

## CHAPTER 1

# History of EMS

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### Before 1966: historical perspectives

Early hunters and warriors provided care for the injured. Although the methods used to staunch bleeding, stabilize fractures, and provide nourishment were primitive, the need for treatment was undoubtedly recognized. The basic elements of prehistoric response to injury still guide contemporary EMS programs. Recognition of the need for action led to the development of medical and surgical emergency treatment techniques. These techniques in turn made way for systems of communication, treatment, and transport, all geared toward reducing morbidity and mortality.

The Edwin Smith Papyrus, written in 1500 BC, vividly describes triage and treatment protocols [1]. Reference to emergency care is also found in the Babylonian Code of Hammurabi, where a detailed protocol for treatment of the injured is described [2]. In the Old Testament, Elisha breathed into the mouth of a dead child and brought the child back to life [3]. The Good Samaritan not only treated the injured traveler but also instructed others to do likewise [4]. Greeks and Romans had surgeons present during battle to treat the wounded.

The most direct root of modern prehospital systems is found in the efforts of Jean Dominique Larrey, Napoleon's chief military physician. Larrey developed a prehospital system in which the injured were treated on the battlefield and horse-drawn wagons were used to carry them away [5]. In 1797 Larrey built "ambulance volantes" of two or four wheels to rescue the wounded. Larrey had introduced a new concept in military surgery: early transport from the battlefield to the aid stations and then to the frontline hospital. This method is comparable to the way that modern physicians modified the military use of helicopters in Korea and Vietnam. Larrey also initiated detailed treatment protocols, such as the early amputation of shattered limbs to prevent gangrene.

The Civil War is the starting point for EMS systems in the United States [6]. Learning from the lessons of the Napoleonic and Crimean Wars, military physicians led by Joseph Barnes and Jonathan Letterman established an extensive system of prehospital

care. The Union Army trained medical corpsmen to provide treatment in the field; a transportation system, which included railroads, was developed to bring the wounded to medical facilities. However, the wounded received suboptimal treatment in these facilities, stirring Clara Barton's crusade for better care [7].

The medical experiences of the Civil War stimulated the beginning of civilian urban ambulance services. The first were established in cities such as Cincinnati, New York, London, and Paris. Edward Dalton, Sanitary Superintendent of the Board of Health in New York City, established a city ambulance program in 1869. Dalton, a former surgeon in the Union Army, spearheaded the development of urban civilian ambulances to permit greater speed, enhance comfort, and increase maneuverability on city streets [8]. His ambulances carried medical equipment such as splints, bandages, straitjackets, and a stomach pump, as well as a medicine chest of antidotes, anesthetics, brandy, and morphine. By the turn of the century, interns accompanied the ambulances. Care was rendered and the patient left at home. Ambulance drivers had virtually no medical training. Our knowledge of turn-of-the-century urban ambulance service comes from the writings of Emily Barringer, the first woman ambulance surgeon in New York City [9].

Further development of urban ambulance services continued in the years before World War I. Electric, steam, and gasoline-powered carriages were used as ambulances. Calls for service were generally processed and dispatched by individual hospitals, although improved telegraph and telephone systems with signal boxes throughout New York City were developed to connect the police department and the hospitals.

During World War I, the introduction of the Thomas traction splint for the stabilization of patients with leg fractures led to a decrease in morbidity and mortality. Between the two world wars, ambulances began to be dispatched by mobile radios. In the 1920s, in Roanoke, Virginia, the first volunteer rescue squad was started. In many areas, volunteer rescue or ambulance squads gradually developed and provided an alternative to the local fire department or undertaker. After the entry of America

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into World War II, the military demand for physicians pulled the interns from ambulances, never to return, resulting in poorly staffed units and non-standardized prehospital care. Postwar ambulances were underequipped hearses and similar vehicles staffed by untrained personnel. Half of the ambulances were operated by mortuary attendants, most of whom had never taken even a first aid course [10].

Throughout the 1950s and 1960s, two geographic patterns of ambulance service evolved. In cities, hospital-based ambulances gradually coalesced into more centrally coordinated city wide programs, usually administered and staffed by the municipal hospital or fire department. In rural areas, funeral home hearses were sporadically replaced by a variety of units operated by the local fire department or a newly formed rescue squad. Additionally, in both urban and rural areas, a few profit-making providers delivered transport services and occasionally contracted with local government to provide emergency prehospital services and transport. Before 1966, very little legislation and regulation applicable to ambulance services existed. Providers had relatively little formal training, and physician involvement at all levels was minimal.

A number of factors combined in the mid-1960s to stimulate a revolution in prehospital care. Advances in medical treatments led to a perception that decreases in mortality and morbidity were possible. Closed-chest cardiopulmonary resuscitation (CPR), reported as successful in 1960 by W.B. Kouwenhoven [11] and Peter Safar [12], was eventually adopted as the medical standard for cardiac arrest in the prehospital setting. New evidence that CPR, pharmaceuticals, and defibrillation could save lives immediately created a demand for physician providers of those interventions in both the hospital and prehospital environments. Throughout the 1960s, fundamental understanding of the pathophysiology of potentially fatal dysrhythmias expanded significantly. The use of rescue breathing and defibrillation was refined by Peter Safar, Leonard Cobb, Herbert Loon, and Eugene Nagel [13]. Safar persuaded many others that defibrillation and resuscitation were viable areas of medical research and clinical intervention.

In 1966 Pantridge and Geddes pioneered and documented the use of a mobile coronary care unit ambulance for prehospital resuscitation of patients in Belfast, Ireland. Their treatment protocols, originally developed for the treatment of myocardial infarction in intensive care units, were moved into the field [14]. Because the medical team was often with the patient at the time of cardiac arrest, the resuscitation rate was a remarkable 20%. Their “flying squads” added a dimension of heroic excitement to the job of being an ambulance attendant, and their performance data helped convince American city health officials and physicians that a more medically sophisticated prehospital advanced life support (ALS) system was possible.

## 1966: the NAS-NRC report

The modern era of prehospital care in the United States began in 1966. In that year, the recognition of an urgent need, the crucial element necessary for development of prehospital systems

nationwide, was heralded by a report generated by the National Academy of Sciences National Research Council (NAS-NRC), a non-profit organization chartered by Congress to provide scientific advice to the nation. *Accidental Death and Disability: The Neglected Disease of Modern Society* documented the enormous failure of the United States health care system to provide even minimal care for the emergency patient. The NAS-NRC report identified key issues and problems facing the United States in providing emergency care (Figure 1.1). Its summary report listed recommendations that would serve as a blueprint for EMS development, including such things as first aid training for the lay public, state-level regulation of ambulance services, emergency department improvements, development of trauma registries, single nationwide phone number access for emergencies, and disaster planning [15]. This document established a benchmark against which to measure subsequent progress and change.

The 1966 NAS-NRC document described both prehospital services and hospital emergency departments as being woefully inadequate. In the prehospital arena, treatment protocols, trained medical personnel, rapid transportation, and modern communications concepts, such as two-way radios and emergency call numbers, were all identified as necessities that were simply not available to civilians. Although there were more than 7,000 accredited hospitals in the country at the time, very few were prepared to meet the increased demand that developed between 1945 and 1965. From 1958 to 1970, the annual number of emergency department visits increased from 18 million to more than 49 million [15]. In addition, emergency departments were staffed by the least experienced personnel, who had little education in the treatment of multiple injuries or critical medical emergencies. Early efforts of the American College of Surgeons (ACS) and the American Academy of Orthopedic Surgeons (AAOS) to improve emergency care were largely unsuccessful because medical interest was essentially non-existent [16,17,18,19].

The 1966 NAS-NRC document was the first to recommend that emergency facilities be categorized. It also emphasized aggressive clinical management of trauma, suggesting that local trauma systems develop databases, and that studies be instituted to designate select injuries to be incorporated in the epidemiological reports of the US Public Health Service. Changes were also recommended concerning legal problems, autopsies, and disaster response reviews. Trauma research was especially emphasized, with the ultimate goal of establishing a National Institute of Trauma [15]. Another problem identified in the report was the broad gap between existing knowledge and operational activity.

The NAS-NRC was not the first report in which many of these issues were raised. The President’s Commission on Highway Safety had previously published a report entitled *Health, Medical Care, and Transportation of Injured* [20], which recommended a national program to reduce deaths and injuries caused by highway accidents. Its findings were complemented by and consistent with the NAS-NRC report. The recommendations

## Inadequacies of Prehospital Care in 1966

1. The general public is insensitive to the magnitude of the problem of accidental death and injury.
2. Millions lack instruction in basic first aid.
3. Few are adequately trained in the advanced techniques of cardiopulmonary resuscitation, childbirth, or other life-saving measures, yet every ambulance and rescue squad attendant, policeman, fire fighter, paramedical worker, and worker in high-risk industry should be trained.
4. Local political authorities have neglected their responsibility to provide optimum emergency medical services.
5. Research on trauma has not been supported or identified at the National Institutes of Health on a level consistent with its importance as the fourth leading cause of death and a primary cause of disability.
6. The potentials of the U.S. Public Health Service Program in accident prevention and emergency medical services have not been fully exploited.
7. Data are lacking on how to determine the number of individuals whose lives are lost through injuries compounded by misguided attempts at rescue and first aid, absence of physicians at the scene of the injury, unsuitable ambulances with inadequate equipment and untrained attendants, lack of traffic control, or the lack of voice communication facilities.
8. Helicopter ambulances have not been adapted to civilian peacetime needs.
9. Emergency departments of hospitals are overcrowded, some are archaic, and there are no systematic surveys on which to base requirements for space, equipment, or staffing for present, let alone future, needs.
10. Fundamental research on shock and trauma is inadequately supported; medical and health-related organizations have failed to join forces to apply knowledge already available to advanced treatment of trauma, or educate the public and inform Congress.

**Figure 1.1** Key findings of the 1966 NAS-NRC report. Adapted from *Accidental Death and Disability: The Neglected Disease of Modern Society*. Washington, DC: National Academy of Sciences, 1966, National Academy Press.

in both documents were used when the Highway Safety Act of 1966 was drafted. This law established the cabinet-level Department of Transportation (DOT) and gave it legislative and financial authority to improve EMS. Specific emphasis was placed on developing a highway safety program, including standards and activities for improving both ambulance service and provider training [21].

The Highway Safety Act of 1966 also authorized funds to develop EMS standards and implement programs that would improve ambulance services. Matching funds were provided for EMS demonstration projects and studies. All states were required to have highway safety programs in accordance with the regulatory standards promulgated by the DOT. The standard on EMS required each state to develop regional EMS systems that could handle prehospital emergency medical needs. Ambulances, equipment, personnel, and administration costs were funded by the highway safety program. Regional financing, as opposed to county or state funding, was a new concept that would be echoed in federal health legislation throughout the remainder of the decade [21].

With the Highway Safety Act as a catalyst, the DOT contributed more than \$142 million to regional EMS systems between 1968 and 1979. A total of roughly \$10 million was spent on research alone, including \$4.9 million for EMS demonstration projects. A number of other federal EMS initiatives in the late 1960s and early 1970s poured additional funds into EMS, including \$16 million in funding from the Health Services and Mental Health Administration, which had been designated as the lead EMS

agency of the Department of Health, Education, and Welfare (DHEW), to areas of Arkansas, California, Florida, Illinois, and Ohio for the development of model regional EMS systems [22].

In 1969 the Airlie House Conference proposed a hospital categorization scheme [23]. The AMA Commission on EMS urged facility categorization and published its own scheme, which identified staffing, equipment, services, and personnel types [24]. This became known as “horizontal categorization.” Although it was supported by professional and hospital associations, many hospitals and physicians feared hospitals in lower categories would suffer a loss of prestige, patients, or reimbursement. The DHEW EMS program developed a categorization scheme based on hospital-wide care of specific disease processes. Known as “vertical categorization,” this concept was ultimately embraced by many regional programs as a major theme in the development of EMS systems.

By the late 1960s, drugs, defibrillation, and personnel were available to improve prehospital care. As early as 1967, the first physician responder mobile programs morphed into “paramedic” programs using physician-monitored telemetry as a modification of the approach by Pantridge in Belfast.

The “Heartmobile” program, begun in 1969 in Columbus, Ohio, initially involved a physician and three EMTs. Within 2 years, 22 highly trained (2,000 hours) paramedics provided the field care, and the physician role became supervisory. Similarly, in Seattle, physicians supervised highly trained paramedics, increasing the survival rate from 10% to 30% for prehospital cardiac arrest patients whose presenting rhythm was ventricular fibrillation. The Seattle

story was also one in which fire department first responders played a crucial role in building what is now called a chain of survival. In Dade County, Florida, rapid response of mobile paramedic units was combined with hospital physician direction via radio and telemetry for the first time [25]. In Brighton, England, non-physician personnel provided field care without direct medical oversight. Electrocardiographic data were recorded continuously to permit retrospective review by a physician [26].

National professional organizations such as the ACS, the AAOS, the American Heart Association (AHA), and the American Society of Anesthesiologists (ASA), in concert with other groups, provided extensive medical input into the early development of EMS. New organizations were formed to focus on EMS, including the AMA's Commission on EMS, the AHA's Committee on Community Emergency Health Services, the American Trauma Society, the Emergency Nurses Association, the Society of Critical Care Medicine, the National Registry of Emergency Medical Technicians (NREMT), and the American College of Emergency Physicians (ACEP). In the years prior to 1973, such groups made significant but uncoordinated efforts toward the reorganization, restructure, improvement, expansion, and politicization of EMS [23,24,27,28].

In 1972, the NAS-NRC published *Roles and Resources of Federal Agencies in Support of Comprehensive Emergency Medical Services*, which asserted that the federal government had not kept pace with efforts by professional and lay health organizations to upgrade EMS. The document endorsed a vigorous federal government role in the provision and upgrading of EMS. It recommended that President Nixon acknowledge the magnitude of the accidental death and disability problem by proposing action by the legislative and executive branches to ensure optimum universal emergency care. It urged the integration of all federal resources for delivery of emergency services under the direction of a single division of DHEW, which would have primary responsibility for the entire emergency medical program. It also recommended that the focal point for local emergency medical care be at the state level, and that all federal efforts be coordinated through regional EMS programs [29].

### 1973: the Emergency Medical Services Systems Act

By 1973 several major lessons had emerged from the demonstration projects and the various studies undertaken during the preceding 7 years. Although the federal initiative had been limited to the 1968 DHEW regional demonstration projects mentioned earlier, significant progress had been made toward clearly defining a potential program goal. The projects proved that a regional EMS system approach could work. However, because systems research was not a component of the DHEW program, the demonstration projects did not prove that a regional approach, or for that matter any particular approach, was more effective than another.

By early 1973 many national organizations supported further federal involvement, both in establishing EMS program goals and in providing direct financial support. The first efforts at passing federal EMS legislation were defeated, but a later modified EMS bill passed with support from numerous public and professional groups. President Nixon vetoed this bill in August 1973. The standard conservative philosophy was that EMS was a service that should be provided by local government, and the federal government should neither underwrite operations nor purchase equipment. Additional congressional hearings led to the reintroduction of a bill proposing an extensive federal EMS program, based on the rationale that individual communities would not be able to develop regional systems without federal encouragement, guidelines, and funding. Finally, in November 1973, the Emergency Medical Services Systems Act was passed and signed. It was added as Title XII to the Public Health Service Act, wherein it addressed EMS systems, research grants, and contracts. It also added a new section to the existing Title VII concerning EMS training grants [30].

Although the law was amended to reauthorize expenditures in 1976, 1978, and again in 1979, its goal remained to encourage development of comprehensive regional EMS systems throughout the country. The available grant funds were divided among the four major portions of the EMS Systems Act: Section 1202 – Feasibility studies and planning; Section 1203 – Initial operations; Section 1204 – Expansion and improvement; and Section 1205 – Research. Applicants were encouraged to use existing health resources, facilities, and personnel. The EMS regions were ultimately expected to become financially self-sufficient. Therefore, a phase-out of all federal funding was targeted for 1979 but later extended to 1982. The program was administered in the DHEW through the Division of Emergency Medical Services (DEMS), with David Boyd, the medical director of the Illinois demonstration project, named as director. The law and subsequent regulations emphasized a regional systems approach, a trauma orientation, and a requirement that each funded system address the 15 “essential components” (Figure 1.2). It should be noted that medical

1. Manpower
2. Training
3. Communications
4. Transportation
5. Facilities
6. Critical care units
7. Public safety agencies
8. Consumer participation
9. Access to care
10. Patient transfer
11. Coordinated patient record-keeping
12. Public information and education
13. Review and evaluation
14. Disaster plan
15. Mutual aid

**Figure 1.2** *The Fifteen Essential EMS Components.* Washington, DC: Department of Health, Education, and Welfare, Division of EMS, 1973.



oversight was not one of the 15 components, although subsequent regulations encouraged medical oversight.

### 1973–1978: rapid growth of EMS systems

In 1974 the Robert Wood Johnson Foundation allocated \$15 million for EMS-related activities, the largest single contribution for the development of health systems ever made in the United States by a non-profit foundation. Forty-four areas received grants of up to \$400,000 to develop EMS systems [31]. This money was intended to encourage communities to build regional EMS systems, emphasizing the overall goal of improving access to general medical care. The money was provided over a 2-year period to establish new demonstration projects and develop regional emergency medical communications systems [32].

In early 1974 a newly reorganized DHEW-DEMS began implementing the legislative mandate. Adopted from earlier experiences, the basic principles were that an effective and comprehensive system must have resources sufficient in quality and quantity to meet a wide variety of demands, and the discrete geographic regions established must have sufficient populations and resources to enable them to eventually become self-sufficient.

Each state was to designate a coordinating agency for state-wide EMS efforts. Ultimately, 304 EMS regions were established nationwide. By 1979, 17 regions were fully functional and independent of federal money. However, of the 304 geographic areas, there were 22 that had no activity and 96 that were still in the planning phase [33]. Testimony was given before the congressional committee considering extension of funding, and an additional year of funding was authorized as the 1202b program for planning.

In the regulations, David Boyd strictly interpreted the congressional legislative intent of the EMS Systems Act to mandate that all communities adopt the 15 essential components. Regions were limited to five grants, and with each year of funding, progress toward more sophisticated operational levels was expected. By the end of the third year of funding, regions were expected to have basic life support (BLS) capabilities, which required no physician involvement. ALS capability, which was expected to perform traditional physician activities, was expected at the end of the fifth year. The use of BLS and ALS terminology in the regulations spread widely. However, the original definitions that corresponded directly to the funded emergency medical technician- ambulance (EMT-A) and paramedic levels of training quickly became elusive as variations in the EMT-A and paramedic levels emerged. The EMT-A level required no medical input, but some states such as Kentucky did extend medical oversight to BLS because of insurance laws – laws making medical care and transportation across a county line virtually impossible without a physician's approval over the radio.

Developing the geographic regions required to secure federal funding through the EMS Systems Act usually necessitated new

EMS legislation at the state level. The state laws that developed throughout the 1970s varied markedly in regard to the issues of medical oversight, overall operational authority, and financing. In some states, physician involvement was required. In others, medical oversight was not even mentioned. Often, the responsibility for coordinating activities was assigned to a regional EMS council of physicians, prehospital providers, insurance companies, and consumers who often had interests to protect. Commonly, physician input was somewhat removed from the medical mainstream.

### Personnel

A lack of appropriately trained emergency personnel at every level of care had been identified in the NAS-NRC document [15]. After 1973, extensive effort and money were directed at correcting this educational deficiency, and serendipity played a role. A large number of medical corpsmen, physicians, and nurses, who understood that trained non-physicians could perform life-saving tasks in the field, were returning from Vietnam. Many argued that rapid transport and early surgery could improve civilian trauma practice.

### Physicians

In 1966 the NAS-NRC document stated, “No longer can responsibility be assigned to the least experienced member of the medical staff, or solely to specialists, who, by the nature of their training and experience, cannot render adequate care without the support of other staff members.” [15] Thus the importance of physician leadership and training in EMS was identified early. During the 25 years following World War II, increasing demands for care were placed on hospital emergency departments. Not surprisingly, a branch of medicine evolved with its focus on the critically ill. The academic discipline and scientific rigor necessary to define a separate medical specialty began to develop.

In 1968 ACEP was founded by physicians interested in the organization and delivery of emergency medical care. In 1970 the first emergency medicine residency was established at the University of Cincinnati, and the first academic department of emergency medicine in a medical school was formed at the University of Southern California. Soon the directors of medical school hospital emergency departments founded the University Association for Emergency Medical Services. Between 1972 and 1980 more than 740 residents completed training at 51 emergency medicine residencies throughout the country [34,35,36]. The first major step toward certification as a specialty occurred in 1973 when the AMA authorized a provisional Section of Emergency Medicine. In 1974 a Committee on Board Establishment was appointed, and a liaison Residency Endorsement Committee was formed [36]. Further impetus toward expansion of residency programs in emergency medicine occurred with the formation of the American Board of

Emergency Medicine (ABEM) in 1976 [37]. Before that time there was some hesitancy to create residency programs that might not lead to board certification.

In September 1979, emergency medicine was formally recognized as a specialty by the AMA Committee on Medical Education and the American Board of Medical Specialties. One of the strongest arguments in favor of the new specialty was that emergency physicians had a unique role in the oversight of prehospital medicine. The ABEM gave its first certifying examination in 1980, which incidentally did not touch on any areas of prehospital care.

Although emergency medicine, emergency nursing, and prehospital care were all nourished by the funds distributed between 1973 and 1982, the interest of ACEP in EMS activities lagged, perhaps because individual physician interest lagged. The first full-time EMS medical director was not appointed until April 1981. Previously, all had been part-time, and some had simply been functionaries. Shortly thereafter, cities like Salt Lake City and Houston followed New York's lead, and appointed full-time EMS medical directors. Even then, EMS as a physician career choice was perceived by many as too limited and perhaps a risky career undertaking.

### Prehospital providers

The Highway Safety Act of 1966 funded EMT-A training and curriculum development. By 1982, there were approximately 100,000 providers trained at the EMT-A level. They were trained to provide basic, non-invasive emergency care at the scene and during transport, including such skills as CPR, control of bleeding, ventilation, oxygen administration, fracture management, extrication, obstetrical delivery, and patient transport. The educational requirements, which began as a 70-hour curriculum published by the AAOS in 1969, soon grew to 81 hours of lectures, skills training, and hospital observation, with most of the increase in hours being due to the addition of training in the use of pneumatic anti-shock garments. After working for 6 months, graduates were allowed to take a national certifying examination administered by the NREMT. Founded in 1970, the NREMT developed a standardized examination for EMT-A personnel as one requirement for maintaining registration. Many states began to recognize NREMT registration for the purposes of reciprocity or state certification or licensure [28].

While the EMT-A quickly became a nationally recognized standard, the development of national consensus at the paramedic level lagged behind, with marked differences in training from locality to locality. Paramedic practices became somewhat formalized with the adoption of the DOT emergency medical technician – paramedic (EMT-P) curriculum. By 1982, EMT-P training ranged from a few hundred to 2,000 hours of educational and clinical experience. Typical clinical skills included cardiac defibrillation, endotracheal intubation, venepuncture, and the administration of a variety of drugs. The use of these skills was based on interpretation of history, clinical signs, and rhythm strips. Telemetric and voice communications with physicians

were usually required. In the early days of paramedics, extensive “online” medical oversight was mandatory for all calls in most systems. With time, this requirement was modified by the introduction of protocols allowing for greater use of standing orders [38]. However, a great deal of variation in the use of direct medical oversight remained. As early as 1980, paramedics in decentralized systems such as New York's used many clinical protocols, most of which had few indications for mandatory direct medical oversight. On the other hand, as late as 1992, many centralized systems, such as the Houston Fire Department, had only a few standing orders (mainly for cardiac arrest) that did not require contemporaneous instruction from direct medical oversight.

The concept of the EMT-Intermediate (EMT-I) evolved as a provider level located somewhere between EMT-A and EMT-P. Airway management, IV therapy, fluid replacement, rhythm recognition, and defibrillation were the most common “advanced” skills included in the EMT-I curriculum, though significant variation existed (and still does) from state to state. Many states developed several levels of EMT-I, often in a modular progression with formal bridge courses. By 1979, formally recognized prehospital providers existed at dozens of levels, with highly variable requirements for medical oversight.

### Public education

Cardiopulmonary resuscitation training gradually became more widely accepted, as evidenced by participation in training programs throughout the country. As early as 1977, a Gallup Poll reported that 12 million Americans had taken CPR courses and another 80 million were familiar with the technique and wanted formal training [6]. The success of public training was documented by many studies [39,40]. The issues of whom to train and how to improve skill retention continue to be explored, as reflected in the AHA/International Liaison Committee on Resuscitation's *Guidelines 2010* document, which contains significant changes in how the techniques of CPR and emergency cardiac care are taught to laypersons [41].

### Communications

Before 1973, there were few communication systems available for emergency medical care. Only one in 20 ambulances had voice communications with a hospital, a universal emergency telephone number was not operational, and telephones were not available on highways and rural roads. Centralized dispatch was uncommon and there were problems in communications because of community resistance, cost, and insufficient technology. With DOT funding, major steps were taken toward overcoming these communication problems. National conferences, seminars, and public awareness programs advocated diverse methodologies for EMS communication systems. A

communications manual published in 1972 provided technical systems information [42]. In 1973, the 9-1-1 universal emergency number was advocated as a national standard by the DOT and the White House Office of Telecommunications. The Federal Communications Commission (FCC) established rules and regulations for EMS communication and dedicated a limited number of radio frequencies for emergency systems. In 1977 the DHEW issued guidelines for a model EMS communications plan [43].

Emergency medical services medical directors gradually began to appreciate the importance of more structured call receiving, patient prioritizing, and vehicle dispatching. Physicians were forced to look seriously at EMS operational issues that had previously been seen as neither critical nor medical [44]. On the other hand, telemetry as it had been pioneered by Gene Nagel in Florida was generally seen to be impractical, expensive, and unnecessary, and essentially disappeared over time.

## Transportation

Transportation of the critically ill or injured patient rapidly improved after 1973. Although national standards for ambulance equipment were developed in the early 1960s, a 1965 survey of 900 cities reported that fewer than 23% had ordinances regulating ambulance services. An even smaller percentage required an attendant other than the driver, and only 72 cities reported training at the level of an American Red Cross advanced first aid course, the nearest thing to a standard ambulance attendant course before the advent of EMT-A in 1969 [45]. The hearses and station wagons used in the 1960s did not allow personnel room to provide CPR or other treatments to critically ill patients. The vehicles were designed to carry coffins and horizontal loads, not a medical team and a sick patient. In the 1960s, two reports focused national attention on the hazardous conditions of the nation's ambulances [15,46]. In addition to inadequate policies, staff training, and communications, ambulance design was faulty and equipment absent or inadequate. Morticians ran 50% of the ambulance services because they owned the only vehicles capable of carrying patients horizontally. No US manufacturer built a vehicle that could be termed an ambulance.

As early as 1970, the DOT and the ACS had developed ambulance design and equipment recommendations [47,48]. In 1973, the DHEW released the comprehensive guide, *Medical Requirements for Ambulance Design and Equipment*, and a year later the General Services Administration issued federal specifications KKK-A 1822 for ambulances [49]. Although the KKK specifications were originally developed for government procurement contracts, local EMS agencies were often politically obligated to meet or exceed the specifications when ordering new ambulances. A 1978 study of 183 EMS regions described the status of ambulance services within 151 of the regions. Only 65% of the 13,790 ambulances in those regions met the federal KKK standards. Eighty-one regions used paramedics and 72

had some type of air ambulance capability. Response time was often longer than 10 minutes in urban areas and as much as 30 minutes in rural areas [50].

## Hospitals

When awarding grants for EMS under the EMS Systems Act, the DHEW required regions to develop standards and guidelines for categorization of emergency departments in the following eight critical clinical groups: trauma, burns, spinal cord injuries, poisoning, cardiac, high-risk infants, alcohol and drug abuse, and behavioral emergencies. Regions were required to identify the most appropriate hospitals for each of these clinical problems.

In reality, only a small portion of emergency facilities was functionally categorized and in many cases the system did not work as described on paper. Hospital administrators resisted losing control, physicians feared surrendering clinical judgment, and both feared losing patient revenues. Despite this resistance, the DHEW used EMS hospital categorization fairly effectively to restructure acute patient distribution along the lines of clinical capability rather than market share.

## 1978–1981: EMS at midpassage

By 1978 many of the original problems and questions concerning EMS had come into focus. Most of the deficiencies identified in the 1966 NAS-NRC report had been addressed, and progress was being made in many areas. Economic resources and political support were being contributed by local and state governments, private foundations, non-profit organizations, and professional groups. However, there was still tremendous geographic variability regarding distribution of services, access, accessibility, quality, and quantity of EMS resources. Basic questions concerning the effectiveness of the various components, system designs, and relationships still existed, and future funding was uncertain.

In 1978, the NAS-NRC released *Emergency Medical Services at Midpassage*, which stated, “EMS in the United States in midpassage [is] urgently in need of midcourse corrections but uncertain as to the best direction and degree.” The report was sharply critical of how the EMS Systems Act had been implemented by the DHEW, and recommended “research and evaluation directed both to questions of immediate importance to EMS system development and to long-range questions. Without adequate investment in both types of research, EMS in the United States will be in the same position of uncertainty a generation hence as it is today” [51]. The report documented coordination problems among various governmental agencies, focusing particular concern on the multiple standards promulgated as a condition of funding. Some of the standards were conflicting; often they had never been evaluated [51].

Between 1974 and 1981, there were various sources of federal and private funds, and each grant often came with a new set of requirements. The DOT established standards for ambulance design, provider training, and other transportation elements, and the DHEW announced seven critical care areas as the basis for a systems approach and 15 components as modular elements for EMS design. A variety of private organizations also produced standards. With regard to the technique of CPR, the American Red Cross and the AHA established slightly different standards, criteria, and training requirements. By 1978 some states still had not enacted EMS legislation, whereas others had legislated exactly what prehospital providers could do, potentially hampering the flexibility needed for successful local development. Lack of national conformity or agreement precluded the development of universally accepted national standards in most areas of EMS.

On 26 October 1978, a memorandum of understanding was signed by the DOT and DHEW describing each organization's responsibilities relating to development of EMS systems [48]. The agreement was an attempt to coordinate government activities and assign national level responsibility for EMS development and direction. The DOT, in coordination with the DHEW, was to "develop uniform standards and procedures for the transportation phases of emergency care and response." The DHEW was responsible, in coordination with the DOT, for developing "medical standards and procedures for initial, supportive, and definitive care phases of EMS systems." Research and technical assistance were to be performed cooperatively, and both agencies agreed to exchange information and "establish joint working arrangements from time to time" [52].

Because the roots, constituencies, and operating philosophies of the agencies were markedly different, the 1978 agreement quickly failed. Over the four subsequent years the lack of coordination continued [53].

In 1980 the EMS directors from each state banded together to form the National Association of State EMS Directors (NASEMSD). With membership from all 50 states and the territories, it attempted to take a leadership role with regard to national EMS policy, and to collaborate on the development of effective, integrated, community-based, and consistent EMS systems. Its strategy was to "achieve our mission by the participation of all the states and territories, by being a strong national voice for EMS, an acknowledged key resource for EMS information and policy, and a leader in developing and disseminating evidence-based decisions and policy" [54].

## Financing

By 1978, termination of federal funding in most regions was imminent, and the potential effect on operations and future development began to raise concerns. The 1976 and 1979 amendments to the EMS Systems Act reflected concerns about

future funding and had consequently demanded evidence of financial self-sufficiency as one basis for further support. Significant disagreement in describing financial self-sufficiency was apparent in the testimony and documents provided by the various agencies. The DOT estimates of non-federal monies spent annually between 1968 and 1980 ranged up to \$800 million.

In 1979, DHEW officials estimated in testimony that 90% of regions with paramedic service had achieved financial self-sufficiency by 1978 [43]. However, the Comptroller General, in a 1976 report entitled *Progress in Developing Emergency Medical Services Systems*, cited considerable inconsistency in the degree and duration of support provided by community resources [55]. A few years later, in 1979, the Comptroller General testified on the financial status of the EMS regions after analyzing grant applications under the 1976 amendments. Regions were required to document commitment by local governments to continue financial support after federal funds were terminated under Title XII. By the 1980s, the discrepancy between the DHEW's and the Comptroller General's estimates of financial self-sufficiency of EMS systems suggested serious unrecognized difficulties in the continued underwriting of EMS systems.

The financial demands on an EMS system were considerable, related to four major elements: prehospital care, hospital care, communications, and management. The specific costs varied by community. The original 1966 NAS-NRC report estimated that ambulance services accounted for about one-fourth of total EMS system costs, with 75% of that amount for personnel. Communications costs varied from 7% of total cost when there was integration with existing public services, to 35% when completely new systems needed to be established. Although management costs were high during the development phases, they were originally expected to account for less than 2% of the total cost during the operational phase [51].

Health insurance reimbursement did not keep pace with EMS costs, which presented a real problem for EMS providers. Health care benefits were often limited to hospital care and had maximum fixed reimbursements. For example, 20% of Blue Cross patients were not covered for emergency transport, and, of those covered, one-third were only covered after an accident. By 1982, the NAS-NRC wrote, "Availability of advanced emergency care throughout the nation is a worthy objective, but the cost of such services may prohibit communities from obtaining them" [51].

## Research

A total of \$22 million was appropriated between 1974 and 1979 for EMS research. The National Center for Health Services Research, in coordination with the DHEW, funded various clinical and systems research projects. During the 1979 legislative hearings, testimony from the DHEW and the



leadership of academic research centers stressed the need for continued EMS research. Annual reports from the DHEW detailed the type of research under way, questions being studied, and the scope of long-term and short-term research projects funded under Section 1205 of Title XII [50]. These projects included “methods to measure the performance of EMS personnel, evaluate the benefits and the costs of advanced life support systems, examine the impact of categorization efforts, determine the clinical significance of response time, and explore the consequences of alternative system configurations and procedures” [56]. Other projects focused on “developing systems of quality assurance, designing and testing clinical algorithms, and examining the relationships between Emergency Departments and their parent hospitals (including rural-urban differences)” [56].

In early 1979, the Center for the Study of Emergency Health Services at the University of Pennsylvania urged continued support of EMS research, claiming “Dollars spent in EMS research have great potential to help control rising health care costs, [and can] have a significant and visible effect in preventing death and enhancing the quality of patient life following emergency events” [57]. The center suggested research identifying EMS cost control potentials because the phasing out of federal funds, coupled with the effects of local tax revolts, would certainly reduce financing. As the 1980s progressed, the demand for more efficient, effective systems would become universal. Managers of EMS systems, just like their counterparts elsewhere, needed to know which components of the system were crucial and which could be deleted if funding was limited. The answers to those questions were anything but clear.

### 1981: the Omnibus Budget Reconciliation Act

Late in the summer of 1981, President Reagan signed comprehensive cost containment legislation that converted 25 Department of Health and Human Services (DHHS) funding programs into seven consolidated block grants [58]. EMS was included in the Preventive Health Block Grant, along with seven other programs such as rodent control and water fluoridation. In effect, individual states were left to determine how much money from the block grants would be distributed locally. Although existing EMS programs were temporarily guaranteed minimal support, a state could later decide to withdraw all block grant money from one or more regional EMS programs. This concept, simply a fundamental premise of conservative federal government, evolved quite differently in each of the states. As with decisions regarding how to implement provider levels and assure competence, the funding process was generally quite political, with little direct input from the public or the medical community.

The 1976 *Forward Plan for the Health Services Administration* made it clear that by 1982, all federal EMS system financial

support would end, and regional EMS programs would be the responsibility of the regional agencies. The federal role was to be “one of technical assistance and coordination” [59].

### 1982–1996: changing federal roles

The public health initiative for developing a national EMS system came to a gradual, quiet, and unceremonious demise after 1981. In most regions the remnants of the old DHEW program were left to die off slowly under the cloud of confusion occasioned by the Preventive Health Block Grants formula. In most, but not all, states EMS regional programs were lost in the shuffle of competing health programs while the Reagan administration was systematically eliminating federal support for all such programs. In fact, in most jurisdictions the regional EMS momentum present throughout the 1970s simply evaporated. Paradoxically, some individuals involved in EMS saw the end of the DHEW era as an opportunity to develop and implement alternative approaches that would not previously have been permitted [60].

Organizations such as the NREMT, National Association of EMTs (NAEMT), and NASEMSD stepped into the vacuum and endeavored to provide some degree of national infrastructure and EMS identity. At the state level, state EMS agencies managed to keep the momentum by sponsoring well-attended state-wide provider conferences.

In 1984 the Emergency Services Bureau of the National Highway Traffic Safety Administration (NHTSA) was instrumental in creating the American Society for Testing and Materials (ASTM) Committee F-30. Through the ASTM, the NHTSA sought to legitimize the promulgation of standards in many areas of EMS. Through a complex consensus process, thousands of ASTM technical standards were arrived at in many different industries, including construction and building. Although these standards have no federal mandate, they were often enforced at the local level, for example, in building codes. Since a confusing but enthusiastic beginning in 1984, more than 30 EMS-related standards have been developed, including those for the EMT-A curriculum, rotary and fixed-wing medical aircraft, and EMS system organization. This last document outlines the roles and responsibilities of state, regional, and local EMS agencies. The resultant standards, although mandated by no authority, were considered by several state legislatures when state EMS laws or guidelines, written to obtain federal funding in the mid-1970s, required updating.

The F-30 Committee prospered as long as physician involvement was evident and decisive, but it was clearly the NHTSA's decision what standard to expedite and when. The NREMT, NAEMT, and other interest groups joined the physicians, each to protect themselves. Although many physicians and physician groups eventually tired of the F-30 exercise, the NHTSA preserved some semblance of a central authority.

As early as 1983, the NHTSA began assuming some roles previously associated with the old DHEW program. Many of the original evaluation staff were hired on a part-time basis to promote use of EMS management information systems. Management conferences were arranged for regional EMS system grantees. Saddled with growing financial problems under block grants, few could attend. In 1988, the NHTSA attempted to organize the electronic exchange of information among surviving EMS clearing houses, but those efforts eventually failed after 3 years. Because the NHTSA had no specific legislative mandate to assume many of the roles previously performed by the DHEW, some states tried to assume those roles but were often unsuccessful. One area that received less attention at the federal level was trauma research and systems development. That would remain so until the passage of the Trauma Care Systems Planning and Development Act in 1990 (Public Law 101-590).

It would be incorrect to view the period since 1982–1996 as simply stagnant. It might be better characterized as a time when centrifugal forces played havoc with attempts by the federal government and national organizations to define and standardize EMS. During this time, neither an operational consensus nor a discrete EMS development philosophy emerged. Across the country, local activists battled others in pursuit of diminishing funds. By 1992, patients had clearly emerged as customers, and, by the beginning of the Clinton administration, EMS was just as conceptually unified, standardized, efficient, expensive, and confused as the rest of American health care. The Clinton health care plan of 1993 barely mentioned ambulance services, and it did not address EMS systems at all.

The Emergency Medical Services for Children (EMSC) program was first authorized and funded by the US Congress in 1984 as a demonstration program under Public Law 98-555. Administration of the EMSC program is jointly shared by the Health Resources and Services Administration's Maternal and Child Health Bureau (MCHB) and the NHTSA. This program is a national initiative designed to reduce child and youth disability and death caused by severe illness or injury [61], and serves as an example of a successful collaboration between government and academic forces.

In the late 1970s, the Hawaii Medical Association laid the groundwork for the EMSC program. It urged members of the American Academy of Pediatrics (AAP) to develop multifaceted EMS programs that would decrease morbidity and mortality in children. It worked with Senator Daniel Inouye (D-HI) and his staff to write legislation for a pediatric EMS initiative.

In 1983, a particular incident demonstrated the need for these services. One of Senator Inouye's senior staff members had an infant daughter who became critically ill. Her treatment showed the serious shortcomings of an average emergency department when caring for a child in crisis. A year later, Senators Orrin Hatch (R-UT) and Lowell Weicker (R-CT),

backed by staff members with disturbing experiences of their own, joined Senator Inouye in sponsoring the first EMSC legislation.

Initial funding from the EMSC program supported four state demonstration projects. These state projects developed some of the first strategies for addressing important pediatric emergency care issues, such as disseminating educational programs for prehospital and hospital-based providers, establishing data collection processes to identify significant pediatric issues in the EMS system, and developing tools for assessing critically ill and injured children. In later years, additional states were funded to develop other strategies and to implement programs developed by their predecessors. This work progressed through the 1990s when all 50 states and the territories received funding to improve EMSC and integrate it into their existing EMS systems. In response to the available money, in many areas prehospital care of children became the focus of all EMS innovation.

After several years, with projects developing many useful and innovative approaches to taking care of children in the prehospital setting, a mechanism was needed to make these ideas and products more easily accessible to interested states. In 1991, two national resource centers were funded to provide technical assistance to states and to manage the dissemination of information and EMSC products. In 1995, the EMSC National Resource Center in Washington, DC was designated the single such center for the nation. Additionally, with the recognition of the dire need for research and the lack of qualified individuals in each state to perform it, a new center was funded, the National EMSC Data Analysis Resource Center (NEDARC) located at the University of Utah School of Medicine. Created through a cooperative agreement with the Maternal and Child Health Bureau, the NEDARC was established to “help states accelerate adoption of common EMS data definitions, and to enhance data collection and analysis throughout the country” [62].

As the 1980s ended, members of Congress requested information that justified continued funding of the EMSC program. The Institute of Medicine (IOM) of the National Academy of Sciences was commissioned in 1991 to conduct a study of the status of pediatric emergency medicine in the nation. A panel of experts was convened to review existing data and model systems of care, and to make recommendations as appropriate. The findings from this national study revealed continuing deficiencies in pediatric emergency care for many areas of the country and listed 22 recommendations for the improvement of pediatric emergency care nationwide [63]. These recommendations fell into the following categories: education and training, equipment and supplies, categorization and regionalization of hospital resources, communication and 9-1-1 systems, data collection, research, federal and state agencies and advisory groups, and federal funding. These findings convinced Congress to raise funding for the EMSC program.

In response to the IOM report, the EMSC program developed a strategic plan. With the assistance of multiple professionals, including physicians, nurses, and prehospital providers, major goals and objectives were identified. The EMSC 5-year plan for 1995–2000 served as a guideline for further development of the program [64]. The plan had 13 goals and 48 objectives. Each objective had a specific plan that identified national needs, suggested activities and mechanisms to achieve the objective, and listed potential partners. In 1998, the plan was updated with baseline data, refined objectives, and progress in completing activities [65].

### EMS physicians 1982–1996

Throughout the 1970s, emergency physicians and the fledgling ACEP supported regional EMS programs. Unfortunately, by 1983, emergency physicians and the embryonic state chapters of ACEP were primarily focused on developing their new specialty. During this period, medical directors for EMS systems around the country increasingly began to publish articles in scientific journals on prehospital research and on their respective experiences with prehospital care. Gradually, they began to meet and in the process found many areas of common interest. After a series of organizational meetings that began in Hilton Head, South Carolina, in 1984, the National Association of EMS Physicians (NAEMSP) was created in 1985, with Dr Ron Stewart as its first president. By the late 1980s, emergency physician groups such as the ACEP and the Society for Academic Emergency Medicine (SAEM) placed more emphasis on EMS and began to encourage EMS-related activities among their members.

### Training 1982–1996

In the early 1980s, the NHTSA developed an EMT-I curriculum and by 1992 developed the EMT-B curriculum, which was a qualified success and adopted by most states. The EMT-B curriculum included the use of automated external defibrillators as recommended by the AHA [41] and assisting patients with their medications. The National EMS Training Blueprint Project Task Force sponsored by the NREMT began a process to more clearly define the scope of practice of EMS providers in 1993 [66].

### Transportation 1982–1996

Encouraging the use of voluntary ambulance standards was common from 1983 to 1990. By 1990, issues of ambulance operations, safety, and optimal mode of response were starting to be a risk management concern and more services began to use medical priority dispatch systems. The number and

availability of medical helicopters increased, but with as many as 44 such crashes in one year, safety concerns began to increase as well.

### 1996–2008: the role of the federal government matures, the United States faces terrorism, and EMS is at breaking point

#### *EMS Agenda for the Future*

In 1996, the NHTSA and the Health Resources and Services Administration (HRSA) published the *EMS Agenda for the Future* [67]. This document was the culmination of a year-long process to develop a common vision for the future of EMS. The federally funded project was coordinated by the NAEMSP and NASEMSD, but involved hundreds of other organizations and EMS-interested individuals who provided input to the spirit and content of the agenda. In addition to describing a vision for the future of EMS, the document discusses 14 attributes of the EMS system and outlines steps that will enable progress toward realizing that vision. Shortly after its initial publication, thousands of copies of the *EMS Agenda for the Future* had been distributed to guide EMS system-related planning, policy creation, and decision making.

#### *EMS Education for the Future: A Systems Approach*

In December 1996, the NHTSA held a conference to address EMS education recommendations of the *EMS Agenda for the Future* report published earlier in the year. Over the next 2 years an EMS Education Task Force was established and the goals were expanded to include defining the essential elements of a national EMS education system as well as the interrelationships necessary to achieve the recommendations in the agenda.

The outcome of the Task Force was the document entitled the *EMS Education for the Future: A Systems Approach* [68], which called for the development of five components of an overall EMS education system: a national EMS core content, a national EMS scope of practice blueprint, national EMS education standards, national EMS education program accreditation, and national EMS certification.

#### **National ambulance fee schedule**

Complaints about Medicare reimbursement for ambulance services increasingly became an issue during the 1990s. Specifically, there were concerns about the lack of uniformity in reimbursement from region to region. The Balanced Budget Act of 1997 required the Health Care Financing Administration (HCFA) to commence a negotiated rule-making process with industry groups and develop a national fee schedule for ambulance services. That process began in 1999 when the HCFA established a rules committee that included the HCFA, the American

Ambulance Association, the International Association of Fire Chiefs, the International Association of Firefighters, the National Volunteer Fire Council, the AHA, the National Association of Counties, the NASEMSD, the Association of Air Medical Services, and a single physician representing both the ACEP and NAEMSP.

The regulations and national fee schedule that resulted from the negotiated rule-making process became effective on 1 April 2002 [69]. The fee schedule established seven national categories of reimbursement for ground ambulances: BLS (emergency and non-emergency), ALS (emergency and non-emergency), a second level of ALS for complex cases, paramedic ALS intercept, and specialty care transport. In addition, there were two categories for air medical transport: fixed winged and rotary winged. The final rule also included adjustments for regional wage differences as well as for services provided in rural areas where the cost per transport is generally higher due to the lower overall numbers of transports.

A medical committee was established during the negotiated rule-making process to develop a coding system for ambulance billing that would better convey to the HCFA the medical necessity for transport and the need for ALS. This document was not an official component of the rule-making process. However, the coding system was eventually adopted in 2005 by the Centers for Medicare and Medicaid Services as an “educational tool.” It was never made a requirement for reimbursement as was originally proposed [70].

### **National EMS Information System**

In 2001 the NASEMSD, in conjunction with its federal partners at the NHTSA and the Trauma/EMS Systems program at the HRSA, began developing a national EMS database, the National EMS Information System (NEMSIS). By 2003, a detailed data dictionary was completed. Information about each of the data elements, the variables, and the definitions associated with the data elements as well as how to deploy the elements in a database were described [71].

With funding from the NHTSA, EMSC, and CDC, the NEMSIS Technical Assistance Center (TAC) was established at the University of Utah School of Medicine in 2005. The mission of the TAC is to partner with the University of North Carolina at Chapel Hill to provide support to the NEMSIS project [72].

### **11 September 2001**

The attacks on the World Trade Center and the Pentagon on 11 September 2001 changed the way that Americans think about the world as well as the way they live. Efforts to enhance the capability to prevent and respond to terrorist attacks have become routine. Shortly after 9/11, the Department of Homeland Security (DHS) was established, which represented the largest and most expensive reorganization of the federal government in history. Congress began funding preparedness efforts with billions of dollars going to federal agencies, state and local

governments, and private entities such as hospitals. Despite the massive funding for public safety and medical preparedness, reports have indicated that only a small percentage (less than 4%) of this funding has gone to EMS [73]. Advocacy efforts to increase federal funding for EMS, for both day-to-day services and preparedness, were largely unsuccessful.

### **Advocates for EMS**

Recognizing the need for greater national advocacy for EMS, the NASEMSD and NAEMSP formed a non-profit organization, Advocates for EMS (AEMS), on 22 October 2002, for promoting, educating, and increasing awareness among decision makers in Washington on issues affecting EMS [74]. Although there had been previous efforts to establish national EMS advocacy coalitions, none were able to sustain their efforts for more than a few years.

### **Federal Interagency Committee on EMS**

The Federal Interagency Committee on EMS (FICEMS) has coordinated efforts between federal agencies on related EMS issues for several decades. Although this forum provided an opportunity for collaboration between federal agencies on EMS issues, the FICEMS lacked statutory authority and its representatives were not senior officials, which often led to policy and implementation challenges. In 2005, Congress created a new FICEMS with senior representatives from the DOT, DHS, DHHS, the Department of Defense, the Federal Communications Commission, and a single state EMS director. The role of the FICEMS is to identify state and local EMS needs, to recommend new or expanded programs for improving EMS at all levels, and to streamline the process through which federal agencies support EMS. The first meeting of the new FICEMS was held in December 2006. In 2007, the National EMS Advisory Council was established to provide advice and consult with the FICEMS and the Secretary of Transportation relating to EMS issues affecting DOT.

### **Trends in air medical services**

Air medical services in the United States struggled financially for a number of decades and the industry as a whole experienced only modest growth until 2000. However, by 2005, an estimated 700 air ambulances were in operation, more than double the number from a decade before. Unfortunately, that same growth was associated with a more than 200% increase in helicopter crashes. From 2000 to 2005, 60 people died in 84 crashes, and an estimated 10% of air ambulances in the United States had experienced crashes [75]. At the same time, the number of flights paid for by Medicare was up 58% from 2001, and during the same period Medicare payments for air ambulance transports doubled to \$103 million [76]. This has led to a belief that the improved reimbursement for air medical services that came with the implementation of the national fee schedule in 2002 was a factor that contributed to this increase in helicopter utilization.



Efforts by states to regulate air ambulance services have been hampered by legal challenges from the industry related to the Airline Deregulation Act of 1978. The act preempts states from regulating FAA-licensed air transport services in ways that affect their rates, routes, or services. Although the FAA recognizes the role of states in regulating the medical aspects of air ambulance services, questions frequently arise as to what is medical and what is related to rates, routes, or services [77].

### **Institute of Medicine report on the future of emergency care**

In the decade from 1993 to 2002, the number of emergency departments and hospital inpatient beds in the United States declined at the same time that the number of patients coming to emergency departments (EDs) increased by 26%. As emergency medicine has matured as a specialty, patients have increasingly come to EDs as a place to get what is perceived as good care at a convenient time. Additionally, they are frequently referred to EDs by private physicians for unscheduled care. There is also evidence that patients without insurance use EDs as a safety net for obtaining care that they cannot get elsewhere. The result of these intersecting issues, combined with an aging population, is hospital and ED overcrowding. When hospitals are full, admitted patients are frequently “boarded” in the ED until an inpatient bed becomes available. ED boarding, as well as elective admissions, are felt to be the major factors contributing to ambulance diversion. In 2003 there were more than 500,000 ambulance diversions in the United States.

The IOM began a study of hospital-based emergency care in 2003 that rapidly expanded to address long-standing and significant issues related to EMS and emergency care for children. In particular, EMS systems were viewed as increasingly overburdened and underfunded. The result was a three-volume IOM report titled *The Future of Emergency Care*, which was released in 2006 [78]. Key findings of the report included the following: many EDs and trauma centers are overcrowded; emergency care is highly fragmented; critical specialists are often unavailable to provide emergency and trauma care; EMS and EDs are not well equipped to handle pediatric care. Key recommendations of the report included the following: create coordinated, regionalized, and accountable emergency care systems; create a lead (federal) agency for emergency care; end ED boarding and diversion; increase funding for emergency care; enhance emergency care research; promote EMS workforce standards; enhance pediatric presence throughout emergency care.

The IOM report was the first major report on emergency care since the 1966 NAS-NRC report and included a number of recommendations for EMS that, if adopted, would have a major impact. One recommendation of particular relevance to EMS physicians is the recommendation to create a subspecialty for EMS physicians. Other recommendations of specific interest to EMS include developing national standards for the

categorization of emergency care facilities; developing evidence-based national model EMS protocols; increased funding for EMS preparedness; states should require national accreditation of paramedic education programs and national certification for state licensure; EMS agencies should have pediatric coordinators to ensure appropriate equipment, training, and services for children.

### **2009–2013: a period of incremental progress**

#### **Subspecialty in EMS medicine**

Following decades of efforts and bolstered by a recommendation in the 2006 IOM report *The Future of Emergency Care*, the ABEM successfully petitioned and the American Board of Medical Specialties approved a physician subspecialty in EMS on 23 September 2010. The ABEM website has the following description of the subspecialty.

Emergency Medical Services (EMS) is a medical subspecialty that involves prehospital emergency patient care, including initial patient stabilization, treatment, and transport in specially equipped ambulances or helicopters to hospitals. The purpose of EMS subspecialty certification is to standardize physician training and qualifications for EMS practice, improve patient safety and enhance the quality of emergency medical care provided to patients in the prehospital environment, and facilitate further integration of prehospital patient treatment into the continuum of patient care [79].

A task force developed and published an article entitled “The core content of EMS medicine” on 10 January 2012 [80]. The first certification examination was administered in October 2013.

#### **EMS provider education**

In 2009, the NHTSA published the National EMS Education Standards. These are consistent with the principles of the 1996 *EMS Education Agenda for the Future: A Systems Approach* [68] and establish the entry-level educational competencies for the levels of EMS providers outlined in the National EMS Scope of Practice Model [81]. The current model has four levels of providers: emergency medical responder, emergency medical technician, advanced emergency medical technician, and paramedic. The emergency medical technician-intermediate that was established in 1999 was eliminated. The National EMS Education Standards are replacing the National Standard Curricula and will enable more diverse implementation methods and more frequent updates.

#### **Community paramedicine**

There has been growing interest in the United States in expanding the role of paramedics to include the management of urgent low-acuity illnesses, monitoring patients with chronic illnesses at home, and performing other functions that do not involve the traditional EMS role of treating and transporting patients to emergency departments. While scientific evidence of the

safety and effectiveness of such expanded roles is limited, the success of programs in Canada, England, and Australia has drawn the attention of governments and others interested in innovative models of health care delivery and incorporating non-physician providers, who are sometimes viewed as under-utilized, into these models [82]. Legislation passed in Minnesota in 2011 (2011 Minn. Laws, Chap. #12) defines community paramedics and establishes a process for educating and certifying them. In 2012 a law was passed to enable reimbursement for community paramedic services under the medical assistance program and to study the cost and quality of the program (2012 Minn. Laws, Chap. #169). Also in 2012, the Maine legislature passed a law to establish pilot community paramedic projects (Chapter 562, Sec. 1 §84). Community paramedic programs also function in Western Eagle County, Colorado, and Fort Worth, Texas [83].

### National EMS Culture of Safety Project

Emergency medical services is known to be a high-risk profession; EMS providers are 2.5 times more likely than the average worker to be killed on the job [84], and their transportation-related injury rate is five times higher than average [85]. Additionally, there are patient safety concerns as outlined in the 1999 IOM report *To Err is Human* as well as concerns about risks to EMS personnel, patients, and the community from ambulance crashes. In 2009 the National EMS Advisory Council recommended that the NHTSA create a strategy for building a culture of safety in EMS. With support from the EMS for Children Program at the HRSA, the NHTSA contracted with the ACEP to develop a National EMS Culture of Safety Strategy that was published in October 2013 [86].

### EMS research

In response to the recommendations to improve research in emergency care that were included in the 2006 IOM report *The Future of Emergency Care*, the National Institutes of Health (NIH) established an Emergency Care Research Working Group in 2007. The purpose of the working group is to coordinate research in emergency care across the NIH in an effort to improve efficiency, realize scientific opportunities, and enable the rigorous training of new investigators. In November 2010, the NIH published four papers in the *Annals of Emergency Medicine* summarizing the progress, promise, and process of emergency care research and reporting on the outcomes of three roundtables. An Office of Emergency Care Research has been established and Jeremy Brown MD was appointed the first permanent director in July 2013.

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