

Eastern Association for the Surgery of Trauma 1991: Presidential Address

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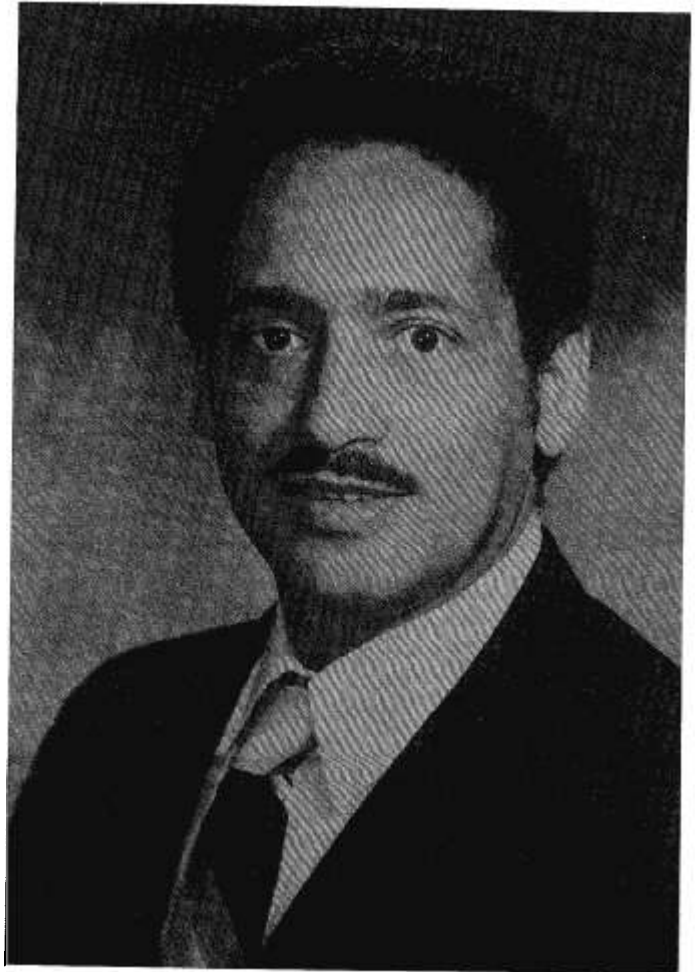
It is a great pleasure to have the honor of serving as President of this Organization. One of the challenges of a Presidential Address is that it gives one the opportunity to reflect on the past, to try to understand the present, and to develop a path for the future.

The trauma environment is changing. It is necessary to have a clear understanding of the forces that are shaping this environment and to be prepared to make the necessary changes in order to continue to deliver excellent care to injured patients and to continue to attract the best, most creative people to the profession.

FORCES FACING TRAUMA SYSTEMS

The forces facing trauma systems include diversification and specialization in multiple areas of general surgery. These forces have created specialists in the prehospital environment; this is particularly true in the Advanced Life Support aviation arena. There are also specialists in emergency medicine, critical care, vascular surgery, colorectal surgery, orthopedics, and neurosurgery. There is further specialization in rehabilitation, preventive medicine, and epidemiology. The goal of pursuing excellence in each of these areas is laudable. However, specialty training and boards in each of these areas have made it more and more difficult for one person to span the entire breadth of the needs of injured patients. This is beginning to work to the detriment of the patient, since multiple individual experts frequently work in disharmony with each other. The result is treatment of a trauma patient as multiple injured organs and systems rather than a complete patient.

Economic Forces. Economic forces have had a tremendous impact on health care in general and the trauma patient in particular. Just as a dam can harness the energy of water and create hydro-electric power, the unchecked forces of a raging river can destroy everything in its path. The medical industry has developed incredible scientific breakthroughs that have been extremely beneficial to patients and have resulted in an increased life span and the return to productive life of severely injured patients. The rise in the percentage of the gross



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national product spent for health care over the last four decades has benefitted patients, physicians, nurses, a plethora of ancillary professionals and paraprofessionals as well as the pharmaceutical, radiographic, and computer equipment industry. It appears that these rising expenditures have begun to severely stress if not break the economic dam with a resultant negative impact on access to and quality of trauma care. Uncompensated trauma care and maldistribution of trauma centers along with poorly thought-out strategies of reimbursement have caused entire systems of trauma care to begin to disintegrate. Fortunately, lessons have been learned which can be applied with positive results in the future.

Government Forces. The involvement of the government as a major payor of health care has dramatically increased regulation of the entire health care industry.

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Trauma has not been immune from this excessive regulation. Trauma patients can benefit substantially from the implementation of a network of trauma care. However, this must be linked to financial support for those centers which document that they are performing as well as or better than national norms. Trauma surgeons need to be in a leadership position relative to collecting patient-specific system-wide data that will document the cost effectiveness of trauma care provided in trauma centers in an operational trauma system. It is through this type of objective validation that regulators can develop adequate systems of compensation for hospitals and personnel who are dedicated to providing optimal care of the trauma patient.

Research Forces. There are many changing forces in the research arena. Funding for clinical research through the National Institutes of Health is becoming more difficult. Research in trauma has traditionally been significantly underfunded.¹

There is a continuing need for research at the basic science and clinical level. It is, however, becoming increasingly important to develop valid research in cost effectiveness and the cost benefits of the delivery of trauma care. It is essential to have clinicians collaborate with researchers skilled in clinical economics in order to generate models for cost-effective clinical trauma care as well as to develop templates for systems of trauma care delivery that can be accepted by health care planners and medical economists. It is no longer acceptable for clinicians to function in isolation from the financial environment in which they practice. It is even more unreasonable to be critical of the financial dilemmas without taking the time to understand the factors that contribute to this dilemma. Legislators, bureaucrats, and planners will respond well to informed clinicians treating injured patients who have taken the time to understand and learn their language. This is our challenge. We must understand the forces that press upon us and our profession. We must harness the energy that is driving these forces, and channel it into directions which will be beneficial to injured patients.

HISTORICAL OVERVIEW

It has been said that medicine has been in place for 2,000 years, modern science for 200 years, Medicare for 20 years, and economic turbulence for 10 years. There have been extraordinary diagnostic and therapeutic advances such as CT scans, MRI, intensive care monitoring devices such as pulmonary artery oximetric catheters, fiberoptic intracranial monitoring devices, and sophisticated ventilators. We now have an understanding of systems of care spanning the prehospital arena, resuscitation, intensive care, and rehabilitation. Unfortunately, the rising cost of trauma care and the impact of uncompensated care has had a profound effect on the system's ability to deliver high quality care.

It was Howard Champion's idea to develop a forum for young surgeons to be creative and generate and discuss ideas. Kim Maull, Burt Harris, and I spent many hours, usually in airports at the beginning or end of a conference or meeting, hammering out the ideas, developing bylaws, and then trying to develop enthusiasm for the idea of the EAST. It has succeeded beyond our wildest dreams. Now there are over 400 surgeons and many other distinguished associate members all dedicated to developing and expanding the concepts and challenges facing the trauma patients of the future.

I often reflect on the person who was my greatest inspiration and motivation. My father was a general surgeon in rural Jamaica and every afternoon we would make house rounds in the car with him. One day we came upon a bicyclist who had been struck by a car. My father responded and we took him to the hospital where he operated upon him. This was my first introduction to the principles of a first responder, assessment and transportation to a designated hospital, and immediate availability of a surgeon with an operating room.

That experience was contrasted with my first call on LIFE STAR, our aeromedical helicopter. We set off to an unknown destination in light rain at night and communicated with ground crews who were unfamiliar with helicopters, obtained a history from first responders, and then resuscitated a young woman who had been in a motor vehicle accident. Our team consisted of a flight nurse, a respiratory therapist, and me. We communicated with the trauma center, where a team was in place on our arrival. So much was different yet the principles of 35 years ago were so similar.

I remember my father coming home after being called out on his third house call. When asked how he could do it, he responded that when people are sick they need you. It is a privilege to take care of them because if there were no patients there would be no doctors.

The trauma surgeons of the 1940s and 1950s were clinical surgeons and basic science researchers who developed an understanding of the metabolic processes of the injured patient. Most of these surgeons practiced in inner city, urban, or university hospitals. The main research thrusts of these times were to elucidate normal physiology and to clearly understand what happened to the organism that was subjected to metabolic insults from hemorrhagic, cardiogenic, neurogenic, or septic shock. This work started with the injured patients in the hospital and was further developed in animal models in the laboratory.

The concept of cellular metabolism and the role of fluid and electrolytes in resuscitation along with the major breakthrough that had occurred with understanding blood typing and the availability of large quantities of refrigerated and stored blood led to resuscitation of seriously injured patients. Patients arrived in the operating suite in a more physiologically stable state. A better understanding of the risks and benefits of anesthesia

along with new surgical techniques in vascular repair resulted in significant decreases in morbidity and mortality. The introduction of penicillin and the growth of antibiotics in the treatment of sepsis was also important.

Following World War II, there was substantial interest in funding scientific projects. Major governmental financial support was generated for universities and their laboratories, who were interested in advancing the science of compromised physiology and metabolism. The early trauma surgeons were aware of the concepts of systems of delivery of care from their experiences in World War II, but the major advances were confined to the bedside and the laboratory.

PREHOSPITAL AEROMEDICAL SERVICES

The forces affecting trauma systems vary depending upon which phase of treatment a patient is experiencing. I will highlight the specific forces and challenges faced during prehospital aeromedical transport, emergency department stabilization, surgery, intensive care stays, nonintensive care admission, and rehabilitation. The general economic environment coupled with the health care cost crisis necessitates specific attention, as does prevention of trauma and standardization of trauma fellowships.

The military conflicts of Korea and Vietnam developed the concepts of rapid transportation and immediate treatment of the injured patient.^{2,3} The Bell 47 helicopter was utilized in Korea. This helicopter was small and the patient was secured to a special external stretcher. The concept was rapid transportation to a Mobile Army Surgical Hospital (MASH), where all the appropriate surgical personnel and equipment were immediately available. There was no treatment performed during transportation because the patient was not accessible to the personnel in the helicopter. The clinical advantage was the dramatic decrease in time from injury to definitive care.

In the Vietnam conflict, General Spurgeon Neel, MD, the person responsible for helicopter medical evacuation, integrated the helicopter into a system of medical care. The system included centralized control, reliable communications, methods for identifying and locating casualties, and well-trained medical personnel who would respond directly to the site of the injury. The mission of these corpsmen was to provide medical attention at the scene, during transportation, and at the hospital. The implementation of this philosophy resulted in no soldier in Vietnam being more than 35 minutes from definitive surgical care.²

The concept changed from rapid transportation to advanced life support treatment at the scene and during flight. The Bell UH1H "Huey" helicopter flew at 135 mph and could transport three or four patients and a crew. The successful implementation of these concepts

resulted in an overall mortality of less than 1.5% for all injured patients in the Vietnam conflict.

These principles were transplanted to civilian practice. The first continuously operating hospital-based helicopter emergency medical service was initiated in Denver, Colorado in 1972.⁴ There has been a significant and sustained rise in the number of hospital-based aeromedical programs over the past two decades. Most of these are associated with trauma centers. One of the most significant advances has been the ability of Advanced Life Support crews to definitively manage the victim's airway for ventilation, hyperventilation, and the prevention of aspiration. Definitive airway control and hyperventilation are particularly helpful in head-injured patients. Aeromedical helicopter services are no longer an episodic, experimental phenomenon. They are now widespread through out the United States and have taken a firm place in modern trauma management. They have the ability to become the cornerstone of regional referral trauma networks. It is essential that the efficacy of these services is well researched and widely reported in order that the scientific basis for these services is well founded. A number of confirmatory reports attesting to the usefulness of these services are in the literature.⁵⁻¹¹

There were a number of differences between the military trauma environment and the civilian environment. First, the main mission of the military medical teams was to be immediately available to support injured soldiers. The cost for having teams of surgeons, nurses, corpsmen, and ancillary support personnel was a secondary concern. Furthermore, the entire cost was borne by the government. The inherent inefficiency of scheduling for a maximal inflow of patients was tolerated as part of what was necessary to be maximally prepared for incoming casualties. A further major difference was that penetrating trauma from bullets and fragments frequently did not require substantial preoperative evaluation. Frequently, the preoperative investigation of choice was a chest x-ray film and evaluation of the long bones for fractures. Definitive treatment occurred in the operating room with an exploratory laparotomy and surgical management of contaminated wounds.

The challenge from the civilian environment is twofold. First, the type of trauma seen at inner city hospitals was largely penetrating in nature, which is very similar to that occurring in the military arena. The care of these patients was largely in urban inner city hospitals supported by university services, which provided substantial surgical resident education.

The overwhelming majority of civilian trauma is a result of motor vehicle accidents, pedestrians being struck, motorcycle accidents, and falls from high places. These injuries, characterized as blunt trauma, represent substantial diagnostic challenges to the trauma surgeon. The risks of failing to detect intra-abdominal, intrathoracic, and intracerebral injuries are significant. The general surgeon or general practitioner in a suburban or

rural facility who is not familiar with the investigations and management of major trauma patients is susceptible to missing substantial life-threatening injuries. Trunkey, West, and others in numerous preventable death audits across the country have documented these events.¹²⁻¹⁴ Audits showed that injured patients had a significant risk of dying unnecessarily if they were taken to non-trauma centers.

The twin challenges of dealing with a significant indigent inner city population that sustained largely penetrating trauma and a suburban and rural population that had largely blunt trauma with major diagnostic problems presented a challenge for trauma surgeons in the 1970s and 1980s.

The strong leadership of the American College of Surgeons' Committee on Trauma in establishing criteria for trauma centers and in advocating comprehensive systems of trauma care, which included prehospital management, resuscitation, in-house treatment, as well as rehabilitation, created multiple new avenues of thought, research, and development for trauma surgeons.¹⁵ The aeromedical program along with sophistication in ground ambulance transportation led to the need for strong medical control and medical involvement in the prehospital environment.

EMERGENCY DEPARTMENT RESUSCITATION

The last two decades have witnessed the inception, growth, and maturation of emergency medicine. In the 1950s and 1960s, most patients contacted their own family physician in the event of an emergency. These physicians were available in their offices or their homes; alternately, physicians made house calls to evaluate the emergency. As laboratory and radiologic examinations became immediately available these practices changed, and the time from ordering a test to receiving the results dropped from many hours or a day to minutes. The standard of care changed from an entirely subjective evaluation to an objective test-driven confirmation of the history and physical examination. The medicolegal climate was also changing to a more litigious one. Exacerbated by larger and larger financial settlements, litigation was encouraged and malpractice premiums increased. The vicious cycle of unnecessary tests the functions of which were to provide objective evidence of evaluation of an emergency and confirmation of the absence of disease or injury was fueled.

The real need of providing physicians to evaluate emergencies was assumed by hospitals. There was usually an adjacent room for the physician to see the patient. Frequently the physician and or nurse was summoned to this area or "emergency room" from other responsibilities within the hospital.

As the volume of patients seeking medical attention increased, the architecture changed into entire departments with radiographic and laboratory facilities. Plaster

rooms for orthopedic procedures and operating bays for suturing and resuscitation were added. This has now matured to full-service trauma resuscitation areas with equipment for surgical procedures, excellent lighting, built-in radiographic capabilities, fluid warmers, external monitoring, and, in some cases, an adjacent operating theater.¹⁶

It was a major challenge to generate personnel to support these changes. It became clear that waiting for the patient's own surgeon or physician to come from his or her office to see the patient was unsatisfactory. This resulted in the placement of any physician, regardless of training or competence, on duty in the emergency area to diagnose, admit, or discharge the patient. These functions were carried out by service-specific residents in the teaching hospitals and moonlighting physicians in non-teaching hospitals.

The decade of the 1970s saw the development of a formal curriculum in emergency medicine and the implementation of emergency medicine residencies and board certification in emergency medicine. These early residencies were founded in busy nonuniversity teaching hospitals, where the need was most apparent, since there was not a plethora of surgical and medical residents to staff the emergency department. There was some resistance on the part of the more conventional programs to support and develop this new specialty. The resistance gradually diminished during the 1970s and 1980s. Simultaneously with these developments, general surgeons were diversifying into subspecialties and in many instances abdicated the emergency department arena. The retreat coupled with the advance of emergency medicine caused tension in the area of the immediate management of the trauma patient. Trauma surgeons feel strongly that trauma is a surgical disease and surgeons should be involved in the care of the injured patient from the time of injury. A number of surgeons took a leadership role in establishing medical control of prehospital services. These surgeons were involved in the training of EMTs and paramedics, hands-on care, and medical control of the service. The American College of Surgeons' Committee on Trauma took a leadership role in establishing standards for optimal care of injured patients, including prehospital care, triage, aeromedical services, and trauma facilities.¹⁵

In the mid-1980s it became clear that a severely injured patient would be better served by a coordinated, harmonious relationship between trauma surgery and emergency medicine. The American College of Surgeons' Committee on Trauma and the American College of Emergency Medicine's Trauma Committee met and developed position papers that were supportive of systems of trauma care which would ensure that severely injured patients would be identified and triaged to trauma centers.

A number of challenges remain to foster optimum trauma care in emergency departments. It is essential that trauma surgeons be immediately involved in the

care of severe trauma patients. This is particularly important in residency training programs; however, the emergency physician who is integrally involved in the patient's care is an important part of the resuscitation team. This has to be reflected in the training of emergency physicians, and these residents need to be an integral part of the resuscitation. Since the majority of hospitals in the United States do not have in-house surgeons, this is particularly important. In these circumstances the well-trained emergency physician will be initiating the resuscitation process. It is in the patients' best interests that they are comprehensively educated in the process and skills of trauma resuscitation.

INTENSIVE CARE UNIT

The increasing sophistication of surgical care that has been rendered to patients has changed the manner in which the early postoperative care of severely ill or injured patients is conducted. One of the events that generated the concept of an intensive care unit was the Coconut Grove Fire in Boston in 1942. There were 491 fatalities. The majority of the burned patients were transported to the Massachusetts General Hospital. One of the floors of the White Building of the hospital was evacuated and converted into a burn unit. The unit stayed open for 15 days and the lessons learned from collecting large numbers of critically injured patients in one location with dedicated physicians and nurses were widely reported. Simultaneously, military medicine was developing "shock wards" to manage the large numbers of casualties generated by the multiple battles of World War II.

The Copenhagen polio epidemic of 1952 produced large numbers of patients who required mechanical ventilation. Medical students were recruited to provide mechanical ventilation by hand for 15-minute shifts 24 hours a day. The substantial number of lives saved provided the impetus for postoperative recovery rooms and the awareness that special training was necessary to effectively manage these types of patients.¹⁷

In the 1960s and early 1970s, the more sophisticated understanding of the metabolic needs of patients which had been developed in the laboratory was utilized at the bedside. At the same time, sophisticated monitoring devices were becoming available for use in the clinical setting. The early days of coronary artery bypass surgery and open heart surgery provided an excellent clinical setting for the management of physiologically unstable patients. Surgical residents frequently were required to spend the majority of their days and nights in the immediate vicinity of these patients. Similarly, a trauma patient who had sustained major injury and was in the postoperative phase recovering from hemorrhagic shock provided an excellent clinical education for surgeons. During the 1970s and the 1980s, there was the advent of sophisticated ventilators and a sound physiologic under-

standing of the principles of ventilation. The ability to electronically manipulate all phases of the ventilatory cycle led to the salvage of injured patients with pulmonary insufficiency who previously would have died. This was associated with advances in invasive cardiophysiologic monitoring devices. As the number of these critically ill patients who were in one unit increased, it became clear that these patients would need to be managed on a 24-hour basis by medical personnel highly skilled in cardiophysiologic management.

The concept of ICU education in the 1970s was that skills could be learned at the same time that the resident was managing multiple other patients in the operating room and on the floors. As the equipment became more sophisticated and units accrued more severely ill and injured patients, it became clear that these critical care principles should be formally taught during rotations in the ICU. A two-track process developed. One track was a one- to two-month rotation for residents and the other track was for those who wished to become expert in the management of critical care. This required a formal one-year fellowship with a curriculum and a certifying examination.

Unfortunately, many surgeons who found themselves in busy practices were content to delegate the minute-to-minute management of these patients to nonsurgeons in the intensive care unit. At the same time, anesthesiologists, pulmonologists, and intensivists saw the ICU as an important area to expand and develop. These specialties provided training and certification in critical care medicine. The situation progressed in the 1980s until by the end of the decade more than 3,261 nonsurgeons held certificates of competence in critical care compared with 508 surgeons. Only 50% of surgical chairmen surveyed provided formal ICU training for their surgical residents and only 3% offered formal fellowship training designed to prepare surgeons to be eligible for certification in critical care medicine and manage surgical intensive care units.¹⁸ Based on these historical trends, care of trauma patients in an intensive care unit is evolving because of the influences of credentialing, resident education, interdisciplinary collaboration, and patient control.

The minimal supply of surgeons interested in ICU management coupled with the large number of physicians trained and willing to assume responsibility for ICUs has encouraged medical staff credentialing bodies and hospital management to move toward giving the overall responsibility for ICU management to those credentialed in critical care medicine. If surgeons do not wish to be consultants in the management of their own surgical patients, then this situation needs to be comprehensively addressed.

The program for training a general surgeon must include formal education in critical care that is sufficiently comprehensive so that any board-certified surgeon is comfortable with the clinical management of ICU pa-

tients. Those persons wishing to develop leadership skills in administrative ICU management as well as excellence in clinical management and research need to pursue intensive care fellowships in programs that have the volume and intensity of seriously ill and injured patients as well as a cadre of surgeons who are competent to educate in the arena.

The dilemma of the availability of a surgeon or surgical resident to manage these patients as well as to operate and manage a busy service has become a substantial one. Trauma surgeons seemed to have learned from the experience of the cardiac surgeons, who had abdicated the intensive care unit to cardiologists, pulmonologists, and intensivists. It continues to be essential that the surgeon maintain control of management of the trauma patient. Delegation of the responsibility for management or transfer of a patient to a nonsurgeon for this critical phase in the patient's management is inappropriate and can be deleterious to the patient's care.

Critical care of severely injured patients is expensive. The cost in the United States is in excess of 50 billion dollars annually. In a large hospital, critical care expenses are often in excess of 40% of the hospital's budget. Intensive care units can be life saving but they have raised many issues relative to when to limit or stop maximum efforts when it is clear that the patient will not survive or that their survival will be absent of any quality. These dilemmas are more profound in the elderly population with terminal cancer or cardiac disease, but are equally as devastating in the young trauma patient with multisystem and severe head injuries.

The current predictive clinical scoring systems lack forecasting precision for routine application. A prospectively applied scoring system which was 90% accurate in predicting mortality would still be devastating to the 10% of patients who would have survived if maximum care was provided.

There is need for ethico-moral training, a sound understanding of the legal implications of rationing, and the need to develop more precise prospective mortality and morbidity scoring systems. The medical profession in general and the trauma surgeon in particular must not be stampeded into rationing of health care, especially to young, previously healthy trauma patients by legislative, fiscal, and lay initiatives that are not in the best interest of the patient.

The surgeon is the guardian of the trauma patient and must be prepared to discuss, debate, and defend optimal care for the patient against all adversaries, no matter how well reasoned any proposal to limit the care may be. In order to perform this task the trauma surgeon needs to be broadly educated in many areas over and above clinical excellence.

TRAUMA UNITS AND REHABILITATION

The European trauma centers have routinely collected all injured patients in hospitals dedicated to the initial

management and rehabilitation of these patients since the early part of this century. The development of the specialties of orthopedics and neurosurgery in the United States along with the medicolegal climate have ensured that the European-type trauma surgeon who performs general and orthopedic surgery is unlikely to exist in the United States. The general surgeon is the surgeon responsible for multisystem injured patients. This person has to make decisions that are in the best interest of the entire patient. Frequently, this may mean suboptimal treatment for one system in order to maximize life or limb survival of the entire patient.

Responsibility extends to organizing a team approach to the patient. One effective way to achieve this is to have a team that includes surgeons, residents, nurses, physiotherapists, nutritionists, and social service providers who make daily rounds on the trauma patients, allowing multispecialty discussion and clear direction and decisions to be implemented.

During the early part of this century, the Austrian experience with rehabilitating injured soldiers with orthopedic injuries set the stage for modern rehabilitation. This was further amplified by Rusk in 1943, when he conclusively demonstrated to the United States Army that rehabilitation rather than convalescence was essential to allow soldiers to return to active duty.

Modern rehabilitation begins in the ICU with consultation and planning for early activity. Passive movement by therapists and machines allow for joint exercise in unconscious or compromised patients. The concept of having rehabilitation therapists as part of the clinical team making daily clinical rounds is essential to effective management. There is a major added benefit of early placement of patients who need chronic services in rehabilitation centers. This practice can significantly decrease hospital stays and decrease costs.

The trauma surgeon needs to maintain surgical credibility by having all trauma patients admitted to his or her care and taking firm control over the clinical and administrative management decisions that occur during the course of the patient's care.

If the trauma surgeon is practicing in a low-volume environment, he or she must maintain a general surgical profile in order to maintain the technical and clinical skills necessary for managing surgical patients. It would be improper to be relegated to being a triage officer for orthopedic, neurosurgical, and maxillofacial colleagues. Conversely, it is inappropriate to generate so large an elective surgical practice that the trauma patient is merely a hobby. In this latter scenario there will not be sufficient energy to advocate for the entire system of trauma care.

THE ECONOMIC ENVIRONMENT

Health care as a percentage of the gross national product has been increasing in the past two decades in

the United States. In 1971, health represented 7.6% of the gross national product, whereas in 1987, it represented 11.4%. At the same time, the increase in Canada went from 7.4% in 1971 to 8.6% in 1987.¹⁹ The rapid rate of rise in health care expenditures captured the attention of both the government and employers. The increasing percentage of companies' budgets that has to be allocated to health is affecting the ability of companies to compete in the international marketplace. Private enterprise has been concerned that the explosion of health care costs, which show no real prospects of staying at the same level or decreasing, will have a deleterious effect on the country. For the first time, the concepts of restricting or rationing of health care have become important discussion points in both corporate and legislative arenas. It is essential that physicians in general and trauma surgeons in particular understand the implications of restricting access to care and the quality and quantity of medical care. In the former circumstance the principles of universal access, which are the foundations of emergency care, are at risk. In the latter, the fundamental principles of providing the best care for one's patient will be put at risk by financial constraints or bureaucratic regulations. Surgeons must become involved as informed advocates of patient care in this dialogue.

The American College of Surgeons reported in their Bulletin of 1990 that there were 25 million uninsured Americans in 1970 and that this would grow to between 30 and 37 million in the 1990s.¹⁹ Employers' health care costs increased from 15.3 billion dollars in 1970 to a projected 134 billion in the 1990s. These dramatic increases are difficult for the practitioner struggling with a ruptured spleen to grasp. However, the implications have become clearer over the past 5 years. Trauma centers in Los Angeles and Miami have closed, citing financial burdens as one of the mitigating factors. This has caused major stresses for the remaining trauma centers and has the potential to decrease the quality of care to trauma patients.

The optimistic side of this issue is that it is now clear to hospitals, legislators, planners, physicians, and patients that there is a substantial problem that needs to be resolved. A number of creative solutions have been put into place that show great promise. Alexander et al. in Florida have quantified the uncompensated trauma care being provided by hospitals in the state. They have made this information available to the state government, which has passed a law to mandate financial relief to trauma centers providing high quality care to these patients. Another strategy enacted in Connecticut was to identify that severely injured patients had a much longer length of stay than was expected under the Diagnosis Related Group (DRG) guidelines.²⁰ New York State has developed trauma-specific DRGs. Research in this area allowed for the outlier reimbursement to be readjusted. This had a positive impact on the hospitals managing trauma patients. In California, there has been the appli-

cation of user taxation. The income from this can be applied to uncompensated health care. These strategies have been a direct result of advocates of trauma care understanding the concepts of cost reimbursement, the legislative process, and the judicial process. Trauma surgeons are perceived as strong and credible advocates of patient care because they are directly involved in the delivery of care to these patients. It is essential that young surgeons be trained to understand all of these concepts and to carry forward advocacy in the legislative, regulatory, and lay arenas.

PREVENTION

Prevention is an important tool in the control of trauma.²¹ William Haddon was a leader in documenting the influence the ingestion of alcohol has on fatal motor vehicular and pedestrian crashes. Three strategies for injury control are used to classify most injury countermeasures: (1) education/persuasion; (2) laws and administrative rules; and (3) engineering/technology. Education and persuasion strategies are designed to alter the behavior of those who may be exposed to certain hazards. An example is teaching high school students the perils of driving while intoxicated. The second countermeasure, laws and administrative rules, is also designed to alter behavior but not through an educational forum. The change in behavior is primarily generated by requirements and penalties imposed by laws or rules, for example, mandatory seat belts and speed limit laws. The third strategy deals with protecting the potential host by adjusting the agents, vehicles, or the environment through laws, administrative rules, or persuasion addressed to manufacturers. The law regulating the installation of automatic restraining devices in automobiles is an example. In terms of effectiveness, research indicates that education is the least effective and automatic protection is the most effective.¹

TRAUMA FELLOWSHIP

The education of young surgeons prepared to make major contributions in trauma is one of the greatest challenges facing the discipline today. The goals of such a fellowship program would include competence in the discipline of general surgery. This expertise would include resuscitation, all aspects of technical surgery, and critical care. There would need to be a sound understanding of the principles of rehabilitation. These surgeons would need to know the body of knowledge and understand the principles of emergency medical service systems including prehospital, basic, and advanced life support delivery in all its phases. They would also need the skills to manage a trauma program, which would include the complexities of establishing, operating, and integrating emergency departments, intensive care units, operating rooms, and clinical units. The goals of research would be to have a sound understanding in basic and

clinical sciences as well as epidemiology. This latter is critically important, since medicine in general and trauma in particular are becoming more regionalized. An understanding of demographics and how patients are accrued across large geographic areas and large population bases will be essential to strategically plan and develop systems of trauma care.

In order to achieve these goals, a two-year trauma/critical care fellowship would be necessary. It is highly unlikely that the Board of Surgery will grant a specific certificate in trauma; therefore, it would be necessary to embody the curriculum and discipline that is currently in place for critical care as one year of the fellowship. It would then be necessary to integrate into the second year all phases of trauma care. This would include resuscitation, operating room, prehospital, and clinical management skills that are not part of the critical care curriculum. It would be necessary to formally involve the fellows in research and administrative education which would also span involvement in the regional and state regulatory bodies for trauma (Fig. 1). The entry criteria for such a fellowship would be the completion of a general surgical residency and a strong interest in trauma care.

It would be necessary to have these criteria accepted by professional bodies and societies and widespread agreement that this was an accepted and standardized curriculum for trauma. It would be useful to develop a society of fellowship directors in order to modify the goals and objectives of the fellowship over time. A major initiative would be to educate one's surgical and medical peers about the importance of this fellowship. This education should be broadened to hospital directors and government officials so that candidates who have successfully completed a fellowship can assume leadership

in trauma development at hospital, academic, and governmental levels.

The challenge to all of us in this Association and all of us who are interested in advocating for optimal care for trauma patients is to clearly identify and understand the forces influencing trauma care; to create an educational program that will be stimulating enough to attract the finest talent to the trauma arena; and finally, to advocate clearly, thoughtfully, and fearlessly for all of those patients who are injured.

Acknowledgments

I would like to dedicate this presidential address to my father and my family.

I would like to thank my mother for being such an inspiration and for encouraging me to dream and then to have the determination and courage to pursue the dream.

I would like to thank Barbara, who has been a partner and colleague, an educator and a fearless worker for EMS on her own behalf, who has helped and guided me through a thousand biostatistical mine fields, and who has been a co-author on our most important contribution to the literature. Most of all she has been my best friend and the person with whom I could initiate and develop dreams.

Finally, I would like to thank my daughter Jennifer, the light of my life, who has made everything worthwhile.

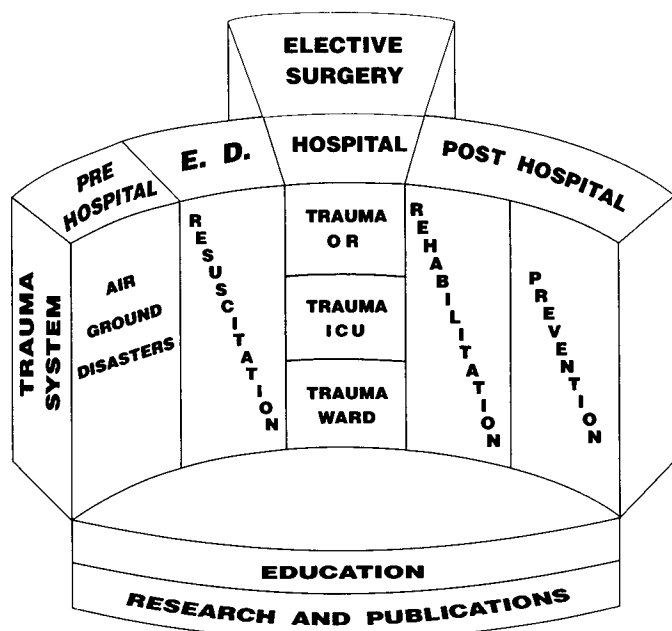


FIG. 1. Areas of interest for a trauma fellowship.

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