The growing discrepancies between the facilities and support services offered in other hospitals combined with this diminishing patient load to impair recruitment of senior staff, as well as house officers. Participating medical schools, preoccupied with their own hospitals, withdrew their limited support and assignment of students. Admissions to the trauma unit fell less drastically but were increasingly

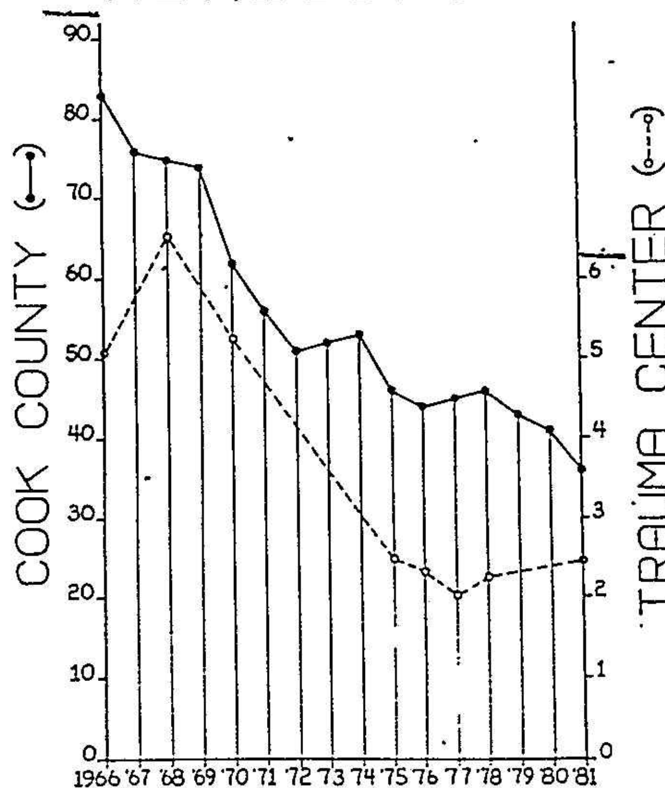

FIGURE 1

skewed by the growing interests of private hospitals in caring for some types of injuries. The alcoholic, the criminal, the victims of urban violence, and the indigent injured continued to be treated in large numbers at the public hospital.

Recent cutbacks in federal spending and the transfer of Medicaid monies to hard-strapped state governments does not augur well for the public hospital and its trauma center. Admissions, largely transfers of indigent patients from other hospitals, are already up 17.5% at Cook County Hospital compared to 1981 (2). This comes at a time when staffing at all levels is critically low.

Loss or further deterioration of our large public hospitals and their trauma units may pose serious problems for patients and community hospitals. Of great concern to me is the loss of this unique educational resource for training in the care of the injured. The studies and report by our esteemed member, Doctor Donald Trunkey, in his presidential address to the Society of University Surgeons, pointed out some glaring deficiencies in undergraduate as well as graduate training in trauma care (9). The fact that the leading cause of death and disability in patients under the age of 40 may be entrusted to a trauma team captain with little prior exposure or operative experience in the total spectrum of trauma is cause for concern. If we allow the politicians and public to abandon this rich educational and health care resource the public hospital, I think we will soon regret it. A substantial segment of the injured population will get little or no care. A few already strapped private hospitals closest to the inner city will become overwhelmed with a large number of socially and medically difficult patients. We will cease to educate our students and house officers in some of the important areas of trauma.

The solution to this dilemma rests with a more enlightened use of the local tax base and Medicaid funds. The latter are now largely under the control of the State. Rogers has pointed out that the general public and the medical profession tend to regard Medicaid as "welfare programs masquerading in health care clothing" (7). The view that Medicaid primarily serves the unemployed and minorities has made it a prime target for budget cutting. Currently, 30% of Medicaid expenditures are for medical care and nursing home services for persons with severe permanent disabilities. The remaining two thirds provide nursing care for the elderly (not covered under Medicare) and care for children from single-parent families. Somewhere in these expenditures, the needs of the public hospital and the care of indigent injured must be provided.

There is some evidence that state governments will exercise their recently assigned discretionary powers in reimbursing for Medicaid services (6). While this has generally been viewed as having disastrous consequences for public (and teaching) hospitals. I see a potential for the education of state governments to continue and enhance their support of well conceived, cost effective emergency care. Properly allocated, these monies will serve both the poor and the rich and, at the same time, improve the educational opportunities for the states' future physicians and nurses. As a taxpayer and trauma surgeon, I would applaud the actions of several states in eliminating the freedom of choice for Medicaid recipients. Nine states have adopted proposals to curtail the inappropriate use of emergency rooms. The State of California has authorized its Medicaid director to negotiate contracts with hospitals for Medicaid recipients. New Jersey is considering imposing a patient fee to discourage use of certain services such as optometry and podiatry. I am sure that many will view these actions as discriminatory and heartless. Having witnessed the proliferation of storefront health centers and renal dialysis units, and the unnecessary and excessively prolonged hospitalizations that occurred once the federal government agreed to pay, I hope and believe the states will not make the same error. For economic reasons, I predict that state governments will soon be forced to become involved in areas such as the trauma center designation process. Once they understand what is required to operate a first-class trauma center and emergency medical system, and how they serve the citizenry, I think the money and support for public hospitals and an effective trauma care and emergency medical services system will be found and put to good use. I cite as one example the recent actions of the State of Maryland in removing the cap on Medicaid reimbursement for hospitals providing for the care of trauma victims. Since Maryland has a well-defined system of designated trauma centers, they can limit the potential for abuse without jeopardizing the economic security of the State's trauma center hospitals. I sincerely hope that funding follows function and that we, as trauma surgeons, are vocal and persistent in insisting on categorization, avoidance of reduplication, establishing strict performance standards, and of unselfish concern for all patients.

Public hospitals and their trauma centers would be wise to pursue the example set by Doctor Lenworth Jacobs and his colleagues at the Boston City Hospital. Not content to serve only the indigent who are thrust upon them, they are playing a crucial role in the city-wide EMS system, educating all levels of personnel, running communications, and providing medical control as well as developing a city-wide disaster plan. In addition, they are monitoring and measuring performance of all hospitals, distributing the workload among interested and capable facilities, and proving that treatment in the prehospital phase makes a difference. Boston, like most cities, cannot do without its public hospital, but in Boston, as in San Francisco and a few other cities, the public, the medical profession, and the politicians all know it.

A look at the university hospital trauma center provides an interesting and, in too many instances, a disturbing contrast. Unlike the public hospital, they are, for the most part, Johnny come latelys to the trauma scene.

Their commitment to trauma care and their willingness to develop trauma centers vary widely. Some state-supported schools are providing innovative and inspiring leadership in all aspects of trauma care. For the private medical schools, increasing reliance upon private patients for support of their facilities as well as educational programs has led many of them to view trauma care as a liability. They prefer tertiary care and elective surgery on private patients. Their operating rooms and intensive care units are filled with coronary artery bypasses, radical cancer surgery, and microvascular reconstructions. And yet in many settings, they are the only institution with the complete range of facilities, equipment, and staff required to give comprehensive trauma care and high-level trauma education. In the western suburbs of Chicago, where the Loyola University Medical Center is located, none of the very excellent community hospitals in the area can mobilize the range and numbers of specialists in a matter of minutes that are available in a university hospital 7 days a week, 24 hours a day. In our university hospital, the CT scanner and angiography suite are readily available, and a busy cardiac surgical team is in action most of the time and can easily be diverted to the care of a torn aorta. But we may not have an operating room, and we will certainly have difficulty finding an intensive-care bed, let alone reserving one for trauma patients. Our neurosurgical staff until recently displayed little fervor for treating head injuries and great reluctance to see their limited number of elective beds filled with the prolonged stay patients so common in neurosurgical trauma. We operate a Burn Unit and manage to accommodate a large number of both blunt and penetrating injuries but we need to do more—not only for the region we alone can best serve but for the education of our medical students, nurses, and house staff, which is the purpose of a university hospital.

For university hospitals to opt out of trauma care because of some of the hardships it imposes is to not only deny patients the benefits of their special facilities and staff, but to limit the benefits of high-level research and education to those who will need them in the future. In turn, once the university hospital makes the necessary commitment to trauma care, it, like the public hospital, must be protected against the economic risks which accompany unselected care of the injured.

HEAD INJURIES

The recent report by Seelig, Becker, et al. which demonstrated that prompt diagnosis and intervention in patients with acute subdural hematomas can profoundly effect the end results is to me the most important single article concerned with injured patients in the last decade (8). This landmark paper not only showed that treatment for severe head injuries is worthwhile, but that a period of 2 hours makes the difference between a functioning brain and what most of us had come to accept as at best, a hopeless invalid. If this study, emphasizing time, CT scanning, intracranial pressure monitoring, and early operative decompression, can be confirmed by others, it makes the head injury the focal point in the management of the multiple-injury patient. For the fact remains that in spite of our general surgical prejudices, there is no other injury including the torn aorta in which we can prove a delay of 1 to 2 hours regularly makes a difference. The implications are obvious and awesome. Any Emergency Medical Services System that fails to place head injuries in neurosurgical treatment centers in a matter of minutes is not doing its job. Any Level I center that cannot provide around-the-clock CT scanning, intracranial pressure monitoring, and early operative decompression becomes a Level II. An in-house neurosurgeon becomes almost as essential as our broadly trained, trauma-oriented general surgeon. And if there are not enough interested and available neurosurgeons to do the job, maybe the general surgeon will have to operate on brain injuries.

Finally, an all-out commitment to the head-injured patient poses immense problems for hospitals, nursing services, and the medical staff. The long-term care of the serious brain injury that has been salvaged by modern heroics could overwhelm the intensive-care capabilities of most of our Level I centers. Arrangements must be made to decompress this workload into rehabilitation units with both high-level nursing care and physical and psychological therapy.

Now rest assured that I am not advocating a return to the days when we stood helpless in the emergency room awaiting the neurosurgeon to advise about the head injury before we could operate on the ruptured spleen. I would deplore an arrangment that exists in parts of Canada, where neurosurgical trauma is concentrated in one center just because it has the only CT scanner or an interested neurosurgeon, but little else. We now know that the best thing for the injured brain is to provide good care for the rest of the body. But when we hav restored blood volume, established the airway, provide oxygenation and optimal pH, removed the spleen, o repaired the aorta, the end result for the patient an society is too often determined by the magnitude of brai injury and its treatment. This problem deserves the kin of full court press that it receives in centers like Sa Diego, Richmond, and a handful of other neurotraum units in the trauma centers of this country. It can ar should become the paramount concern in the Level designation process.

HELICOPTERS

An obvious corollary of focusing the emergency ca system on the care of head injuries is the need to short the time interval between injury and the onset of tre ment. The past decade has seen incredible advances the prehospital phase of our emergency medical syste

Due in large measure to members of this Association, their work with paramedic training, ambulance equipment and design, improved communication, and on-line medical control, one of the finest chapters in the history of American medical achievements is represented.

As yet unresolved is the role of the helicopter in the transportation of the injured. To the best of my knowledge, the first civilian hospital heliport was built at the Cook County Hospital in 1968. This highly visible and dramatic approach to injured patients was affordable chiefly because the Chicago Fire Department owned and operated the helicopters for other purposes. Additionally, a concerned newspaper columnist had raised money on behalf of a severely burned child to whom the heliport was then dedicated. The arrival of the helicopter, usually with a patient transferred from another hospital to the burn center, was dramatic and inspiring and did much to establish the trauma center concept in the eyes of the hospital's staff and the public. In that regard, it served a very useful purpose. For the most part, however, the patients who were transported could have been carried by land ambulance almost as fast and certainly at less cost and risk.

When the practice of hospitals controlling the helicopter ambulance arose, I and others questioned their merit and potential. Nevertheless, there are now some 55 hospital-based helicopter services in this country. I have spent the past month visiting some, reviewing data from others, and discussing their role with knowledgeable and concerned people. I now believe they too are here to stay and will play an increasingly important role in the trauma centers of the future.

A number of things have led me to this conclusion. Programs involved in this activity have a national organization, are in regular communication with one another, and are conscientiously addressing the very real problems of equipment, safety, cost, and service. They are, in addition, collecting data and conducting regular surveys (Table I). Estimates of the population served by existing programs suggests that coverage is being provided to nearly 25% of the population of this country (5). For the 42 services reporting in the 1982 survey, there was an average of 711 flights per year with seven centers transporting more than 1,000 patients and the units at Hermann Hospital in Houston, and St. Anthony's in Denver at the 3,000-patient level. At least half their missions were for trauma patients. Discussions with surgeons and others at these units reveal an increasing use of helicopters in transporting patients from the scene in addition to interhospital transfers. They report more and more hospitals have built heliports and an increasing number of law enforcement personnel know how to clear an area to allow access or facilitate transfer. There is also an increasing interest in the use of conventional fixed-wing aircraft to extend the range of services to more distant areas. In some units, physicians with varying expertise are accompanying air paramedics or flight nurses on these missions. The extent to which a hospital-based helicopter program serves other hospitals as well as the public in a region is reflected in the fact that more than one third of missions transport patients to institutions other than the one providing the helicopter service. All units visited or reviewed by phone seem pleased with their progress and optimistic that the heavy cost of money, time, and talent seem justified.

Finally, at least one unit is about to publish data that confirm what the others all believe, that they do make a difference. The unit at the University of California in San Diego has shown a statistically significant difference in survival comparing two groups of 150 patients with comparable severity injury scores. Those carried by land ambulances fared less well than those transported by helicopter (3).

As in the case of the head injury problem, I believe the availability of a hospital-based helicopter will and should become a significant determinant in the designation of a smaller number of more versatile Level I centers.

TABLE I
Profile of U.S.-hospital based helicopter services, years 1979–1982

	1979	1980	1980	1982
Programs reporting	10	23	30	44
Average persons transported per program	N.A.	622	714	690
Transported to host hospital	--	63%	59%	63%
Salvage due to helicopter[a]	15%	17%	18%	24%

Based on Annual Survey. Courtesy Tallahassee (Florida) Memorial Regional Medical Center, Inc.

[a] Programs asked to estimate the number of patients believed to have survived because of the use of the helicopter

HEROES

No presidential address is complete without acknowledging one's debt to his mentors, colleagues, assistants, family, and especially to those who have elected him to the highest office of this Association. I am deeply indebted to all but at the risk of appearing ungrateful, I would like to close my presentation by identifying individuals who in my judgment are the real heroes of the trauma center concept. They have in common immense dedication and a capacity for personal sacrifice, ingenuity, vision, and a willingness to persevere.

R Adams Cowley, Director of the Maryland Institute of Trauma and Emergency Medical Services Systems (MIEMSS), has pioneered the trauma center concept as an extension of his research interest in shock and critical care, for close to 20 years. He has labored mightily to convince a reluctant profession of the way it should be done. With wisdom, dogged persistence, skillful use of public relations, and a lot of savvy, he sold the concept to the politicians and to the public. He directs the entire emergency medical system for the State of Maryland and

has received approval from the State legislature to build a new 138-bed Maryland Institute for emergency medical service at a projected cost of $50 million. His concept of the first hour after injury as the golden hour for treatment is being affirmed by both his own results and the work of others cited today. His attention to detail and insistence on following a standard operating procedure has been criticized as too rigid and stifling but I, as are virtually all of his many trainees, am convinced that the protocol approach is the way to survival in critical injuries. For those who would dwell on his failings or damn with faint praise, I am convinced that he is one of the most creative, hardest working, dedicated, and in the sense of accomplishing his goals, most successful trauma surgeon in our country.

No less controversial, and in many ways not unlike his mentor, Doctor Cowley, is my second hero, David R. Boyd. Doctor Boyd has spent the most productive years of his professional life in relentless pursuit of his goal of a nationwide network of trauma centers as the hub of a sophisticated emergency medical care system (4). For reasons best known to him, he gave up his surgical career and used his not inconsiderable talents as a teacher, investigator, intensivist, and surgeon traveling to every region of this country to sell trauma centers and the systems approach to emergency medical care to every physician, newspaper reporter, politician, and citizen he could reach. He made mistakes, acquired a platoon of critics, and lost his battle in Washington. But he has an army of those who believe him and some stunning victories. Most of all, I believe he *won our war* of regionalization, emergency services, and the trauma center concept.

My final hero is far less controversial. He is a numerically small but integral part of our membership. He is Doctor H. Blaiswalt Shirtrundon and he is an *academic trauma surgeon*. For those of you who do not recognize him, his name is in fact a compilation of portions of some of the surgeons who go under this banner. Rather than risk embarrassing them or alienating others, the complete list will remain anonymous. They are in fact largely modern-day general surgeons and colleagues, who have built and devoted their entire academic careers around the care of the injured. They do scientific research, they present papers, and they publish regularly and well. They teach students, train residents, and the practicing doctor, nurse, and paramedic. Unlike many of their academic colleagues, they take care of patients, operate in the middle of the night, and virtually all have worked in both public and university hospitals. Their efforts and talents have placed them in key positions in universities, medical schools, the American College of Surgeons, regional and national societies, and organizations such as the American Board of Surgery. In each of these roles, they are the trauma surgeons' best foot forward and they serve our interests and our goals in a unique and meaningful way. It is my fond wish that the recently established scholarship generously provided by the membership of this Association will contribute to an increase in their ranks.

In summary, the concept of trauma as the organizing basis for all emergency care seems well established and likely to continue. Further progress will require the identification of some 200 superbly equipped and staffed hospitals strategically located and totally committed to the care of the injured and the education of those who provide it. This commitment will require the hospitals' initiative in the prompt retrieval of injured patients with greater emphasis on time of arrival then upon resuscitation at the scene. The helicopter should effectively expand the size of the region served, reduce delays in treatment, and offer the greatest chance for matching facilities with patient needs. The results of these efforts will be most apparent in improved care of head-injured patients.

I wish to thank you for the honor and privilege of serving as your President.

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