

EMS: A Historical Perspective

The development of EMS has been based on tradition and, to some extent, on scientific knowledge. Its roots are deep in history. For example, the Good Samaritan bound the injured traveler's wounds with oil and wine at the side of the road, and evidence of treatment protocols exists as early as 1500 B.C.

Although the Romans and Greeks used chariots to remove injured soldiers from the battlefield, most credit Baron Dominique-Jean Larrey, chief physician in Napoleon's army, with institution of the first prehospital system (1797) designed to triage and transport the injured from the field to aid stations. Flying ambulances (dressing stations) were made to effect transport, and protocols dictated much of the treatment. In the United States, organized field care and transport of the injured began after the first year of the Civil War, when neglect of the wounded had been abysmal.

Military conflicts have provided the impetus for many of the innovations for treating and transporting injured people. Among the most obvious of these is the use of aircraft for medical transport. The first known air medical transport occurred during the retreat of the Serbian army from Albania in 1915. An unmodified French fighter aircraft was used. During World War I mortality was linked to the time required to get to a dressing station. Additionally, application of a splint devised by Sir Hugh Owen-Thomas resulted in a reduction of mortality due to femur fractures from 80% to 20%. The use of rotary wing aircraft for rapid evacuation of casualties from the field to treatment areas was demonstrated during later conflicts, especially in Korea and Vietnam.

Civilian ambulance services in the United States began in Cincinnati and New York City in 1865 and 1869, respectively. Hospital interns rode in horse drawn carriages designed specifically for transporting the sick and injured. The first volunteer rescue squads organized around 1920 in Roanoke, Virginia, and along the New Jersey coast. Gradually, especially during and after World War II, hospitals and physicians faded from prehospital practice, yielding in urban areas to centrally coordinated programs. These were often controlled by the municipal hospital or fire department, whose use of "inhalators" was met with widespread public acceptance. Sporadically, funeral home hearses, which had been the common mode of transport, were being replaced by fire department, rescue squad and private ambulances.

By 1960, new advances to care for the sickest patients were being made. The first recorded use of mouth-to-mouth ventilation had been in 1732, involving a coal miner in Dublin, and the first major publication describing the resuscitation of near drowning victims was in 1896. However, it was not until 1958 that Dr. Peter Safar demonstrated mouth-to-mouth ventilation to be superior to other methods of manual ventilation. Of note, Dr. Safar used Baltimore firefighters in his studies to perform ventilation of anesthetized surgical residents. In 1960, cardiopulmonary resuscitation (CPR) was shown to be efficacious. Shortly thereafter, model EMS programs were developed based on successes in Belfast, where hospital-based mobile coronary care unit ambulances were being used to treat prehospital cardiac patients. American systems relied on fire

department personnel trained in the techniques of cardiac resuscitation. These new modernized EMS systems spurred success stories from cities such as Columbus, Los Angeles, Seattle, and Miami.

Modern EMS in the USA

Demonstration of the effectiveness of mouth-to-mouth ventilation in 1958 and closed cardiac massage in 1960 led to the realization that rapid response of trained community members to cardiac emergencies could help improve outcomes. The introduction of CPR provided the foundation on which the concepts of advanced cardiac life support (ACLS), and subsequently EMS systems, could be built. The result has been EMS systems designed to enhance the "chain of survival."

The 1966 white paper, "Accidental Death and Disability: The Neglected Disease of Modern Society" prepared by the Committee on Trauma and Committee on Shock of the National Academy of Sciences—National Research Council, provided great impetus for attention to be turned to the development of EMS. This document pointed out that the American health care system was prepared to address an injury epidemic that was the leading cause of death among persons between the ages of 1 and. It noted that, in most cases, ambulances were inappropriately designed, ill-equipped, and staffed with inadequately trained personnel; and that at least 50% of the nation's ambulance services were being provided by 12,000 morticians.

The paper made 29 recommendations for ultimately improving care for injured victims; 11 related directly to out-of-facility EMS. They were:

- Extension of basic and advanced first aid training to greater numbers of the lay public;
- Preparation of nationally acceptable texts, training aids, and courses of instruction for rescue squad personnel, policemen, firemen, and ambulance attendants;
- Implementation of recent traffic safety legislation to ensure completely adequate standards for ambulance design and construction, for ambulance equipment and supplies, and for the qualifications and supervision of ambulance personnel;
- Adoption at the state level of general policies and regulations pertaining to ambulance services;
- Adoption at district, county, and municipal levels of ways and means of providing ambulance services applicable to the conditions of the locality, control and surveillance of ambulance services, and coordination of ambulance services with health departments, hospitals, traffic authorities, and communication services;
- Pilot programs to determine the efficacy of providing physician-staffed ambulances for care at the site of injury and during transportation;
- Initiation of pilot programs to evaluate automotive and helicopter ambulance services in sparsely populated areas and in regions where many communities lack hospital facilities adequate to care for seriously injured persons;
- Delineation of radio frequency channels and of equipment suitable to provide voice communication between ambulances, emergency department, and other health-related agencies at the community, regional, and national levels;

- Pilot studies across the nation for evaluation of models of radio and telephone installations to ensure effectiveness of communication facilities;
- Day to day use of voice communication facilities by the agencies serving emergency medical needs; and
- Active exploration of the feasibility of designating a single nationwide telephone number to summon an ambulance.

In the same year, the Highway Safety Act of 1966 which established the Department of Transportation (DOT) was passed. The DOT was given authority to improve EMS, including program implementation and development of standards for provider training. States were required to develop regional EMS systems, and costs of these systems were funded by the Highway Safety Program. Over the next 12 years the DOT contributed more than \$142 million for EMS system development.

The Highway Safety Act of 1966 included funds to create an appropriate training course for emergency care providers, as recommended in *Accidental Death and Disability: The Neglected Disease*, and the first nationally recognized EMT-A curriculum was published in 1969. Shortly thereafter paramedic education began, but training focused heavily on cardiac care and cardiac arrest resuscitation, almost to the exclusion of other problems. Although national curricula have been developed and revised, training standards and certification requirements have continued to vary significantly in communities throughout the nation.

In 1972 the Department of Health, Education, and Welfare allocated \$16 million to EMS demonstration programs in five states. Funds were used to develop regional EMS systems. In 1973, The Robert Wood Johnson Foundation appropriated \$15 million to fund 44 EMS projects in 32 states and Puerto Rico.

Title XII to the Public Health Service Act, The Emergency Medical Services Systems Act of 1973, provided additional federal guidelines and funding for the development of regional EMS systems. In total, more than \$300 million were appropriated for EMS feasibility studies and planning, operations, expansion and improvement, and research. By 1978, states had identified 304 EMS regions. The law established that there should be 15 components of the EMS systems. They are commonly referred to as:

- Manpower
- Training
- Communications
- Transportation
- Facilities
- Critical care units
- Public safety agencies
- Consumer participation
- Access to care
- Patient transfer

- Coordinated patient record keeping
- Public information and education
- Review and evaluation
- Disaster plan
- Mutual aid

Funding under the EMS Systems Act essentially ended with the Omnibus Budget Reconciliation Act of 1981, which consolidated EMS funding into state preventive health and health services block grants. Thus, states gained greater discretion in funding statewide EMS activities and regional EMS systems, and many of the regional EMS management entities established by federal funding quickly dissolved. Others continued, becoming more the part of technical assistants and enablers while seeking improved EMS quality.

The development of emergency medicine as a medical specialty has paralleled that of EMS. The first residency program to train new physicians exclusively for the practice of emergency medicine was established in 1972 at the University of Cincinnati. By 1975 there were 32 such programs, and there are currently 112 accredited emergency medicine residency programs graduating in excess of 800 emergency medicine physicians each year. Since the late 1970s, pediatric emergency medicine fellowships have provided physicians with specialized training in the management of childhood emergencies. Pediatric emergency medicine became officially recognized as a subspecialty of pediatrics and emergency medicine in 1992. To varying degrees, emergency physicians in training are exposed to the principles and practices of providing medical direction for EMS systems, and the Society of Academic Emergency Medicine has published a model EMS education curriculum for physicians. Although emergency physicians often fulfill the medical direction needs of EMS systems, other groups of physicians continue to significantly and positively influence EMS. They include pediatricians, cardiologists, surgeons, intensivists, family practitioners, and others.

Efforts to improve EMS care for specific groups of patients have included development and successful implementation of standardized courses as components of EMS curricula or to supplement personnel education in focused areas. These include cardiac, pediatric, and trauma life support courses.

The American Heart Association, through adoption and promotion of the "Chain of Survival" concept, has provided leadership to improve emergency cardiac care. It continues to explore ways to increase survival from cardiac emergencies.

Federal legislation established the Emergency Medical Services for Children (EMS-C) program in 1984, as issues relating to children's emergency care required attention. Emergency Medical Services for Children projects have represented the largest federal funding outlay for EMS development since consolidation of funds in block grants. During the first 10 years of the EMS-C program, the Maternal and Child Health Bureau (MCHB) of the Health Resources and Services Administration (HRSA) funded projects in 40 states, Puerto Rico, and the District of Columbia. Project efforts have involved

systems development, injury prevention, research and evaluation, improved training and education, and other aspects of EMS. The results have been EMS improvements benefitting not only children, but the entire population. The program commissioned the 1993 Institute of Medicine Report, Emergency Medical Services for Children which pointed out continuing deficiencies in our health care system's abilities to address the emergency medical needs of pediatric patients. It noted that in 1988, 21,000 people under the age of 20 died from injuries; thousands more were hospitalized and millions more were treated in emergency departments. The report indicated that although EMS systems and emergency departments are widely assumed to be equally capable of caring for children and adults, this is not always the case. For too many children important resources were not available when needed. The EMS-C program continues to work to ensure that pediatric issues are better integrated into the EMS system.

In 1985, the National Research Council's Injury in America: A Continuing Public Health Problem described deficiencies in the progress of addressing the problem of accidental death and disability. Development of trauma care systems became a renewed focus of attention with passage of the Trauma Care Systems Planning and Development Act of 1990. HRSA Division of Trauma and EMS (DTEMS) was created to administer this legislation, which supported the concept of a trauma system that addresses the needs of all injured patients and matches them to available resources. The act encouraged the establishment of inclusive trauma systems and called for the development of a model trauma care system plan, which was completed in 1992. More inclusive trauma care better serves the population's needs. Local EMS authorities assumed responsibility for establishing trauma systems and designating trauma centers in an effort to improve care for trauma victims. However, one survey concluded that by 1993 only five states met criteria for having a complete trauma system. Although interest in developing inclusive trauma care systems remains, DTEMS was disbanded in 1995.

The National Highway Traffic Safety Administration implemented a statewide EMS technical assessment program in 1988. During assessments, statewide EMS systems are evaluated based on 10 essential components. They are:

- Regulation and policy
- Resource management
- Human resources and training
- Transportation
- Facilities
- Communications
- Public information and education
- Medical direction
- Trauma systems
- Evaluation

It is impossible to overestimate the influence of the media on the evolution of EMS. In 1971, the television program "Emergency" caught the attention of the country — it was

visionary in itself. The program suggested to the public that paramedics existed everywhere. In reality, they did not. Additionally, it portrayed paramedics as frequent lifesavers when they were part of an integrated EMS system. In reality, they did save lives, though not as readily. The vision continues in current programs such as "Rescue 911", where all callers dial "911" for help and all calls are answered by personnel able to provide lifesaving instructions over the telephone. In fact, much of the country cannot access EMS help by calling "911" and pre-arrival instructions are not uniformly provided. As in the 1970s, the media continues to create public interest and effect perception and expectations regarding EMS. Responses to the public's expectations may secondarily prompt EMS system changes. However, the value of the media's effect is uncertain. While the media might hasten change, we cannot be certain that the changes created are those that would have been chosen had the impetus been different.

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