1

History

Anthony C. Mustalish, M.D., M.P.H., FACEP, FACPRM
Carl Post, B.A., M.A., Ph.D., EMT-D

Over the last 25 years, emergency medical services (EMS) in the United States has undergone major expansion, development, and change. The object of neglect before 1966, EMS has progressed and improved, since receiving emphasis by public and private agencies, resulting in the development of innovative systems, multiple levels of providers, and a new specialty in medicine. Although the events were partially due to the application of a systematic approach, the adoption of clinical breakthroughs, the integration of the hospital and prehospital phases of emergency medical care, and heightened political and public awareness, in a real sense the advances evolved naturally. There was neither supporting evidence nor a shared paradigm.

This chapter analyzes the historical development of EMS, discusses philosophical and social events that fueled change, and reviews major trends. The chapter is constructed around the watershed years of 1966, 1973, and 1982.

Before 1966

Prehospital care has existed since man learned to hunt and make war. 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 present prehospital EMS programs. Among these elements was the recognition of a need for action, which led to the development of medical and surgical emergency treatment techniques and the evolution of a system of communication, treatment, and transport to reduce morbidity and mortality.

One of the earliest known medical documents, the *Edwin Smith Papyrus*, written in 1500 BC, vividly describes triage and treatment protocol.[11] Reference to prehospital emergency care is also found in the *Babylonian Code of Hammurabi* where a detailed protocol for treatment of the injured is described.[30] In the Old Testament, Elisha breathed into the mouth of a dead child and brought the child back to life.[42] The Good Samaritan not only treated the injured traveler but also instructed others to do likewise.[48] Greeks and Romans had surgeons present during battle to treat the wounded. Chariots were available to transport them to hospitals set up nearby.

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.[34]

To quote Larrey directly: "At Limbourg, our advanced guard had a brisk engagement with the King of Prussia. The remoteness of our ambulances deprived the wounded of the requisite attention . . . we found it most impossible to bring off our wounded who fell into the power of the enemy . . . I was authorized to construct a carriage which I called the flying ambulance."[12] 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.

One can speculate that Napoleon's contemporaneous and brilliant battlefield innovation of light, highly mobile artillery sparked Larrey's creativity, much in the same way that modern physicians modified the military use of helicopters into medical

evacuation roles. Larrey also initiated detailed treatment protocols such as the early amputation of shattered limbs to prevent gangrene, just as Napoleon codified his military dictums and civilian laws.

The Civil War marked the origin of the first organized prehospital system in the United States.[33] 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. After several early catastrophes, the Union Army trained medical corpsmen to provide treatment in the field. In addition, a transportation system, which included railroads, was developed to bring the wounded to medical facilities.[70] As documented by Walt Whitman[73] and James Brady, the facilities were primitive; many wounded died in agony, more often from dysentery, malnutrition, and infection than an immediate result of their wounds.[63]

Throughout the first half of the nineteenth century few organized programs of prehospital care existed for civilians. The medical experiences of the Civil War stimulated the beginning of urban ambulance services in the United States and England. The first ambulance systems in cities such as Cincinnati, New York, London, and Paris during postwar years. The early prehospital care advocates, often solitary and criticized, recognized the need for a prehospital system to care for patients in workplaces, at home, and on urban streets. Injuries caused by runaway horses, fires, and other aspects of nineteenth century urban life resulted in suffering and often death for those who were either left unattended or transported in a slow and painful manner.[11]

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.[35] On the ambulance there was 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, themselves a new concept, accompanied the ambulance; often, care was rendered on the scene and the patient left at home. Ambulance drivers had virtually no formal medical training.

One of the best descriptions of a turn of the century urban ambulance service comes from Emily Barringer, the first woman ambulance surgeon in New York City. Her descriptions are still timely. For example, "Aside from the permanent personnel of the ambulance house, there was a most interesting collection of people who 'dropped in' there for a chat; . . . these various men exchanged confidences and formed plans. It was there in the ambulance house that the reporters would surely drop in for the 'inside dope' about any inpatient matter, be it politics, murder, or accident."[6]

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 the individual hospital, although improved telegraph and telephone systems with signal boxes throughout New York City were developed to connect the police department and the hospitals.[35]

During World War I, the introduction of the traction splint for the stabilization of patients with leg fractures by Thomas led to a decrease in morbidity and mortality. Between the two wars, ambulances were dispatched by mobile radios. In the 1920s in Roanoke, Virginia, the first volunteer rescue squad model was begun. The Virginia Beach EMS, with more than 200 members, remains the largest volunteer EMS organization in the United States.

After the American entry into World War II, the military demand for physicians pulled the interns from ambulances, resulting in a marked alteration and deterioration of prehospital care. Physicians never returned to ambulance duty in the United States. Instead the postwar ambulances, in effect poorly equipped vehicles or hearses, usually responded to emergencies staffed by untrained personnel able to provide only minimal treatment on the scene. Half the ambulances were operated by mortuary attendants, most of whom had never taken even a first aid course.[7] The primary function was to transport the patient to the hospital in a horizontal position.

Throughout the 1950s and 1960s, two geographic patterns of ambulance service evolved. In cities, hospital-based ambulances gradually coalesced into more centrally coordinated citywide programs usually administrated 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. In urban and rural areas a few profit-making providers continued to deliver transport services and occasionally even contracted with local government to provide emergency prehospital services and transport. In most rural venues there was minimal coordination among providers and little integration of prehospital services with medical facilities.

Before 1966, very little legislation and regulation applicable to ambulance services existed. Responding providers had relatively limited formal

training, and physician involvement at all levels was minimal. Although a gradual evolution would have continued, a number of factors intersected in the mid-1960s, which stimulated a revolution in prehospital care.

Interest in prehospital care was stimulated by breakthroughs in medical treatment simply because at least something could be done. Closed chest cardiopulmonary resuscitation (CPR), reported as successful in 1960 by Kouwenhoven,[43] was quickly 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 providers of those interventions in both the hospital and the prehospital environments.

Throughout the 1960s, fundamental understanding of the pathophysiology of potentially fatal dysrhythmias expanded significantly. CPR, pharmaceutical intervention, and electrical defibrillation were first carried out by physicians. In 1966, Pantridge and Geddes documented the use of a mobile coronary care unit (CCU) ambulance for prehospital resuscitation of patients in Belfast. Their treatment protocols, originally developed for the treatment of myocardial infarction in intensive care units, were quickly moved into the field.[61] Because the medical team was often with the patient at the time of cardiac arrest, the success rate was a remarkable 20%.

1966: A Turning Point

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 aggressive development of prehospital systems, was heralded by the National Academy of Sciences-National Research Council (NAS-NRC) report. NAS-NRC is a private organization chartered by Congress to provide scientific advice to the Federal government. "Accidental Death and Disability: The Neglected Disease of Modern Society," documented the enormous failure of the US health care system to provide even minimal care for the emergency patient. Prehospital services were accurately described, in absolute terms and in comparison with care available to military personnel in World War II and the Korean conflict, as primitive and woefully inadequate. Treatment protocols, trained medical personnel, rapid transportation, and modern communications such as two-way radios and emergency call numbers were all identified as necessities simply not available to civilians.[20]

The NAS-NRC report identified key issues and problems facing the United States in providing emergency care. Twenty-four recommendations were proposed that would serve as a blueprint for EMS development. Its summary report (see box) listed factors contributing to the inadequate status of the US emergency care system.[20]

It is worth quoting this document extensively not only because it details the prehospital emergency care problem, but also because it establishes a benchmark to measure subsequent progress and change.

> **DEATHS:** Accidents are the leading cause of death among persons between the ages of 1 and 37; and they are the fourth leading cause of death at all ages. Among accidental deaths, those due to motor vehicles constitute the leading cause for all age groups under 75. Since 1903, when the "horseless carriage" toll assumed significance, there have been more than 6,500,000 deaths from accidents in this country, over 1,690,000 involving motor vehicles. In 1965, the accident death toll was approximately 107,000 including 49,000 from motor vehicles, 28,500 at home, and 14,100 at work. Deaths from traffic injuries have increased annually; 10,000 more were killed in 1965 than in 1955, and the increase from 1964 to 1965 was 3 percent. Seventy percent of the motor vehicle deaths occurred in rural areas and in communities with populations under 2500.
>
> Despite increasing mechanization, death rates from work accidents in manufacturing have decreased in the past 33 years, from approximately 37 accidental deaths per 100,000 workers in 1933 to a rate of 20 per 100,000 in 1965. This reduction is due largely to education, training, and surveillance of industrial workers, and elimination of hazardous machinery in industrial plants. Similar efforts should be directed to the increasing millions of drivers and to vehicles.
>
> The tragedy of the high accidental death rate is that trauma kills thousands who otherwise could expect to live long and productive lives, whereas those afflicted with malignancy, heart disease, stroke, and many chronic diseases usually die late in life. Thus many more millions of productive man-years are lost owing to deaths from accidents than from chronic diseases among older persons. The human suffering and financial loss from preventable accidental death constitute a public health problem second only to the ravages of ancient plagues or world wars. In one year alone vehicle accidents kill more than we lost in the Korean War, and in the past 60 years more Americans have died from accidents than from combat wounds in all of our wars. In the 20–year period from 1945 through 1964, there were over 97,000 accidental deaths among military personnel, predominantly caused by motor vehicles.
>
> **DISABILITY:** The total number of nondisabling injuries treated at home, in doctors' offices, in out-

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 US 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 attemps 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.[20]

From *Accidental death and disability: the neglected disease of modern society*, National Academy of Sciences, Washington, DC, 1966, National Academy Press.

patient clinics or in emergency departments is unknown. In 1965, disabling injuries numbered over 10,500,000 including 400,000 that resulted in some degree of permanent impairment. It is estimated that the number of United States citizens now physically impaired by injuries is over 11 million, including nearly 200,000 persons who have lost a leg, a foot, an arm, or a hand and 500,000 with varying degrees of impaired vision.

COSTS: In 1965, accident costs totaled about $18 billion, including wage losses of $5.3 billion, medical expenses of $1.8 billion, administrative and claim settlements of $3.6 billion, property loss in fires of $1.4 billion, property damage in motor vehicle accidents of $3.1 billion, and indirect cost of work accidents of $2.8 billion. The total approaches the current national annual appropriation for conducting the war in Vietnam.

MEDICAL LOAD: The care of accident cases imposes a staggering load on physicians, paramedical personnel, and hospitals. Approximately one of every four Americans suffers an accident of some degree each year. Of the more than 52,000,000 persons injured in 1965, although many were treated at home or at work, most received medical attention in physicians' offices or in outpatient or emergency departments of hospitals. It is estimated that in 1965 more than 2,000,000 victims of accidental injury were hospitalized; they occupied 65,000 hospital beds for 22,000,000 bed-days and received the services of 88,000 hospital personnel. This exceeds the number of bed-days required to care for the 4 million babies born each year or for all the heart patients and it is more than four times greater than that required for cancer patients. Approximately 1 of 8 beds in general hospitals in the United States is occupied by an accident victim.[20]

The 1966 NAS-NRC document also cited hospital emergency departments as being woefully inadequate. Although there were more than 7000 accredited hospitals, very few were prepared to meet the increased demand that developed between 1945 and 1965. From 1958 to 1970, the number of emergency department visits increased from 18 million to more than 49 million.[20] 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. 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 nonexistent.[16,17,37,38]

The 1966 NAS-NRC document was the first to recommend emergency facilities be categorized: "The current dictum that an ambulance should deliver a patient to the nearest emergency unit is no longer acceptable. In the absence of a descriptive categorization of the level of care that might reasonably be expected at a facility, neither the patient nor the ambulance driver can judge which facility is

adequate to the immediate need."[20] The report further suggested emergency units might be categorized as the following: an advanced first aid facility, a limited emergency facility, a major emergency facility, or an emergency facility combined with a trauma research unit.[20]

The NAS-NRC report emphasized aggressive clinical management of trauma. It suggested that local trauma registries develop data bases concerning the natural history and epidemiology of trauma, the establishment of a national computerized central registry, and studies on the feasibility of designating select injuries to be incorporated in the epidemiologic reports of the Public Health Service. Additionally, changes were recommended to address legal problems, for autopsies of trauma victims, and for disaster response reviews. Finally, trauma research was emphasized with the ultimate goal of establishing a National Institute of Trauma.[20]

Another problem identified in the report was the broad gap between existing knowledge and operational activity. For example, the mortality rate for injured soldiers reaching medical facilities in World War I was 8%, in World War II it was 4.5%, and it was less than 2% in Vietnam.[19,39] The dramatic improvement in military survival was attributed to appropriate ambulance services, trained personnel, adequate communication systems, and strategically located treatment facilities. Yet in the mid-1960s, these components were missing from civilian services. Although communication with astronauts was possible, mobile communication with ambulances was not yet regarded as integral to EMS.

The NAS-NRC report did not appear out of thin air. The President's Commission on Highway Safety[63] had previously published a report titled "Health, Medical Care, and Transportation of Injured," which recommended a national program to reduce deaths and injuries caused by highway accidents. Its findings were complemented by and consistent with the later NAS-NRC report. The recommendations 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.[56]

The Highway Safety Act 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.[56]

1966 to 1973

Encouraging matching funds from state and local governments, as well as private sources, the Highway Safety Act served as a catalyst for targeting millions of dollars toward EMS development. Between 1968 and 1979 the DOT contributed more than $142 million to regional systems under the EMS standard. Ten million dollars was spent between 1967 and 1979 on more than 50 research projects dealing with three major areas: development ($584,000), demonstrations ($4.9 million), and studies/surveys ($5.3 million). Contract obligations to the DOT included specific criteria for the EMS use of helicopters, ambulance design, EMS communication systems, and EMS system development.[27,40,58]

Other federal EMS initiatives during this period included the designation of the Health Services and Mental Health Administration (HSMHA) as the lead agency for EMS within the Department of Health, Education, and Welfare (DHEW). In 1972, $16 million was awarded by HSMHA to areas of Arkansas, California, Florida, Illinois, and Ohio to develop model regional EMS systems. The purpose of those demonstration projects was to compare various approaches to emergency medical care so other localities could develop their own systems. Typically, politically influential areas were chosen for the projects, which were federally financed operations as much as they were demonstrations.[41,68]

In 1969 the Airlie House Conference proposed a hospital categorization scheme.[18] The AMA Commission on EMS urged facility categorization and published its own, which identified staffing, equipment, services, and personnel types.[14] This became known as "horizontal categorization." Although categorization 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 EMS demonstration projects developed a categorization scheme based on hospitalwide care of specific disease processes. Known as "vertical categorization," it was ultimately embraced by

many regional programs as a major theme in the development of EMS systems.

By the late 1960s, drugs, defibrillators, and personnel were available to improve prehospital care. Fortunately, space age telemetric technology was also available, so responders with limited medical training did not have to interpret rhythm strips. As early as 1967 the first physician responder mobile programs metamorphosed into "paramedic" programs using physician-monitored telemetry. These new programs combined existing clinical knowledge, evolving technology, and available personnel to define the ultimate clinical product; obviously, there were great geographic variations in approach.[46,53] However, if automated external defibrillators had existed in 1967, the evolutionary path of prehospital providers in the United States may have been very different.

The "Heartmobile" program, begun in 1969 in Columbus, Ohio, initially consisted of a physician and three EMTs; yet, within 2 years, 22 highly trained (2000 hours) paramedics provided field care and the physician's role had become supervisory. Paramedics performed lifesaving techniques with physician supervision, resulting in a cardiac arrest survival rate similar to that obtained by physicians alone. Similarly, in Seattle, physicians supervised highly trained paramedics, increasing the survival rate from 10% to 30% for prehospital patients whose presenting rhythm was ventricular fibrillation. In Dade County, Florida, the rapid response time of mobile paramedic units was effectively combined with hospital physician direction via radio and telemetry for the first time.[53] In Brighton, England, non-physician personnel provided field care without direct medical control. Electrocardiographic data were recorded continuously to permit retrospective review by a physician.[46]

National professional organizations such as the American College of Surgeons (ACS), the American Association of Orthopaedic Surgeons (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 Commission on EMS of the AMA, the Committee on Community Emergency Health Services of the American Hospital Association, the American Trauma Society, the Emergency Department Nurses Association, the Society of Critical Care Medicine, the National Registry of Emergency Medical Technicians, and the American College of Emergency Physicians (ACEP). Before 1973 such groups exerted significant but uncoordinated forces toward the reorganization, restructure, improvement, expansion, and politicization of EMS.[4,10,14,18]

The Robert Wood Johnson Foundation (RWJF) allocated $15 million for EMS-related activities in 1974, the largest single contribution for the development of health systems in the United States ever made by a nonprofit foundation. Forty-four areas received grants of up to $400,000 to develop EMS systems.[66] This money was to encourage communities to build regional EMS systems emphasizing the overall goal of improving access to general medical care. The program recognized that many patients had difficulty getting immediate and appropriate assistance in an emergency situation and that a reduction in the time between initial need and the provision of care offered tremendous lifesaving potential. RWJF estimated that more than 90,000 lives could be saved each year through prompt medical treatment of trauma victims. The money was provided over a 2-year period to establish new demonstration projects and develop regional emergency medical communications systems.[67]

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 both the provision and upgrading of EMS. It recommended that President Nixon express concern about the magnitude of the accidental death and disability problem and that he propose action by the legislative and executive branches to ensure optimum universal emergency care. Furthermore, it urged interdepartmental coordination in identifying federal resources for delivery of emergency services, as well as the integration of all those responses into a single division of the DHEW, which would have primary responsibility for the entire emergency medical program. Finally, it 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.[15] This set the stage for the new EMS regional programs to directly conflict with both the counties and the states.

1973: The Emergency Medical Service System 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 five 1968 DHEW regional demonstration projects, signif-

icant progress had been made toward clearly defining a potential program goal. The projects proved that a regional EMS system approach could work; however, they did not prove that a regional approach was necessarily the best.

By early 1973 many national organizations supported further federal involvement both in establishing EMS program goals and 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 that 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 System 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.[29]

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 three major portions of the EMS System Act:

Section 1202—Feasibility studies and planning
Section 1203—Initial operations
Section 1204—Expansion and improvement
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. Funding for operations, research, and training from 1973 to 1979 is presented in Table 1-1. Table 1-2 displays funding authorized under the EMS System Act through fiscal year 1982.

The program was administered in the DHEW through the Division of Emergency Medical Services (DEMS). David Boyd, the medical director of the Illinois demonstration project was named the director. The law and subsequent regulations emphasized a regional systems approach, a trauma orientation, and required that each funded system address the 15 components listed in the box on p. 10. Appendix I of this chapter describes each component as prepared by the DHEW and published as part of its revised *Program Guidelines* in 1979. Medical oversight was addressed neither in 1973 nor in 1979.

Although the EMS System Act and its subsequent regulations encouraged a degree of medical over-

Table 1-1. History of EMS Authorizations and Appropriations

Purpose	Authorized($)	Appropriated ($)
Fiscal year 1974:		
Services	30,000,000	17,000,000
Research	5,000,000	3,300,000
Training	10,000,000	6,600,000
TOTAL	45,000,000	26,900,000
Fiscal year 1975:		
Services	60,000,000	32,500,000
Research	5,000,000	4,500,000
Training	—	—
TOTAL	65,000,000	37,000,000
Fiscal year 1976:		
Services	35,000,000 5,003,000	29,700,000
Research	5,000,000	3,925,000
Training	10,000,000	—
TOTAL	55,003,000	33,625,000
Fiscal year 1977:		
Services	45,000,000	33,200,000
Research	5,000,000	3,925,000
Training	10,000,000	6,000,000
Burn program	5,000,000	3,000,000
TOTAL	65,000,000	46,125,000
Fiscal year 1978:		
Services	55,000,000	36,625,000
Research	5,000,000	3,000,000
Training	10,000,000	6,000,000
Burn program	7,500,000	3,000,000
TOTAL	77,500,000	48,625,000
Fiscal year 1979:		
Services	70,000,000	36,625,000
Research	5,000,000	3,000,000
Training	10,000,000	3,000,000
Burn program	10,000,000	3,000,000
TOTAL	95,000,000	45,625,000

From the Committee on Labor and Human Resources: United States Senate 96th Congress, 1st Session. Rep No 96-102, In: *United States Senate Hearing report*, 515-516, Feb 28, 1979, Washington, DC, 1979, US Government Printing Office.

Table 1-2. Authorizations of Appropriations for Emergency Medical Services Programs

	1980 ($)	1981 ($)	1982 ($)	Totals ($)
Services	40,000,000	40,000,000	40,000,000	120,000,000
Research	3,000,000	3,000,000	3,000,000	9,000,000
Burn trauma or poison	3,000,000	3,000,000	3,000,000	9,000,000
Training	4,000,000	4,000,000	4,000,000	12,000,000
TOTALS	50,000,000	50,000,000	50,000,000	150,000,000

From Committee on Labor and Human Resources: United States Senate 96th Congress, 1st Session Report No 96-102, In: *Hearing report*, 504, Feb 28, 1979, Washington, DC, 1979, US Government Printing Office.

sight, the focus was on the project medical director who, in retrospect at least, seems far removed from the practice of prehospital medicine.

1974 to 1981

The 15 essential EMS components may have been flawed, but the concept that an EMS chain of survival was only as strong as its weakest link was correct. In early 1974, DHEW officials began implementing the legislative mandate. Adopted from earlier experiences the basic principles were that (1) an effective and comprehensive system must have resources sufficient in quality and quantity to meet a wide variety of demands and (2) the discrete geographic regions established have sufficient populations and resources eventually enabling them to become self-sufficient.

Each state was to designate a coordinating agency for statewide EMS efforts. Ultimately, 304 EMS regions were established nationwide. Table 1-3 demonstrates the status of regional EMS activity in 1979. Of the 304 geographic areas, 22 "no activity" and 96 "section 1202 planning" areas represented 118 regions not in operation. As early as 1979, 17 regions were fully functional and independent of federal money.

In 1979 testimony was given before the congressional committee considering extension of funding. DHEW officials stated that 291 of the 304 regions had received funding under Title XII, 258 (covering 159.5 million people) had completed the planning process, and 206 (covering 150 million people) had either completed or were in the development phase.[49]

In the regulations, Boyd, strictly interpreted the congressional legislative intent of the EMS System Act to mandate that all communities adopt the 15 essential components. Regions were limited to five grants; 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; and advanced life support (ALS) capability 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 responded

Table 1-3. Regional Activity: 1979

Status of EMS activity	Regions (No.)
No activity	22
Section 1202 planning	96
Section 1203 (1st year) establishment	50
Section 1203 (2nd year) establishment	68
Section 1204 (1st year) improvement	39
Section 1204 (2nd year) improvement	12
Completed eligibility	17
TOTAL	304

From Committee on Labor and Human Resources: United States Senate 96th Congress, 1st Session Report No 96-102, In: *Hearing report*, 508, Feb 28, 1979, Washington, DC, 1979, US Government Printing Office.

The Fifteen Essential EMS Components (1973)

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

Table 1-4. Grant Activity Provided by the EMS System Act

Fiscal Year 1974

Eighty-five grants covering 126 regions and serving a population of 88,200,000 were awarded in the amount of $17,000,000.

Section of act	Grants (No.)	Regions (No.)	Amount ($)	Population served
1202	53	90	2,250,000	63,000,000
1203	21	27	10,400,000	18,900,000
1204	11	9	4,350,000	6,300,000
TOTAL	85	126	17,000,000	88,200,000

Fiscal Year 1975

One hundred and sixteen grants, covering 174 regions and serving a population of 121,890,000 were awarded in the amount of $32,242,800.

Section of act	Grants (No.)	Regions (No.)	Amount ($)	Population served
1202	56	82	4,617,000	57,400,000
1203	49	66	19,500,000	46,200,000
1204	11	26	8,125,000	18,290,000
TOTAL	116	174	32,242,000	121,890,000

Fiscal Year 1976

Fifty-two grants, covering 63 regions and serving a population of 44,100,000 were awarded in the amount of $29,115,300.

Section of act	Grants (No.)	Regions (No.)	Amount ($)	Population served
1202	—	—	—	—
1203	41	51	21,836,475	35,700,000
1204	11	12	7,278,825	8,400,000
TOTAL	52	63	29,115,300	44,100,000

Fiscal Year 1977

Eighty-three grants, covering 99 regions and serving a population of 69,300,000 were awarded in the amount of $32,775,000.

Section of act	Grants (No.)	Regions (No.)	Amount ($)	Population served
1202	14	21	986,563	14,700,000
1203	44	54	21,767,304	37,800,000
1204	25	24	10,021,133	16,800,000
TOTAL	83	99	32,775,000	69,300,000

Fiscal Year 1978

Ninety-four grants, covering 100 regions and serving a population of 70,000,000 were awarded in the amount of $36,027,800.

Section of act	Grants (No.)	Regions (No.)	Amount ($)	Population served
1202	12	14	930,000	9,800,000
1203	53	61	23,589,791	42,700,000
1204	29	25	11,508,009	17,500,000
TOTAL	94	100	36,027,800	70,000,000

From Committee on Labor and Human Resources: United States Senate 96th Congress, 1st Session Report No 96-102, In: Hearing report, 510-511, Washington, DC, 1979, Feb 28, 1979, US Government Printing Office.

directly to the EMT-A and paramedic levels of training quickly became elusive as variations in the EMT-A and paramedic levels emerged. An additional year of funding was authorized as the 1202b program for planning. Table 1-4 shows a summary of the grant activity provided by the EMS System Act.

Developing the geographic regions required to secure federal funding through the EMS System Act usually required new EMS legislation at the state level. The state laws developed throughout the 1970s varied markedly in regard to the issues of medical oversight, overall operational authority, and financing. In some states, physician direction 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, and consumers; commonly, the physician input was somewhat removed from the medical mainstream.

Personnel

Lack of appropriately trained emergency personnel at every level of care had been identified as early as 1966 in the NAS-NRC document.[20] After 1973, extensive effort and money were directed at correcting this educational deficiency resulting in significant achievements. By 1978 the Emergency Medical Training Program, authorized under Section 789, provided more than $18 million for the training of more than 200,000 emergency care providers and 12 million citizens in CPR. This was a significant accomplishment considering that just 10 years earlier there were essentially no CPR-trained personnel.

At this time, serendipity played a role. A large number of medical corpsmen, physicians, and nurses who understood that trained non-physicians could perform lifesaving tasks were returning from Vietnam. Many also believed rapid transport and early surgery could save civilian trauma victims.

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."[20] 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. This resulted from the increase in medical specialization, the decline of general practitioners, the increase in hospital-based technology, the greater expectations of the public, and the increase in health insurance support for emergency care. Not surprisingly, during the 1960s a branch of medicine evolved to deal with 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. By 1979 ACEP membership had exceeded 9500 physicians and reached 15,300 in 1991. Paradoxi-cally, by 1990, 80% of emergency department visits were for non-emergency care or for care that previously would have been given in a physician's office, 15% were emergencies requiring immediate attention, and only 5% were critical.

Even before 1966 the ACS had established standards and provided specific training for surgeons in the management of trauma. A number of physicians and centers had also attempted to improve education in trauma, but these early efforts had little impact. However, with increasing public awareness of a national crisis, groups of emergency medicine physicians began developing training programs.

In 1970 the first emergency medicine residency was established at the University of Cincinnati and the first 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 programs in 51 emergency medicine residencies throughout the country.[6,18,47] 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.[47] Further impetus toward expansion of the residency program in emergency medicine occurred with the formation of the American Board of Emergency Medicine (ABEM) in 1976.[3] Before that time there was some hesitancy to create residency programs that might not lead to board certification.

Although RWJF had supplied some money for physician education, major financial support developed when the 1976 EMS amendments provided funds for training the three major EMS personnel components: emergency physicians, emergency nurses, and emergency medical technicians. Ten million dollars was authorized for training physicians in fiscal years 1977, 1978, and 1979; 29 programs received funding for training. In 1978 alone, more than 4000 trainees were supported in medical schools, residencies, and continuing medical education. In the 1970s, mid-career education was important in the effort to produce emergency medicine specialists. The growth of residency programs between 1970 and 1993 is seen in Table 1-5.

Table 1-5. Growth in Accredited Emergency Medicine Residency Programs and Approved Positions 1970-1993

Year	Accredited Programs	Approved Positions
1970	2	3
1975	32	165
1980	51	410
1993	100	2378

From the Society of Academic Emergency Medicine and Association of American Medical Colleges.

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. At that time the emergency medicine physician was defined as one trained to engage in (1) the immediate and initial recognition, evaluation, care, and disposition of patients in response to acute illness and injury, (2) the administration, research, and teaching of all aspects of emergency medical care, (3) the direction of the patient to sources of follow-up care as required, (4) the provision, when requested, of emergency but not continuing care to in-hospital patients, and (5) the management of the emergency medical system for the provision of prehospital emergency care.[3] ABEM gave its first certifying examination in 1980, which incidentally did not touch on any areas of prehospital care. In 1991, 901 fellows were inducted bringing the total of board certified emergency physicians to more than 6900.[1]

While 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 physician as a career choice was perceived by many emergency physicians as limiting and perhaps threatening.

Prehospital Providers. Before 1966 there had been little national, state, or local regulation of ambulance personnel; anyone with a driver's license could answer emergencies. In response to both the 1965 report from the Presidential Commission on Highway Safety and the 1966 NAS-NRC study, Congress passed the Highway Safety Act in 1966, which included funds to develop a training course curriculum for the new position of Emergency Medical Technician-Ambulance (EMT-A). The 70-hour curriculum originally published by the AAOS in 1969 has been updated several times, and also published in other texts.[2] The EMT-A curriculum became the mainstay of training in most states, but actual certification was required in a few.

The 200 people who took the EMT-A course in 1969 were the first ambulance personnel trained to a national standard. The new profession was further defined and officially recognized as an occupational specialty by the Department of Labor in 1972. EMT-A and the more extensive Emergency Medical Technician-Paramedic (EMT-P) were the main educational and operational levels of prehospital care during the early 1970s.

Although the EMT-A concept did not require physician input, the paramedics, who had originally grown out of the physician mobile CCU response programs, were essentially physician-extenders; this concept remained either undeveloped or unadopted by many states. The two types of prehospital providers developed more or less independently. The EMT-A quickly became a nationally recognized standard. Although initially paramedic training differed markedly from locality to locality, the DOT eventually produced a national curriculum. As early as 1973, the practice of the EMT-A was called BLS and the practice of the paramedic, usually trained first as an EMT-A, was labeled ALS.

Because of the great differences in training requirements between the two levels, many local jurisdictions and states quickly developed intermediate levels (EMT-I), which further blurred the already fuzzy distinction between BLS and ALS. By 1979, formally recognized prehospital providers existed at dozens of levels of training from 70 to 2000 hours; the degree of medical supervision required was at least as variable.[46]

By 1982 there were approximately 100,000 providers trained at the EMT-A level with a large portion providing emergency care. The EMT-A was trained to provide the most elemental emergency care at the scene and during transport to the hospital. Such first aid skills include CPR, control of bleeding, ventilation, oxygen therapy, fracture management, extrication, and transport of the patient. The educational requirements of the EMT-A grew to 81 hours of didactic lectures, skills training, and hospital observation; most of the 11-hour increase was devoted to use of the pneumatic antishock garment (PASG). After working for 6 months, graduates were allowed to take a national certifying examination administered by the National Registry of Emergency Medical Technicians (National Registry). Founded in 1970, the National Registry developed a standardized examination for EMT-A

personnel as one requirement for maintaining registration. Many states recognized National Registry registration for purposes of reciprocity, but most still required additional state certification.[10]

The paramedic provided sophisticated medical intervention to patients at the site, and in some early systems either transported or accompanied the patient to the hospital.[30] Paramedic practices became somewhat more formalized with the adoption of the DOT EMT-P curriculum. In 1982, EMT-P training ranged from a few hundred to 2000 hours of educational and clinical experience. Typical clinical skills included cardiac defibrillation, endotracheal intubation, venipuncture, and the use of drugs. Their use 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 paramedicine, extensive "online" medical control was usually mandatory for all calls. However, with time, the requirements for direct medical control were modified by the introduction of protocols allowing for greater use of standing orders.[31] However, a great deal of variation in the use of direct medical control remained. As early as 1980, paramedics in decentralized systems like New York's used many clinical protocols, most of which had few indications for mandatory direct medical control. On the other hand, as late as 1992, centralized systems like the Houston Fire Department's used only one protocol (cardiac arrest), which did not require instruction from direct medical control.

The concept of EMT-Intermediate (EMT-I) evolved as a provider level located somewhere between EMT-A and EMT-P. EMT-I used the EMT-A intervention's as well as some of the more advanced EMT-P techniques. A standardized national examination for the intermediate level was approved in June 1980 by the National Registry. Airway management, IV therapy, fluid replacement, rhythm recognition, and defibrillation were the most common EMT-I skills. The intermediate level was created to provide traditional paramedic skills to the patient without hundreds of hours of provider training and to build a stepwise progression from EMT-A to EMT-P. Many states developed several levels of EMT-I, often in a modular progression with formal bridge courses.

In 1979, a body was established to evaluate and accredit EMT-A and EMT-P training programs. Seven organizations, including ASA, ACEP, ACS, the American Academy of Pediatrics, the National Association of Emergency Medical Technicians (NAEMT), and the National Registry, sponsored the formation of the Joint Review Committee on Educational Programs for the EMT-Paramedic (JRCEMT-P) and agreed to review curriculum, reg istration, and certifying requirements. Th JRCEMT-P developed criteria by which trainin programs were evaluated. Accreditation was offere through the AMA Council on Allied Healt Education (CAHEA) made up of two representative from each of the seven sponsoring organization Later, the JRCEMT-P was integrated with th CAHEA. By March 1993, 88 EMS educational cer ters were accredited by CAHEA and four states mai dated CAHEA approval for individual EMS trainir programs. In October 1993 the AMA was witl drawn from the CAHEA oversight process.

Public Education

CPR training advanced as the minimum level training needed; it was well accepted, as evidence by participation in training programs throughou the country. As early as 1977 a Gallup Poll reporte that 12 million Americans had taken a CPR cour and another 80 million were familiar with the tec nique and wanted formal training.[35] The success public training was documented by many stu ies.[24,51] Various training programs developed, and th issues of who to train when and how to impro retention continued to be explored. In the ear 1980s, approaches to public CPR training includ the following concepts[51]:

- Saturation concept—training enough peop to guarantee training of several citizens in ea neighborhood
- High-risk concept—training families of hig risk individuals
- Selected citizen concept—combining home an geographic saturation with concomitant trai ing of high-risk groups
- Civil servant concept—training all police, fi department, and other constantly present ind viduals
- Public school concept—making CPR part of t curriculum in certain grades at all pub schools

Communications

Before 1973 there were few communication syste available for emergency medical care. Only 1 in ambulances had voice communications with a h pital, a universal telephone number was not ope tional, and telephones were not available on hig ways and rural roads, where most accidents occ Centralized dispatch was uncommon and th were problems in communications because of co munity resistance, cost, and insufficient technolo With the DOT funding, major steps were tak

toward overcoming the 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.[58] In 1973 the 9-1-1 universal emergency number was advocated as a national standard by the DOT and the White House Office of Telecommuni-cations. The Federal Communications Commission 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.[18]

The impact of these efforts was obvious in the evaluation statements of the 183 EMS regions studied in 1978. Sixty-two percent of the projects reported use of the 9-1-1 number covering 18.5% of the country and 34.1% of the population. Central dispatch of ambulances present in 40% of the regions involved more than 60% of all ambulances. Forty-eight percent of patients transported were managed by ambulance providers overseen by physicians. By 1979, 79% of all ambulances in the country had two-way voice communication systems.[5]

As early as 1983 the realization that transmission of biotelemetry would become superfluous had taken root. In addition, full-time EMS medical directors slowly began to comprehend the importance of more structured call receiving, patient prioritizing, and vehicle dispatching. Physicians were forced to seriously look at EMS operational issues that had previously been seen as neither critical nor medical.[6]

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 less than 23% had an ordinance 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.[36]

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 mid-1960s, two reports focused national attention on the hazardous conditions of the nation's ambulances.[20,69] 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 vehicle capable of carrying patients horizontally. No U.S. manufacturer built a vehicle that could be termed an ambulance.

As early as 1970, the DOT and the ACS had developed optimal ambulance design and essential equipment recommendations.[30,57] In 1973 the DHEW released the comprehensive article, "Medical Requirements for Ambulance Design and Equipment," and a year later the General Services Administration issued federal specifications KKK-A 1822 for ambulances.[68] 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.[5]

Hospitals

When awarding grants for EMS under the EMS System Act, the DHEW required regions to develop standards and guidelines for categorization of emergency departments in the following eight critical clinical groups: (1) trauma victims, (2) burn victims, (3) spinal cord injury victims, (4) poisoning victims, (5) acute cardiac victims, (6) high-risk infants, (7) alcohol and drug, and (8) behavioral emergency victims. Patients from these categories comprised most of the 5% of ED patients with significant emergency medical problems.

Regions were required to identify the most appropriate hospital to manage each of the specific clinical problems. A planned transfer mechanism was essential to this system because often patients in the wrong hospital could be transferred to the appropriate hospital only with established written protocols.

A 1979 summary report on categorization, transfer agreements, and CCU plans stated that 91% of the EMS regions had implemented a categorization scheme for the eight critical clinical groups according to national standards. Eighty-two percent of the projects had transfer agreements providing effective triage and transportation of critically ill patients to the appropriate hospital. Critical care patient categories had been developed in 82% of regions.[5]

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

1978: EMS at Midpassage

Between 1966 and 1978, EMS systems development, which progressed on many fronts, stimulated change at all levels of emergency care. Most of the deficiencies identified by the 1966 NAS-NRC report were attacked and significant progress was made in many areas. Local and state governments, private foundations, nonprofit organizations, and professional groups contributed economic resources and political support. Leadership was strong from the DOT, the DHEW, and a variety of nonprofit nongovernmental agencies including the RWJF, ACS, AAOS, ACEP, and ACT Foundation.

By 1978, as a result of broad-based interest, many original problems and questions had come into focus. There was still tremendous geographic unevenness among EMS systems regarding distribution of services, access, availability, quality, and quantity of resources. Basic questions concerning the effectiveness of the various components, system designs, goals, and relationships still existed. There was also the issue of the availability of future funding. Research had addressed a few questions, but the results were not yet available on most long-range issues because EMS systems were completing the growth phase and had not matured enough for comprehensive evaluation.

In 1978, NAS-NRC released a report called "Emergency Medical Services at Midpassage," which described, "EMS in the United States in midpassage (as) urgently in need of midcourse corrections but uncertain as to the best direction and degree." The report 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."[25] Those words were prophetic; they identified in 1978 the major issue to confront EMS in 1993. The report documented coordination problems among various government 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.[25]

The 1978 report sharply criticized how the EMS System Act was implemented by the DHEW. Financing, design, management, regulation, and evaluation of EMS systems remained in doubt.

Coordination

Between 1974 and 1982 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 while the DHEW announced seven critical care areas as the basis for the systems approach and 15 components as modular elements for EMS design. A variety of private organizations also produced standards. For example, with regard to the technique of CPR both the American Red Cross and the AHA established slightly different standards, criteria, and training requirements. Fortunately, adherence to these "voluntary" standards usually was not required by law.

By 1978, some states still had not enacted EMS legislation whereas others had legislated exactly what prehospital providers could do, thereby 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 October 26, 1978, a memorandum of understanding was signed by the DOT and the DHEW describing each organization's responsibilities relating to development of EMS systems.[32] 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."[32]

Because the roots, constituencies, and operating philosophies of the agencies were markedly different, the 1978 agreement quickly failed. Over the four subsequent years an intense civil war was fought. Critical care medicine was shunted aside, and prehospital providers were standardized by highway engineers.[44]

Financing

Toward the end of the 1970s, concern over future financing grew among those involved with development and operation of EMS. Federal, state, local, and private money had financed systems nationwide; however, the federal phaseout had been planned since the program's inception in 1973. By 1978, termination of federal funding was imminent, and the potential impact on operations and future development began to raise concerns.

The 1976 and 1979 amendments to the EMS System 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 of the nation's EMS systems was apparent in the testimony and documents provided by the various agencies. The DOT estimates of nonfederal monies spent between 1968 and 1980 ranged up to $800 million. The DHEW estimates were similar as seen in Table 1-6, which summarizes nonfederal support.

In 1979, the DHEW officials estimated in testimony that 90% of the regions with paramedic capability had achieved financial self-sufficiency by 1978 and that 90% of those in the 1203 developmental phase would achieve self-sufficiency between 1980 and 1986.[26] The comptroller general published, "Progress in Developing Emergency Medical Services Systems," which described progress in many EMS regions but also cited considerable inconsistency in the degree and duration of support provided by community resources.[21]

In 1979 the comptroller general testified on the financial status of the national 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. Only 25 applications were properly endorsed by local government and only six had developed a specific financial plan.[21] By the 1980s, the discrepancy between the DHEW 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 and 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 total about one fourth of total EMS system costs, 75% of which was for pesonnel. Communications costs varied from 7% to 35% of total cost depending on whether there was integration with existing public services and whether completely new systems needed to be established. Although management costs were high during the development phases, they were expected to account for less than 2% of the total cost during the operational phase.[25]

Table 1-6. Emergency Medical Services State and Local Government Funds

Fiscal year	Source of funds		
	State	Local	Total
1975	19,846,273	189,744,871	209,591,144
1976	29,902,517	200,389,021	230,291,538
1977	30,914,371	234,346,879	265,261,250
1978*	35,687,486	270,791,685	306,479,171

Modified from Division of Emergency Medical Services: testimony before the Subcommittee on Health and Scientific Research Committee on Labor and Human Resources, Feb 28, 1979, 33, *United States Senate hearing report*, Department of Health, Education, and Welfare, 1979.

*A survey for fiscal year 1978 shows that $306,479,171 were provided from state and local government funds for the support of emergency medical services, including training of personnel as appropriate.

Health insurance 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 rapid development of EMS systems throughout the country had improved emergency care without providing long-term funding. Summarizing these early financial issues in 1978, 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."[25]

System Design

In 1981 the nation was still moving toward developing a regional network of EMS systems based on the decisions made in the late 1960s; however, patients, clinical providers, and support personnel already had new and different needs. EMS had been directed to treat the critically ill and injured, yet 95% of patients were not in critical condition. Increasingly, the perceptions of the individual providers varied from the realities of the job. Moreover, the concepts forming the basis for system design, funding guidelines, program development, and implementation were unproven. EMS research was just underway and was unable to answer even the most basic questions, including

critical long-term issues addressing ultimate system configuration.

Research

Between 1974 and 1979, $22 million was appropriated for EMS related research. The National Center for Health Services Research (NCHSR) 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 underway, questions being studied, and the scope of long-term and short-term research projects funded under Section 1205 of Title XII.[34] 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."[9] 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)."[9]

Even after President Reagan took office and the Senate majority was Republican, the Center for the Study of Emergency Health Services at the University of Pennsylvania urged continued support of EMS research, "dollars spent in EMS research have a 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."[13] 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. In the case of EMS, 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 Resources (DHHR) funding programs into seven consolidated block grants.[39] EMS was included in the Preventive Health Block Grant along with seven other programs such as Rodent Control and Fluoridation. In effect, individual states were left to determine how money from the block grants would be distributed. 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.

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 health system agencies. The federal role was to be "one of technical assistance and coordination."*

1982 to 1993

The public health initiative for developing a national EMS system came to a gradual, quiet, and unceremonious demise after 1981. The remnants of the old DHEW (now the DHHS) program were left to die-off slowly under the cloud of confusion occasioned by Preventive Health Block Grants formula. In most, but not all, states EMS regional programs were lost in the shuffle of competing health programs while President Reagan and his budget director were 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 cause for rejoicing because escape from the excessive, capricious, and specious regulations might allow the development and implementation of alternative innovative approaches.[60] Unfortunately, freedom to explore new methodologies was often akin to being disinherited and cast out into the world at a fragile age.

After the 1980 elections, the thrust of the federal government for most of the previous 50 years was changed beyond all recognition; the cadre of federal officials left to administrate the remaining programs had to cooperate with each of the 50 states. As federal guidance and funding diminished, a clear nationwide consensus was no longer a requirement for action; each state now had an intrinsic right to

*Department of Health Education and Welfare: *The forward plan for the health services administration,* 1976, US Government Printing Office.

govern areas such as EMS. Occasionally the new paradigm strengthened the state EMS agency; too often, however, EMS definitions gradually lost whatever precision had previously existed and became a baffling array of conflicting elements. Organizations such as the National Registry, the NAEMT, and the National Association of State EMS Directors tried to preserve some semblance of an infrastructure; while attendance lagged and membership sagged, national EMS organizations struggled to survive and keep EMS alive as a discrete cause. Some state EMS agencies managed to keep the momentum by sponsoring well-attended statewide provider conferences.

Like EMS, other industries were deregulated. Airlines, saving and loans, and the telephone company were all permitted to compete in the marketplace. Succeeding, if only in the short-term with dwindling resources became the norm. Deregulation as a path to true competition and a higher quality product found fruition in voluntary standards to reorganize EMS adopted by NHTSA in the mid-1980s.

In 1984, the Emergency Services Bureau of NHTSA was instrumental in creating the American Society for Testing and Materials (ASTM) Committee F-30. Through ASTM, NHTSA sought to legitimize the promulgation of standards in many areas of EMS. The standards branch of ASTM was based in Philadelphia, and through a complex consensus process standards were arrived at in many different industries including construction and building. As of 1993, over 7000 assorted standards had been developed through the ASTM process. Although these standards have no federal mandate, they are 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. During the ASTM process, competing interests often balloted against one another achieving an innocuous consensus. Established and desirable regional variations were lost in the generic rubric of documents on training, communication, evaluation, and finance. The resultant standards, although mandated by no authority, were considered by several state legislatures when state EMS laws were revised.

The F-30 Committee prospered as long as physician involvement was evident and decisive; but it was clearly NHTSA's decision what standard to expedite and when. The National Registry, 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, NHTSA preserved some semblance of a central authority; however, the real significance of the standards remains unclear.

State EMS agencies often patronized the DOT and the ASTM exercise because there was still the possibility of money at the end of the highway safety rainbow. Building for the future, or even sustaining the present, meant maintaining visibility of those applying for matching funds from the Governor's Highway Safety Council. Unfortunately, EMS in the 1980s was a "low priority" for the Highway Safety Council, a striking reversal from a decade earlier.

As early as 1983, NHTSA began trying to wear the mantle associated with the old DHEW program. Many of the 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, NHTSA tried to organize electronic exchange of information among surviving EMS clearinghouses. Three years of posturing came to nothing when hopes of private-public cooperation in EMS were shattered by withdrawal of the largest private clearinghouse. Because NHTSA had no mandate to promote specific programs on a nationwide basis, it was left to the states.

Training was not much different. Physician organizations backed one brand of trauma life support, but provider groups supported another. The American Red Cross, the National Safety Council, and a number of local EMS organizations prospected in the citizen CPR and first aid responder business. Most states developed their own "homegrown" provider curricula, even when provider levels were identical to those in neighboring states.

In 1986, within a decentralized federal government, NHTSA's newest and least likely role was that of standard bearer for trauma EMS system research. From 1982 to 1992, outcome measurement gradually lost relevance. Many jurisdictions and providers simply refused to underwrite the cost for "knife and gun club" specialty centers. Proofs that the system might work were supplanted by more palatable concepts. Faced with economic dislocation and cost shifting, traumatologists found themselves studying quality assurance, population-based research, and the statistical nuances of an outcome study conducted at a large number of hospitals nationwide. NHTSA evolved into the handmaiden of the CDC, awarding grants to researchers defining the structure of EMS and trauma care in the 1990s.

The federal agencies began the 1990s with the following three general areas of EMS interest:

(1) enhancing and revitalizing training standards with particular emphasis on the EMT-B level (the new term of EMT-A), (2) promoting information exchange through a computerized network of EMS information clearinghouses, and (3) encouraging trauma center designations, a negligible amount of injury control research, and some vague notions of trauma-EMS systems research. These activities actually culminated in 1990 with the passage of the Trauma Care Systems Planning and Development Act, which raised EMS, once again a subset of trauma, to a greater level of national awareness.[72]

It would be incorrect to view the period from 1982 on as simply stagnate. 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. Managers, visionaries, and guardians of disciplinary parochialism were kept off balance by the fact that neither a geographic center nor a discrete EMS development philosophy emerged. Across the country, local activists battled others in pursuit of diminishing funds. Zealous idealism metamorphosed into an earnest and businesslike focus transforming EMS leaders and providers into hardened idealists with a passion for survival. By 1992, patients had clearly emerged as customers, and by the inauguration of President Clinton, 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 did not address EMS systems at all.

EMS Physicians

Throughout the 1970s, emergency physicians and the fledgling national ACEP supported the visibility and strength federal money gave regional EMS programs. Unfortunately, by 1983, emergency physicians and the embryonic state chapters of ACEP, like most everyone else, had evolved into competitors for the same resources and recognition. Local physicians, EMS medical directors, and provider agencies were often at odds with each other. The new breed of EMS medical directors needed a forum to exchange ideas and ACEP, unfortunately, had not been receptive. In 1982 and 1983, the last unrestricted vestiges of block grant funding allowed the New York EMS agency to gather a few proponents of strong EMS medical oversight to better define the emerging field of prehospital medicine, especially in the complicated urban environment. The brotherhood of these few individuals responsible for the medical stewardship of their respective systems was immediately self-evident. After a series of organizational meetings, the National Association of EMS Physicians (NAEMSP) was created in 1985 with Stewart as its first president. Originally based in South Carolina, NAEMSP ultimately found a permanent home in Pittsburgh. As the importance of EMS to local government grew and NAEMSP focused attention, existing groups like ACEP and the Society for Academic Emergency Medicine once again emphasized and encouraged EMS activities among their members.

Training

The DOT began the 1980s urging EMS agencies to adopt EMT-I as a less expensive alternative to EMT-P. In the middle of the decade, some administrators began advocating greater use of First Responders to obviate the need for expensive EMT-A (soon to become EMT-B) refresher training. If volunteers did not have time to refresh their skills then it made sense to some to require less skill. Something was literally better than nothing. New Jersey experimentally grandfathered roughly half its 20,000 first aid providers to the EMT-A level, totally missing the point that provider tasks, teaching objectives, curriculum, and appropriate classroom hours must be determined in a logical, rational progression.[44]

An alternative approach came to force between 1988 and 1992. Although EMT-P could continue approximating the level of a junior-grade physician extender in the field, a new EMT-B curriculum could serve as an abbreviated version—in which reasoning and presumptive diagnosis took a backseat to treatment algorithms. During the first 3 years of the 1990s, NHTSA struggled to reframe the old EMT-A curriculum. Without knowing how this "new" provider level would fit into the larger system or individual states, the process was flawed; many saw it as yet another overt attempt to encumber local options with overly precise national standards. Although it was clear no one knew exactly how much EMS was enough, the National EMS Training Blueprint Project Task Force (sponsored by the National Registry and chaired by Drew Dawson) began the definition process early in 1993.[55]

The driving issues surrounding training in the early 1990s were increasingly related to medical and technologic advances and the aging of the providers themselves. After 20 years it had finally become logically, if not scientifically, clear that early defibrillation saved a proportion of people in cardiac arrest. It was not bystander CPR, paramedic ambulances, generic ALS, defibrillation in 10 minutes, nor the shocking of asystole that saved lives; it was simply defibrillation of ventricular fibrillation in less than 5 or so minutes that lead to the 30% or

40% save rates that had become the benchmarks of "good" EMS systems. Faster was better. Transporting ambulances were irrevelant. If defibrillation took more than 6 or 7 minutes, the results were depressing. Simply getting the newly developed automated external defibrillators to the right patients with the fastest provider became a goal.

The original EMS providers, who had started in 1970, were getting older. Although there were a few jobs in administration, dispatch, and education, by 1993 many of the most experienced and dedicated field providers were arriving at an intellectual, physical, and emotional dead-end. Reforming EMS practice and education was obviously much more daunting than simply writing a "new" EMT-B curriculum or defining "optimal" provider levels; what was lacking in 1993 was an operational and educational career ladder.[44,71]

Communications

Jeff Clawson, a fire surgeon from Salt Lake City, was a clear exception to the mood of uncertainty prevailing in the 1980s. He was among the first EMS medical directors to explore the communications centers, and emergency medical dispatching quickly came of age. Clawson reasoned that too much *ad hoc* medical information confused prearrival instruction and priority dispatch issues and, therefore, interfered with the appropriate provision of both.

Beginning in Utah and accelerating throughout the world, during the early 1980s, Clawson and others used logic, software, and field experience in making the initial dispatcher call tantamount to the first tier of the EMS system response. In essence, a "first" First Responder with a zero response time. *Ad hoc* human responses were replaced by algorithms. Coupled with technologic advances, such as automatic vehicle locators and computer-aided dispatch systems, many traditional causes of dispatch and response errors or delays vanished.

Transportation

Laissez-faire and voluntary standards served as hallmarks for EMS transportation from 1983 to 1990. Because ambulances were expensive and difficult to replace, more than half of EMS providers remained fire department–based. During that period, EMS began to become both professional and rational. Partly an outgrowth of priority dispatch came the need and ability to analyze how quickly and in what mode EMS vehicle response was required. Once again medical input was key. Also recognized as significant medical and risk management concerns by 1990, were issues of ambulance operations, safety, and optimal mode of response.

Hospitals turned toward more dramatic ventures whenever possible and EMS took to the air from 1983 on, dwarfing contemporaneous efforts by law enforcement. Growth of the aeromedical aspect of EMS was facilitated by an industry consolidation in the mid 1980s; there ceased to be an important distinction between public and private after that time. Several new national organizations focused on the aeromedical aspects of medicine, nursing, and operations; each developed and trumpeted its own standards.

By 1990 the solution to the golden hour, medical evacuation helicopters, were available to most trauma centers and many rural rescue units. Care delayed was no longer care denied, but it cost millions to run even a modest life-flight operation. EMS systems operating on a regional basis worked out the best possible local arrangements, but relatively few aeromedical ventures were financially successful. Often, differences in state law and insurance reimbursement were key to the success or failure of a specific program. Like land ambulances, the air ambulances occasionally crashed thus seriously diminishing their overall cost effectiveness.

Facilities

Researchers tried predicting outcomes and defining severity to justify enormous medical bills. By the 1990s, the trauma center designation criteria of the 1980s were being challenged and undermined. In most systems every reasonably sized hospital with the desire to be a trauma center was designated as such. Urban blight and crime waves tied to inexpensive drugs like crack ensured that unreimbursed urban use would not be a problem.

A related problem for EMS providers was the passage of the 1985 COBRA legislation aimed at penalizing emergency departments for refusing patients, either overtly or through diversions tied to the classic wallet biopsy.[22] In some jurisdictions the poor were legally diverted by ambulance to the public hospital.

The partial fragmentation of EMS by the development of a pediatric subgroup was predictable, but was a problem nevertheless; just as pediatric emergency medicine emerged, so did pediatric EMS. Obviously, issues went beyond clinical to political and financial. During the early 1990s, pediatric EMS was one of the only areas of EMS with enough political support and strength to garner significant funding. Other subsets of EMS may be similarly successful in the future.

Summary

During the last 20 years of the twentieth century, EMS providers experienced a sudden and at times brutal evolutionary process. Once a popular community resource, EMS was now asked to justify its very existence, usually resulting in service cutbacks, capital reductions, reconfiguration of vehicle fleets, and revisions of provider levels.

If the first few years of the 1990s were a dark age for EMS, then there were also isolated points of light portending a future renaissance. EMS physicians increasingly joined other EMS professionals in the quest to redefine and reframe EMS. This expanding physician involvement in clinical prehospital medical research as well as in the planning and operating of prehospital systems was a hopeful sign. Professional organizations established guidelines and fostered discipline in research methodologies.

These actions are already resulting in change, increased medical accountability, and better assessment of prehospital therapy. Prehospital professionals jointly evaluate protocols, procedures, and practices, perhaps to discard some and enhance others. Financial constraints, legal issues, and community expectations are also forcing reassessment and refinement of how and what EMS is doing. Federal legislation and case law are mandating accountability of all medical practices; therefore, a sound scientific and medical basis is being demanded for the clinical practice of prehospital care. Research establishing this medical basis is now emerging as a major priority.

The financial considerations of the 1990s continue to be major factors in EMS development and operations. Public policy and opinion influence decisions affecting staffing, coverage, equipment, and operations. However, spending more money does not always result in better care. Operational and basic research assist in making decisions that result in more efficient and higher quality systems. Those responsible for EMS system financing must understand the rising operational costs brought about by higher wages, increased personnel, greater demand, and expanding technology. For EMS to be accessible, new financing mechanisms, perhaps tied to a national health program or a variety of managed care programs, must be developed quickly.

After more than 25 years of rapid growth, change, and progress, medical directors' key issues of concern as EMS enters the mid-1990s are system design, management, economics, and effectiveness. System analysis and evaluation are still necessary and underfunded. EMS researchers and evaluators must continue investigating system problems to answer questions being asked by EMS managers, medical directors, and legislatures as they develop and mandate the EMS systems of the future.

Of course, the irony is that most of the newly invented tools can be used by any EMS provider; yet few providers can independently supply all the operational components required in a given system. Our society has not yet learned that the cost of EMS failure is significantly greater than the cost of EMS success. Unlike the past, the future of EMS belongs to the efficient and the innovative. Supporting evidence and a shared paradigm are required.

REFERENCES

1. *ACEP News*, 15, Dec 1991.
2. American Academy of Orthopaedic Surgeons: *Emergency care and transportation of the sick and injured*, ed 1, 1969, The Academy.
3. American Board of Emergency Medicine: *Eligibility requirements*, Adopted June 27, 1976.
4. American Heart Association, National Academy of Sciences, National Research Council: Cardiopulmonary resuscitation, *JAMA* 198:372-379, 1966.
5. Answers to questions submitted by members of Subcommittee on Health and Scientific Research of the Committee on Labor and Human Resources, In: *United States Senate hearing report*, 98-100, Feb 28, 1979.
6. Anwar AH, Hogan MH: Residency-trained physicians: where have all the flowers gone? *JACEP* 8(2):85, 1979.
7. Barkley KT: The history of the ambulance, *Proceedings, International Congress of the History of Medicine* 23:456-466, 1974.
8. Barringer ED: *Bowery to Bellevue*, New York, 1950, WW Norton & Co.
9. Boyd DR: *Emergency medical services system evaluation*, Statement submitted to the Subcommittee on Health and Scientific Research, Committee on Labor and Human Resources, In: *United States Senate hearing report*, 47-57, Feb 28, 1979.
10. Boyd DR, Edlich RF, Micik S: Systems approach to emergency care, Norwalk, CT, 1983, Appleton-Century-Crofts.
11. Breasted JH: *Bull Hist Med* 3:58-78, Chicago, 1923.
12. Brewer LA: Baron Larrey 1766-1862, *J Thorac Cardiovasc Surg* 92:1096-1098, 1986.
13. Cayten GC: Testimony to the Subcommittee on Health and Scientific Research of the Committee on Labor and Human Resources, In: *United States Senate hearing report*, 156-166, Feb 28, 1979.
14. Commission on Emergency Medical Services: Recommendations of the conference on the guidelines for the categorization of hospital emergency capabilities: 1971, American Medical Association.
15. Committee on Emergency Medical Services: *Roles and resources of federal agencies in support of comprehensive emergency medial services*, Washington, DC, 1972, National Research Council.
16. Committee on Trauma: Minimal equipment for ambulances, *Bull - Coll Surgeons* 136, July-Aug 1961.
17. Committee on Trauma: Minimal equipment for ambulances, *Bull Am Coll Surgeons* 92-96, March-April 1967.
18. Committee on Trauma: *Recommendations for an approach to an urgent national problem:* Proceedings of the Airlie Conference on Emergency Medical Services, Airlie House, Warrenton, VA, May 5-6, 1969, Chicago, 1969, American College of Surgeons, American Academy of Orthopedic Surgeons.
19. Committee on Trauma: Standards for emergency department in hospitals, *Bull Am Coll Surgeons* 112-125, May-June 1963.
20. Committee on Trauma and Committee on Shock: *Accidental death and disability: the neglected disease of modern society*, Sep

1966, Washington DC, Fifth printing by the Commission on Emergency Medical Services, Jan 1970, American Medical Association.
21. Comptroller General of the United States: *Progress in developing emergency medical services systems,* HRD 76-150, July 13, 1976.
22. *Consolidated Omnibus Budget Reconciliation Act of 1985,* Public Law 99-1, Washington, DC, 1985.
23. Duncan LC: *Civil war: the Medical Department of the US Army in the civil war,* Washington, DC, 1910, US Government Printing Office.
24. Eisenberg MS, Berger L, Hallstrom A: Epidemiology of cardiac arrest and resuscitation in a suburban community, *JACEP 1979.*
25. *Emergency medical services at midpassage,* Washington, DC, 1978, National Research Council.
26. Emergency Medical Services Division, Department of Health, Education, and Welfare: HSA 77-2036, March 1977.
27. *Emergency medical services 1966-1979: program review and fact sheet,* presented before the Subcommittee on Health and Scientific Research Committee on Labor and Human Resources, March 22, 1979, *United States Senate hearing report,* 267-299, Feb 28, 1979.
28. Emergency Medicine Residents Association: *A survey by EMRA,* May 1980.
29. *EMS System Act of 1973,* Public Law 93-154, Washington, DC, 1973.
30. Essential equipment for ambulances, *Bull Am Coll Surgeons* 55(5):7-13, 1970.
31. *Essentials and guidelines of an accredited educational program for the emergency medical technician-paramedic,* Essentials adopted 1978, guidelines approved 1979, Joint Review Committee on Educational Programs for EMT-Paramedics.
32. Federal specifications: ambulance-emergency care vehicle, Specification KKK-A-1822, Jan 2, 1974, US General Services Administration.
33. The Gallup Poll, *Field Newspaper Syndicate* June 30, 1977.
34. Garrison FH: *An introduction to the history of medicine,* Philadelphia, 1929, WB Saunders Co.
35. Haller JR, John S: *J Emer Med* 8:743-755, 1990.
36. Hampton OP: Present status of ambulance services in the United States, *Bull Am Coll Surgeons* 177-178, July-Aug 1965.
37. Hampton OP: The systematic approach to emergency medical services, *Bull Am Coll Surgeons* Sep-Oct 1968.
38. Hampton, OP: Transportation of the injured: a report, *Bull Am Coll Surgeons* 55, Jan-Feb 1960.
39. Heaton LD: Army medical services in Vietnam (guest editorial), *Mil Med* 131:646-647, 1966.
40. Highway safety program manual, *Emergency medical services* vol 11, Washington, DC, Jan 1969, US Department of Transportation.
41. Jelenko, Frey CF: *Emergency medical services: an overview,* Bowie, MD, 1976, The Brady Co.
42. I Kings 17: 17-24.
43. Kouwenhoven WB, Jude JR, Knickerbocker GB: Closed chest cardiac massage, *JAMA* 173:1064, 1960.
44. Kuehl AE: Form should follow function, *JEMS* 18(2):42, 1993.
45. Kuehl AE, Kerr JT: Urban EMS systems, *Am J Emerg Med* 5:217, 1984.
46. Lewis R et al: Effectiveness of advanced paramedics in a mobile coronary care system, *JAMA* 241:1902-1904, 1979.
47. Liason Residency Endorsement Committee: American College of Emergency Physicians, Information supplied, June 5, 1980.
48. Luke 10:25-37.
49. Lythcott GI: Statement before the Subcommittee on Health and Scientific Research Committee on Labor and Human Resources, In: *United States Senate Hearing report,* 24, Feb 28, 1979.
50. Major RH: *A history of medicine,* vol I, Springfield, Ill, 1984, Charles C Thomas.
51. McElroy CR: Citizen CPR: the role of the layperson in prehospital care, *Topics in Emergency Medicine* 1(4):37, 1980.
52. Memorandum of understanding between the US Department of Transportation and the US Department of Health, Education, and Welfare: *Procedures relating to Emergency Medical Services systems,* Washington, DC, Oct 26, 1978.
53. Nagel E et al: Telemetry medical command in coronary and other mobile emergency care systems, *JAMA* 214:332-338, 1970.
54. National Center for Health Services Research: *Research management series,* Emergency Medical Services Research Projects and Research Methodology, Department of Health, Education, and Welfare.
55. National EMS Training Blueprint (working draft) Columbus OH, 1993, National Registry.
56. *National Highway Safety Act of 1966:* Public Law 89-564, Washington, DC, 1966.
57. National Highway Traffic Administration: Ambulance design criteria, Washington, DC, May, 1971, US Government Printing Office.
58. National Highway Traffic Safety Administration: *Communication: guidelines for emergency medical services,* Sep 1972, US Department of Transportation.
59. *The Omnibus Budget Reconciliation Act of 1981,* Public Law 97-35, Washington, DC, 1981.
60. Page J: *History and Legislation Panel,* EMS medical directors' course, Phoenix, March 25, 1993.
61. Pantridge JF, Geddes JS: Cardiac arrest after myocardial infarction, *Lancet* 1:807-808, 1966.
62. Pantridge JF, Geddes JS: A Mobile intensive care unit in the management of myocardial infarction, *Lancet* 2:271-273, 1967.
63. Pollack P: *The Picture history of photography,* London, 1963, Thames and Hudson Inc.
64. Post CJ: *Omaha orange: a popular history of EMS in America,* Boston, 1992, Jones and Bartlett.
65. President's Commission on Highway Safety: *Health, medical care, and transportation of injured,* US Government Printing Office, 1965.
66. The Robert Wood Johnson Foundation: *Special report,* Number 2, 1977.
67. The Robert Wood Johnson Foundation, National Competitive Program Grants for Regional Emergency Medical Communications Systems Administered in Cooperation with National Academy of Sciences: *Program guidelines,* 1973.
68. Roemer R, Kramer C, Frink JE: *Planning urban health services: jungle to system,* New York, 1975, Springer Publishing Co Inc.
69. Summary report of the task force on ambulance services, Washington, DC, April 1967, National Academy of Sciences, National Research Council.
70. Surgeon General's Office: Cir No 9, Washington, DC, 1877, US Government Printing Office.
71. Suter RE: Academic EMS, *JEMS* 18(4):15, 1993.
72. *Trauma Care Systems Planning and Development Act of 1990,* Public Law 101-590, Washington, DC, 1990.
73. Whitman W: *Complete poetry and collected prose,* 1982, The Library of America.

Appendix I

Scope and Specificity of Each Component in EMS Systems

1. *Manpower*—An adequate number of health professionals, allied health professionals, and other health personnel including ambulance personnel, with appropriate training and experience to provide EMS on a 24-hour a day basis, 7 days a week, within the service area of the system.

The major manpower elements to be considered are:

- First Responders—fire, police, and other public safety elements
- Communicators—EMS dispatcher
- Emergency Medical Technician-Ambulance (EMT-A)
- EMT-Intermediate (EMT-I)
- Emergency Medical Technician-Paramedic (EMT-P)
- Registered Nurses—Emergency Department
- Registered Nurses—Critical Care Units
- Paramedic and/or Nurse MICU Coordinators
- EMS Physician Consultants
- EMS Project Director
- EMS Systems Coordinators
- EMS Systems Consultants

2. *Training*—The provision for appropriate training (including clinical training) and continuing education programs, which (1) are coordinated with other programs in the system's service area, which provide similar training and education and (2) emphasize veterans of the Armed Forces with military training and experience in the health care field and of appropriate public safety personnel in such areas.

"Appropriate public safety personnel" includes police, firemen, lifeguards, park rangers, and other public employees charged with maintaining the public safety.

3. *Communications*—Provisions for linking the personnel, facilities, and equipment by centrally coordinated communications systems so that requests for emergency health care services will be handled by a facility which (1) utilizes emergency telephonic screening, (2) utilizes or will utilize the universal emergency telephone number 9-1-1, and (3) will have direct communication connections and interconnections with the personnel, facilities, and equipment of the system and with other appropriate emergency medical services systems.

The system should include a command and control center which would be responsible for establishing those communication channels and allocating those public resources essential to the most effective and efficient EMS management of the immediate problem. The center should have the necessary equipment and facilities to permit immediate interchange of information essential for both the system's resource and medical management and control.

The communication elements should include:

- *Access providing public interface with the emergency resource system:*
  - 9-1-1
  - Alternative single access number
  - Provisions for auditory handicapped individuals
  - Provision for multilingual access
- *Resource Management Function:*
  - Central dispatch or centrally coordinated dispatch
  - Coordination of EMS and other public services
- *Medical Control Function:*
  - Medical communications between field personnel and resource hospital for diagnosis, treatment, and triage

Modified from Emergency Medical Services Systems Program Guidelines: HSA 79-2002, August, 1979.

- *Hospital to Mobile:*
  - Basic voice
- *Hospital to Hospital (resources, associate):*
  - Basic voice
  - Advanced biomedical telemetry (optional)

The supervising medical control resource facility (communication base) must be responsible for monitoring all ALS communications and notification of other receiving hospital(s) so that they will be aware of the problem, and can assume responsibility for the care of the patient immediately upon arrival to their facility.

This supervising facility is responsible for field decisions of triage and transportation of a patient to an appropriate facility or to a special care unit in accordance with previously developed patient triage/transfer guidelines and agreements.

4. *Transportation*—This component shall include an adequate number of necessary ground, air, and water vehicles and other transportation facilities properly equipped to meet the transportation and EMS characteristics of the system area. Such vehicles and facilities must meet appropriate standards relating to location, design, performance, and equipment; and the operators and other personnel for such vehicles and facilities must meet appropriate training and experience requirements.

The elements of transportation should include:

- **Ground—Basic Life Support**
  - Radio communication providing for vehicle control, medical control, and consultation
  - Ambulance vehicles meeting GSS (KKK-A-1822) specifications and including equipment recommended by the American College of Surgeons
  - At least two EMT-As
  - Ambulance locations permitting (for 95% of all calls) a maximum of a 30-minute accurate response time in rural areas
  - Tiered response arrangement of vehicles
- **Ground—Advanced Life Support Elements**
  - All elements of a ground basic life support capability
  - At least two EMTs trained beyond the EMT-A level to address specific clinical items in the medical service plan
  - Advanced communications to provide advanced biomedical telemetry (optional)
  - Additional equipment as appropriate
- **Other**
  - Helicopters
    1. Primary response—unique use depending on geographical constraints
    2. Secondary response—30- to 150-mile transport radius
  - Fixed Wing—greater response for 150-mile transport radius
  - Water—special geographical considerations
  - Snow Mobile—special geographical considerations

5. *Facilities*—This component shall include an adequate number of designated easily accessible emergency medical service facilities which are collectively capable of providing services on a continuous basis. They must have appropriate, nonduplicative, and categorized capabilities which meet appropriate standards. All emergency receiving facilities must be categorized horizontally utilizing American Medical Association criteria and vertically utilizing national professional organizations' criteria for emergency critical care.*

The strategy and process for utilizing the criteria for designation of participating facilities for critical care within each region and the specialty facilities outside the region must be stated in the application. Plans for upgrading/downgrading emergency department personnel and equipment must be coordinated with other health care facilities and planning organizations in the region and based upon patient origin and distribution studies. There should be emplasis on upgrading critical care capabilities through consolidation and use of nonduplicating facilities resources.

Elements for facilities consideration include:

- Regional categorization with accepted state or national criteria with at least one Category II hospital providing 24-hour physician coverage in the emergency department in each EMS region
- Regional EMS Advisory Groups to plan and carry out the categorization plan. These groups should include hospital administrators, physicians, nurses, other providers, and health system planners
- Regional plans for mutual agreement of facility categorization and designation of critical care capabilities, transfer agreements, and resource sharing

6. *Critical Care Units*—This component requires providing access (including appropriate transportation) to specialized critical medical care units. These units should be the number and variety necessary to meet the demands of the service area and are to include trauma, burn, spinal cord injury, poisoning, acute cardiac, high-risk infant, and behavioral emergencies. The grantee must provide for the inventory

*American College of Surgeons (ACS), American Burn Association (ABA), American Association of Poison Control Centers (AAPCC), American Heart Association (AHA), American College of Pediatrics (ACP), and American Psychiatric Association (APA).

and categorization and designation by name of critical care capability (units, centers, program units) for specific critical patient groups. Plans must delineate the responsibility for identifying and providing transfer of specific patients.

Standard critical care capability must be identified for the seven patient categories in regions with such capabilities, and where necessary in distant regions. Facility projected needs assessments of care resources must be documented at least annually. This would include resources within the region and in other distant EMS regions. EMS projects must review the need for further centralization and expansion, and in some cases initiate decentralization as appropriate by patient impact studies.

7. *Public Safety Agencies*—The grantee will take appropriate actions to ensure the participation of public safety agencies to include police, fire departments, lifeguards, park rangers, and other appropriate public safety personnel, as First Responders and/or EMT's within the EMS system.

Provision must be made for effective utilization of appropriate personnel, facilities, and equipment of each public safety agency in the area, with sharing of resources and personnel as appropriate. "Effective utilization" means the integration of public safety agencies into standard EMS and disaster operating procedures of the regional system. It also includes the shared use of personnel and equipment, such as helicopters and rescue boats, appropriate for medical emergencies.

Public safety agency personnel are most frequently the first responders to an emergency patient. The EMS system must , therefore, work with these agencies to ensure the use of special equipment, proper training of staff, linked communications, and the development of cooperative operating procedures demonstrating appropriate coordination and mutual aid plans for day-to-day operations as well as during major disasters.

8. *Consumer Participation*—The EMS system must make provisions in its systems management and take appropriate action to ensure that persons residing in the area who have no professional training or experience participate in policymaking for the system.

Evaluation should be based upon the parameters found in Chapter IV.

9. *Access to Care*—All patients will have access to the EMS system without prior inquiry as to the ability to pay. This access must be assured for the ambulance services, initial general hospital, secondary transport to critical care units, and rehabilitation centers. The system should provide the means to monitor for restrictive measures that may eliminate any person or group of people from equal quality of services within the region. Agreements for admission should be negotiated between hospitals and ambulance services within the EMS region by the completion of the BLS system period and likewise for the ALS system period.

10. *Patient Transfer*—The EMS system shall provide for transfer of patients to facilities which offer definitive follow-up care and rehabilitation as is necessary to effect the maximum recovery of the patient.

The transfer of emergency patients from the emergency site to the emergency department of the general hospital critical care unit and rehabilitation centers is all within the scope of a total EMS system. The components of training, transportation, categorization, recordkeeping, and others all interrelates to this continuum of care.

The transfer agreement is necessary to facilitate communication and cooperation of physician providers within the system. Written arrangements between referring and receiving physicians for each of the critical groups must be documented by physician sign off for acceptance and participation. These transfer agreements from individual rural physicians to individual central critical care physicians must be established and be an integral part of an operating EMS system.

Areawide prehospital treatment and triage protocols must be established by councils of physician providers for the various specialty patient groups and are essential for completion of a Basic Life Support system.

11. *Coordinated Patient Recordkeeping*—Each EMS regional system shall take to provide for a coordinated patient recordkeeping system which shall cover the treatment of the patient from initial entry into the system through his discharge from it. This includes the prehospital, hospital, and critical care unit care within the system. Data elements shall be consistent in patient records used in follow-up care and rehabilitation of the patient; it shall be developed to ensure that emergency patients can be tracked through the system, and used to measure the system's change in efficiency in delivering emergency care.

The minimal patient records necessary for the EMS system are the dispatcher records, the ambulance records (ALS and BLS), the emergency department, and critical care records.

12. *Public Information and Education*—The EMS system shall provide programs of public education and information for all people in the area so they know about the system, how to access it, and how to use it properly.

Residents and visitors to the area need to know or be able to learn immediately how to access EMS. It

should also stress the general dissemination of information on appropriate methods of self-help and first aid and the availability of first aid training programs in the area.

13. *Review and Evaluation*—The DHEW requires the grantee to provide information regarding the periodic, comprehensive, and independent reviews and evaluations to the extent and quality of the emergency care services provided in the EMS system's service area.

Therefore, the grantee will provide the DHEW with a written plan of how an objective review and evaluation is to be conducted within the EMS region. Such a plan shall include the appropriate identification of funds, staff, plans, and programmatic activities to be evaluated. The grantee will deliver a report of such review and evaluation within the period of the grant.

14. *Disaster Plan*—The EMS systems must have a plan to assure that they will be capable of providing emergency medical services in the system's service area during mass casualties, natural disasters, or national emergencies.

The EMS system is not the regional health disaster organization. It is the emergency medical organization that will work with other agencies during a disaster to provide emergency medical care. The EMS system must be linked to the local regional and state disaster plans and participate in exercises to test disaster plans.

15. *Mutual Aid*—Each EMS system must provide for the establishment of appropriate arrangements with other EMS systems or similar entities serving neighboring areas for the provision of emergency services on a reciprocal basis where access to such services would be more appropriate and effective in terms of the services available, time, and distance.

Arrangements among EMS regional systems and similar entities serving neighboring areas shall be written agreements, signed by individuals authorized to act for the respective parties with respect to such agreements, and reviewed and re-evaluated at least once a year. Such agreements should cover the exchange of service coverage, communication linkages, licensure and certification, and reimbursement.