Maryland's EMS system

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A STRONG clinical base combined with voluntary statewide networking characterizes the development of the Maryland Emergency Medical Services (EMS) system. The history of the Maryland EMS system dates to an initial two-bed clinical shock trauma unit established in 1961 by Dr R Adams Cowley. As a cardiothoracic surgeon interested in the management of shock, Cowley persisted in the development of the Shock Trauma Unit of the University of Maryland.

Because of the Shock Trauma Units' clinical successes, the governor issued an executive order in 1973 that established the first statewide EMS system in the country. The Division of Emergency Medical Services (DEMS) was established within the Maryland Department of Health and Mental Hygiene (the state health department), and also established was the Maryland Institute for Emergency Medicine (MIEM) within the University of Maryland. In 1977, the DEMS and the MIEM were amalgamated into the Maryland Institute for Emergency Medical Services by the state legislature. This fusion of the lead EMS agency of the state with the clinical Shock Trauma Center of MIEMSS, the highest level of care facility in

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the state, remains unique throughout the country and forms the cornerstone of the Maryland EMS system.

Paralleling the early development of the Shock Trauma Center in the 1970s was the development of prehospital care. Training and certification programs for prehospital basic life support (BLS) and advanced life support (ALS) were initiated, and 911 communication centers were established. Public service medical helicopter evacuation was begun in December of 1969 and continued with the expansion of helicopter bases throughout the state. The establishment of additional trauma centers in Maryland was begun in the 1970s and continued through the 1980s. Specialty referral centers for pediatric trauma and hand, reimplantation, burn, and eye injuries, as well as nontraumatic specialty referral centers such as neonatal and perinatal centers, also were established.

In 1973, only one county in Maryland had an established 911 communications center, and there were 4,282 certified EMTs, 1 small trauma unit in one hospital, and 2 medevac helicopter bases. Currently, every community has 911 emergency communications, and there are over 20,000 certified EMS prehospital providers, 7 helicopter bases, 11 trauma centers, and 23 specialty referral centers among the state's 50 acute care hospitals with 24-hour emergency department care. On an annual basis, EMS services handle more than 300,000 calls a year, including over 3,400 medevac helicopter calls.

EMS STRUCTURE

The lead EMS agency in Maryland is the Maryland Institute for Emergency Medical Services Systems (MIEMSS). As such, MIEMSS is responsible for coordinating EMS throughout the state. This coordination includes several components: training of prehospital EMS providers, transportation with appropriate care, a statewide communications system, designated trauma centers, and specialty referral centers. In recent years, the system has recognized the importance of rehabilitation as another component in the spectrum of EMS and has begun to fulfill its essential role in evaluating itself and in providing public education and leadership in injury prevention.

Within MIEMSS, the Office of Prehospital Training and Certification coordinates the training of prehospital providers in the state who perform basic life support and advanced life support. Over 20,000 BLS and ALS providers are certified. Both career and volunteer providers are trained, tested, and certified according to the same standards.

BLS providers include first responders, who have undertaken 40 hours of training, and emergency medical technicians who have successfully completed a 110-hour process of instruction and testing (EMT-As). ALS providers include both cardiac rescue technicians (CRTs) and emergency medical technician-paramedics (EMT-Ps). BLS providers are certified by MIEMSS, while ALS providers are certified by the Board of Physician Quality Assurance of the state, the same authority that licenses physicians.

All prehospital ALS providers in the state function medically under a single set of protocols called The Maryland Medical Protocols for Cardiac Rescue Technicians and Emergency Medical Technician-Paramedics.[1] Many prehospital care providers function in a variety of locations, either because they participate in mutual aid responses or because they are employed in one jurisdiction and volunteer in another jurisdiction. The common protocols ensure commonality and standardization for all medical functions performed in the prehospital phase. The Maryland Medical Protocols are developed by MIEMSS in concert with the EMS community and are customarily reviewed and revised every two years to keep pace with advances in technology, changes in

national standards (eg, advanced cardiac life support), and knowledge gained through experience within the state based on an ongoing assessment of the impact of protocols. While the process of input, review, and consensus building is sometimes laborious, the statewide application of a single set of ALS protocols prevents a mosaic of activity across the state. A unified, common language used by prehospital providers and physicians involved in emergency care clearly facilitates patient care. Efforts are under way to develop a parallel document for EMT-As in the provision of BLS.

The Maryland Medical Protocols (CRTs and EMT-Ps) both provide ALS providers with "standing orders" and on-line medical direction. Prehospital providers are to rapidly assess patients and initiate on-line medical direction as soon as possible. The protocols specify what measures may be initiated while consultation is being established and what interventions can be performed only by direct physician order. Direction is provided by the protocols on interventions to be carried out if there is technical difficulty in establishing communications.

TRANSPORTATION

Emergency transportation is provided throughout the state as a public service. Public service emergency ambulance care is provided by over 450 ambulance companies within the state's 24 jurisdictions, primarily as part of fire department services. Commercial ambulances are involved primarily in nonemergency BLS transports (eg, nonemergency interfacility transports); however, it has recently been recognized that the increased demand for emergency interhospital transports places an undue burden on public service EMS ambulances. As a result, a process was developed to provide for interhospital ALS transports by commercial ambulance services.

Helicopter transportation within the state is provided through a medevac public service program operated by the Maryland State Police Aviation Division and coordinated with MIEMSS. There are seven helicopter bases throughout the state, and an eighth base is planned. For many years, the state's medevac services used Bell Jet Ranger helicopters. A transition is currently under way to Aerospatiale Dauphin II helicopters, which provide greater space for patient care, greater lift capability, and increased safety. Patient care aboard the state's medevac helicopters is provided by Maryland State Troopers, who are all trained and certified as EMT-Ps. The state's helicopters have three prioritized missions: medevac, search and rescue, and law enforcement. Given the complexity and expense of a helicopter fleet, the multimission role of the helicopters provides for the best use of resources.

Calls for medevac missions take priority. In the medical evacuation role, the state's helicopters respond to requests both for off-scene emergencies (eg, vehicular crashes) and for interhospital transfers if the patient is going to a designated center providing a higher level of care. In contrast to many EMS helicopter services throughout the country, the majority (77% [MIEMSS inhouse data]) of medevac calls in Maryland are directly to off-scene emergencies.

ACCESSING THE EMS SYSTEM

The public gains initial access to the EMS system via the statewide 911 system. While often taken for granted throughout the country, this system is not universally available. Maryland was the second state to enact a statewide 911 system. In terms of public education, the system should be referred to as a "nine-one-one" system rather than a "nine-eleven" system, as in a moment of crisis, people may look for an 11 button to push after they dial the initial 9.

Calls for emergency 911 assistance are channeled into "central alarms" operated by the 24 jurisdictions (23 counties and the City of Baltimore). Through these central alarms, calls are distinguished as fire, police, or EMS calls. Several central alarms in the state also include enhanced 911 service, which identifies the origin of the call so that if an individual is in a critical situation or is losing consciousness while requesting aid, assistance can be dispatched.

When a call for EMS assistance is received, an ambulance is dispatched to the emergency site. After arriving at the scene, prehospital care providers communicate with receiving hospitals via the EMS communications system. In many parts of the state, the linkage is accomplished through the central alarms. In the Baltimore Metropolitan region, which contains approximately half of the state's population, the connection is via the Emergency Medical Resource Center (EMRC), relieving the central alarms from the burden of bridging ambulances and hospitals after the initial ambulance dispatch. The EMRC is being combined with the Systems Communications Center (SYSCOM) located at MIEMSS, which coordinates medevac helicopter missions throughout the state. ALS providers communicate with hospitals on designated medical channels specifically provided by the Federal Communications Commission in the 460-MHz range (UHF).

Because MIEMSS received the mandate to establish and coordinate EMS communications, the organization played a lead role in this development. Fixed and mobile equipment was provided from state resources for EMS use in ambulances throughout the state. Because a great deal of the equipment was purchased over a decade ago, one of the leading challenges for the EMS system is to provide resources for maintaining and upgrading communications equipment. Communications equipment is highly capital intensive, so the costs on a statewide basis are significant, but the benefits are also significant. By ensuring compatibility between all components of the system (eg, radios, monitor defibrillators, base stations, hospital consoles), an effort can be made to ensure that all of the communications components fit electronically.

SPECIAL CENTERS

Hospitals that provide consultation to prehospital care providers are designated as consultation centers. Typically, medical direction is provided by physicians in emergency departments, but consultation may also be provided directly by the trauma surgeons at the Shock Trauma Center or by other hospital facilities such as those specializing in burn care.

Fifty acute care hospitals in the state have 24-hour emergency departments, and each is linked to the statewide EMS communications system. Hospitals are designated as trauma centers based on compliance with the Echelons of Trauma Care document developed in the 1970s and revised in 1983.[2] Designation as a trauma center is not merely based on compliance measured by verification. Designation as a trauma center indicates both compliance with the Echelons of Trauma Care criteria and demonstration of the need for trauma care access within a geographic region. Monitoring of trauma center hospitals includes use of a trauma registry, and announced trauma center-site surveys. Additional mechanisms include unannounced trauma center surveys and ongoing mortality reviews. At present, 11 trauma centers serve the overall estimated population of 4½ million people within 10,000 square miles.[3] In addition to the 11 trauma centers (including the Shock Trauma Center), 20 specialty referral centers serve specialized needs including pediatric trauma, burns, eye

injuries, reimplantation, and other emergency medical needs unrelated to trauma such as neonatal and perinatal centers.

While the origins of the Maryland EMS System date back to 1961, formal and statutory development of the system began with the 1973 Executive Order and the 1977 law that established MIEMSS as both the Shock Trauma Center and the state program responsible for coordination of the EMS System. It should be noted that the system was established and developed with minimal regulatory authority. The strength and cohesiveness of the system rests on strong leadership and active participation by all of the components. Within the five EMS regions of the state, an EMS Regional Administrator employed by MIEMSS facilitates both statewide and regional development. Each region has a Regional EMS Advisory Council composed of prehospital providers, hospital providers, and consumers, all of whom act in an advisory capacity to the Director of MIEMSS. Regional and program medical directors contribute their expertise in furthering the development of EMS prehospital protocols, quality assurance, and evaluation of new techniques.

EVALUATION

The Federal EMS Systems Act of 1973 included 15 components considered necessary for EMS system development. One of these components was evaluation. Within MIEMSS, evaluation of EMS data is analyzed by Operations Research and Systems Analysis (ORSA), the component of MIEMSS responsible for analyzing data necessary for systems evaluation and future planning. The state trauma registry is administered by ORSA through the statewide trauma network. Another example of systems evaluation is the use of ambulance run sheets, which are evaluated by ORSA through the Maryland Ambulance Information System (MAIS). Optically scanned run sheets provide a hard copy record of patient care to the hospital admitting a patient, and the run sheets are evaluated through centralized standard information recording. While this system has been in use for nearly a decade, it is currently under review and revision. The next revision will still use optical scanning technology, but the goal is to improve the run sheet to make it easier to use and more valuable to EMS personnel.

Both prehospital and hospital systems evaluation has been useful in obtaining information applicable for public policy making. Such information was helpful in obtaining state legislation for mandatory safety belt use and in providing information to support mandatory motorcycle helmet use. To date, however, efforts toward mandatory motorcycle helmet use in adults have not been successful.

BEYOND EMS

One of the areas of greatest visibility within the Maryland EMS system has been trauma care. A result of the improved survival of trauma patients is an increased number of patients needing rehabilitation. While this need has not yet been completely met, a rehabilitation program clinically affiliated with the Shock Trauma Center was developed. Greater efforts and resources must be committed for the expansion of rehabilitation care throughout the state.

While a focus on trauma care has been clear, it is certainly not the only focus of EMS activity. The maturing EMS system has become more sensitive to special situations such as interactions between hospice patients and the EMS system. Through intense discussions between EMS providers and the Maryland State Hospice Network in conjunction with MIEMSS, a Hospice/EMS Protocol was developed to aid in

the appropriate palliative care of hospice patients who access the EMS system. To the author's knowledge, this is the first statewide protocol of its type in the nation.

Interaction between MIEMSS and other public agencies to improve coordination during disasters has resulted in a number of drills to test and improve such a response. The central theme has been that disaster management must be an extension of day-to-day operations: the best response lies within a well functioning EMS system.

Many of the successes of the EMS system in Maryland can be attributed to the determination and leadership of its founder, Dr R Adams Cowley. As the Director of MIEMSS until 1989, when he became the first Director of the National Study Center for Trauma and EMS Systems, his ability to persuade, organize, and lead public policy to focus attention on EMS, before it was ever the subject of a journal, is indeed remarkable. While many people refer to the "golden hour," few know that it was he who coined the term. Likewise, his emphasis on the word "systems" was and is prophetic.

CHALLENGES FOR THE FUTURE

Many challenges remain. The recruitment and retention of volunteer EMS providers, a main source of EMS service for nonurban areas, is an issue. The increase in the number of families that have two breadwinners has stretched the resources of many communities. Concerns about infectious diseases may also have played a role in the decreasing availability of volunteers for EMS. Some volunteer communities have found that they need to employ paid personnel during regular working hours to maintain services, especially in the area of prehospital ALS. Other communities have discussed whether tax benefits could be considered for volunteers as a service in kind for a community.

Another challenge facing Maryland EMS is that of providing emergency health care within an increasingly difficult national health care environment. Many emergency departments find themselves overwhelmed by the numbers of patients they must treat, both for emergency care and for primary nonemergency care. Hospitals providing specialized services, such as trauma care, have also faced fiscal challenges. While trauma centers in some parts of the country have closed for fiscal reasons, the Maryland trauma system has been maintained. Health care costs throughout the state have been tightly regulated. Maryland is an all-payor state, meaning that all third party health care insurers must pay hospital rates determined by the Health Services Cost Review Commission. Because trauma center designation is truly a designation process rather than merely a verification process, trauma centers can put their efforts into maintaining high standards of care rather than incurring unnecessary costs to be competitive. The crises in trauma care financing in many communities throughout the country are merely an intense microcosm of uncompensated care issues throughout health care.

A third challenge that Maryland EMS faces is the ongoing critical assessment of emergency medical services. Critical assessment is especially important in the area of prehospital care, which, because of its relative youth of one to two decades at most, has a relative paucity of scientifically tested and validated tenets. As part of the biennial revision of Maryland Medical Protocols (CRTs and EMT-Ps), an evaluation was conducted to examine the efficacy of second-line medication intervention in prehospital care. Over 600 cases were tracked, and the information was used to make decisions regarding which medications should be carried on prehospital ALS units. Few systems critically look at their own experiences as a basis for decision making.

While there will be many challenges in the 1990s and into the next century, a clear focus will be maintained on the goals of the EMS system. The goal of trauma care is clear—the eradication of preventable death and disability.[4] Another goal in EMS is to more clearly define the meaning of medical direction, which has remained for the past two decades perhaps the murkiest concept in EMS. MIEMSS has defined the goal for medical direction as 100% review of EMS activity by a medical director and face-to-face monthly interaction between medical directors and the prehospital personnel they supervise. While the logistics of meeting this goal and the resources required are great, this goal is a worthy challenge.

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Comprehensive emergency medical care is no longer a goal. It is a public expectation. In Maryland, the goal and the expectation remain a focus of a comprehensive statewide EMS system that links a strong clinical base with voluntary statewide networking.

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