

An Overview of Prehospital Emergency Medical Services

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ABSTRACT

Prehospital emergency medical services (EMS) provide lifesaving care daily in the United States. This article outlines the development of this vital public safety endeavor and highlights the characteristics of the Rhode Island system.

KEYWORDS: Prehospital, emergency medical services, ambulance, EMS, Rhode Island

“Is the sand other than the rocks? That is, is the sand perhaps nothing but a great number of very tiny stones? Is the moon a great rock? If we understood rocks, would we also understand the sand and the moon?”

— Richard Feynman, Physicist

“If you know one EMS system, you know one EMS system.”

— Anonymous EMS Physician

INTRODUCTION

Emergency Medical Services (EMS) systems represent a complex interplay of personnel, ambulances, equipment, communications mechanisms, training endeavors, business operations, and administrative oversight. How did these systems evolve nationally and in Rhode Island? How is the system managed in Rhode Island? This article addresses these questions.

Prehospital emergency service in Rhode Island shares a common heritage with this vital public safety endeavor elsewhere, and its diversity reflects the many service models present in the United States. EMS development is strongly linked to the lessons of battlefield medical challenges and to major paradigm shifts in the care of the most lethal health threats faced by citizens of the developed world.

The modern era in prehospital care dates to the Napoleonic Wars with the battlefield evacuation and treatment efforts championed by Baron Larrey; similar efforts occurred in the United States during the Civil War. Hospital-based ambulance services developed, as did private enterprises of lesser sophistication. The increasing lethality of warfare in the first two World Wars was coupled

with continued emphasis on rapid evacuation, provisional stabilization, and expedited definitive surgery with a resultant mortality reduction. These efforts were redoubled with the air evacuation and forward field hospitals pioneered in the Korean conflict and Vietnam War.¹ The lessons were slow in their civilian sector application as highlighted in the report published in 1966 by the National Academy of Sciences entitled “Accidental Death and Disability: The Neglected Disease of Modern Society.” This study demonstrated that many deaths occurring daily could be prevented through a combination of community education, stricter safety standards, and better prehospital treatments. Its publication was a significant event in the development of modern standards of care.^{2,3,4}

The federal response was legislation intended to create components of a rational trauma care system, mandating automotive safety standards, remedying non-uniform informal training of ambulance attendants, and supporting medical institutional organization into trauma systems.

Advances in care of cardiac disease, another major public health threat, were occurring concurrently, with the development of specialized coronary care units offering increasingly sophisticated monitoring and interventions. Pioneering efforts of Pantridge in Belfast, Northern Ireland, showed that extending these interventions to field care in ambulances could further reduce mortality. This process of



The so-called ‘flying’ ambulances were horse-drawn wagons for collecting and carrying the wounded from the battlefield to base hospitals developed by 18th-century French physician Dominique-Jean Larrey in 1797. The transport carried supplies and a doctor, quartermaster, noncommissioned officer, a drummer boy (who carried the bandages), and 24 infantrymen. According to Dr. Larrey’s field reports, the transports swooped into the battlefield and collected the wounded in less than 15 minutes.



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This photograph of horse-drawn ambulance carriages was featured in a 1911 photographic history of the Civil War.

moving lifesaving care initially developed in the hospital setting into the field is intuitively appealing and has been a general theme in the development of modern EMS, with predominantly positive results.^{5,6,7,8}

EMS Systems Act of 1973

The EMS Systems Act of 1973 was the first important piece of legislation affecting the development of regional emergency and trauma care systems. This act called for creation of a lead agency under the Department of Transportation (DOT), chosen because concern for traumatic highway deaths was a major impetus behind the initiative. The legislation identified 15 components (including trauma systems) to assist local planners in establishing regional EMS programs. This approach to service delivery was viewed as a way of distributing resources equitably while expanding access to health care systems. Substantial funding was devoted to the establishment of an EMS infrastructure in over 300 EMS regions nationwide.⁹ Although national standards for EMS personnel training and certification were developed by the US Department of Transportation National Highway Traffic Safety Office (DOT-NHTSA), and national certification programs offered by the National Registry of Emergency Medical Technicians (NREMT), they were subject to modification by local authority.

During this period, studies continued to link poor patient outcomes with delays in both initial and definitive care of injured patients, drawing continued public attention and accelerating progress towards trauma systems development in some areas. Pioneer efforts in cities around the country began projects to staff ambulances with attendants with training similar to military medics. The popular 1970s NBC series *Emergency!*, portraying two fictional Los Angeles “paramedics” responding to a variety of emergencies, also encouraged interest by other communities in establishing equivalent services.¹⁰ (Personal communication, Dr. Ronald

Stewart, July 2013. Dr. Stewart served as medical advisor to the show *Emergency!* and subsequently as medical director for paramedic training in Los Angeles, among many other accomplishments.)

Health Planning and Resources Development Act of 1974

Nevertheless, this initial legislation failed to adequately stimulate initiatives to sustain EMS funding at the local level. In the Health Planning and Resources Development Act of 1974, regionalization of emergency medical services was designated as a national health care objective. However, by 1981, funding sharply declined when the Omnibus Budget Reconciliation Act consolidated EMS and trauma system funding into the state preventive health block grant program. The intent of the block grant concept was to shift responsibility of funding EMS services to the states while still supporting the lead agencies directing these services. But, since states were given wide discretion regarding use of these funds, many regional EMS programs lost funding and ended, while others responded by increasing their involvement in system development. Uniformly, however, citizen expectations for some minimal level of service were created. Service delivery models that evolved varied from volunteer-staffed units to hospital-based systems to fire department-based or independent public service departments, and the immediate local responsible authority from county or other regional to municipal entities. State governments retained the ultimate oversight responsibility.

PROVIDER EDUCATION AND CERTIFICATION

In concert with this process, the aforementioned DOT-NHTSA training standards and certification levels were developed for personnel, now termed emergency medical technicians (EMTs). The most basic level (EMT-Ambulance) included training in basic first aid, non-invasive airway

and breathing support, treatment of anaphylaxis and hypoglycemia, spinal immobilization and positional prevention and treatment of shock, all in a roughly 100-hour curriculum. An intermediate level (EMT-Intermediate), requiring several hundred more hours of training, added skills in intravenous fluid support and more advanced airway management. The generic term paramedic (EMT-Paramedic) became the formal classification for an advanced level provider capable of providing intravenous support, advanced cardiac rhythm analysis and electrical / pharmacologic therapy, and advanced airway and trauma intervention management. Training requirements for this level were significant, often 1500-2000 hours. However, in keeping with the overall philosophy of latitude in system evolution, these certification levels were subject to local modification.

Since most communities aspired to offer the highest level of care, but many lacked the resources (particularly in volunteer services) to train many providers to the EMT-P level, many systems added treatment skills to the intermediate level but reserved their autonomous practice to the paramedic level. This expansion of intermediate scope of practice under direct medical control was eventually codified in a 1999 DOT-NHTSA intermediate curriculum modification, but much local system heterogeneity still exists for this skill level.¹¹ Additionally, during this period the development of new airway management adjuncts and of automatic external defibrillator technology brought safe use of these lifesaving skills to the basic EMT scope of practice. National efforts continue to bring uniformity to certification levels, an issue addressed in the companion article in this issue.^{12,13,14}

MEDICAL OVERSIGHT

From its inception, prehospital emergency care has clearly been an extension of the practice of medicine into the field. The initial use of battlefield medics, or, in the civilian sector, selective inclusion of nurses or physicians in addition to ambulance attendants provided models that evolved in the United States to formal recognition and training of EMTs with judgment reserved, in varying degrees, by the supervising physician. From pioneering efforts of trauma surgeons and cardiologists in the creation and development of EMS, the responsibility for continuing to guide its daily practice and evolution has largely shifted to physicians trained in emergency medicine, a specialty whose recognition and growth paralleled that of EMS. Medical oversight can be conceptually partitioned into “off-line” and “on-line” medical control, with implications for the practice parameters of the supervised EMTs. Off-line (or indirect) control is the physician involvement in system design, setting of certification and training standards, development of protocols and standing orders, formal quality assurance programs, and EMT education. On-line control is the provision of medical advice for the care of individual patients in the prehospital environment, now accomplished predominantly remotely by cellular telephone or radio, but selectively, in some systems on scene by EMS physicians.

RHODE ISLAND'S EMS SYSTEM

Rhode Island has statewide EMS system administration, with the Department of Health (DOH) empowered by law to establish regulations, create protocols and oversee the system. A highly sophisticated statewide 911 central call center distributes emergency calls to the appropriate public safety dispatch authority. There are approximately 500,000 annually, resulting in about 750,000 referrals to response agencies, as many incidents require multiple resources (eg, police, fire, EMS and power company for a car crash into a utility pole). There are 93 licensed ambulance services in Rhode Island, with 911 response entities predominantly fire service and municipally based. The fire-based system offers personnel depth and resource advantages, as fire apparatus can be dispatched to medical emergencies along with transport ambulances, providing both faster response and the additional

Current implementation of a new electronic Run Report and data system will facilitate reporting to a national EMS database, NEMSIS; all EMS services in Rhode Island will be mandated to only utilize electronic reporting to the state by January 1, 2014.

resource and manpower that may be required. Three communities provide EMS via a “third” service, independent in administration from the local police or fire department. The more rural areas of the state are predominantly served by largely volunteer rescue agencies augmented by career and per-diem staff. Ambulance services are classified and licensed by the DOH as basic life support (BLS), advanced life support (ALS), or mixed, based upon the training level of the EMTs staffing the ambulance and its equipment. In Rhode Island, the DOH licenses three levels of EMS practitioner – EMT (a national standard certification with 1,585 licensed personnel), EMT-Cardiac, (a level unique to the state but similar to the DOT I-99 Intermediate and the new Advanced EMT with 2,193 licensed personnel), and Paramedic (a national standard certification with 333 licensed personnel). ALS ambulances must be staffed by two providers, one at EMT-C or higher licensure.¹⁵ (Personal Communication, Jason Rhodes, MPA, EMT-C, Chief, Emergency Medical Services Division, RI Department of Health, Aug. 27, 2013)

EMT training is available through a wealth of programs, from individual volunteer organizations to private business endeavors to community college-based programs. Supervision of these programs must be by an instructor coordinator trained by the Division of Emergency Medical Services at the RI Department of Health (DOH-EMS); each individual training endeavor must be specifically approved.¹⁶ RI EMTs hold independent licensure; they are directly accountable to the DOH-EMS for adherence to the *Rhode Island Prehospital Protocols and Standing Orders*. Practice standard violations are subject to review and disciplinary action by the DOH-EMS.¹⁷

A standard state-approved EMS Run Report must be completed electronically or manually and filed with DOH-EMS for each completed ambulance call. The data are reviewed for resource allocation, protocol revision, quality assurance programs, and practice standard adherence purposes. Current implementation of a new electronic Run Report and data system will facilitate reporting to a national EMS database, NEMSIS; all EMS services in Rhode Island will be mandated to only utilize electronic reporting to the state by January 1, 2014.¹⁸ A copy is also left with the receiving hospital for inclusion in the medical record.

Programs, training standards, regulations, and protocol revisions are the responsibility of the DOH-EMS, with input from a medical consultant, a specific committee structure, and from an advisory board of individuals representing interest groups within EMS and hospital and professional organizations – the Ambulance Service Advisory Board. The 23 members appointed by the governor offer invaluable perspective on potentially under-recognized implications of proposed administrative changes.¹⁹

The clinical ecology of Rhode Island features a fortunate geographic distribution of hospitals and EMS units offering ALS care with a centrally located Level 1 Trauma Center, interventional cardiology and stroke centers, pediatric and women's specialty hospitals, and three nearby air-medical systems offering potential transport from the more distant portions of the state. In addition, a centrally located critical care ground transport service is able to perform field mutual aid or concurrent rapid response to local hospitals for transfer to tertiary care.

SUMMARY

EMS in the United States has evolved into a diverse, complex system, with some momentum toward greater uniformity and coordination. Rhode Island EMS provides rapid response from 911 call to the patient's side, with thousands of dedicated providers and hundreds of ambulances providing life-saving care to its citizens.

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