

Emergency Medical Services Information Systems

Greg Mears, MD

Emergency medical services (EMS) are often defined as the intersection between public safety, public health, and health care. From a public safety and public health perspective, EMS is the safety net for those who become suddenly ill or incapacitated. This community-level responsibility requires EMS to anticipate events, provide services, and care for patients individually or through the management and coordination of multiple patients. Due to this anticipatory role, EMS must function from a preparedness model.

A preparedness model requires that the EMS component of health care be delivered to the patient as opposed to the patient presenting on their own. Because many EMS events such as cardiac arrest and major traumatic injuries are time dependent, EMS must provide this service and care through an organized mesh of ambulances, personnel, and resources configured to assure a timely response to every event within the EMS service area. No other component of the health care industry is required to function in their day-to-day operations from this preparedness-based, "go to the patient" model. From an operational and clinical perspective, EMS is the most complex and data dependent component of the US health care system. Unfortunately, EMS is also the most underdeveloped component of the health care industry from a personnel, data, financial, educational, or resource perspective. Information systems are critical for effective EMS system implementation because each EMS event requires knowledgeable personnel, appropriate equipment, and other required resources within an optimal EMS response time to the correct location.

The Importance of EMS Data

In the United States, there are over 25 million EMS events each year requiring patient care or transport. North Carolina's 8.6 million people call 9-1-1 and receive EMS services over 1 million

times each year. These services range from life-threatening emergencies to medical transports between hospitals and other health care facilities.

At the local EMS system level, EMS data are critical to determining where and how to allocate EMS resources to assure that the correct equipment and personnel are provided for each event in a timely fashion. Data that describe patterns of use can direct the allocation of resources, vehicles, personnel, and supplies. Information systems provide the EMS medical record, documenting the clinical care provided as well as supporting the administrative demands of the system. This documentation

"From an operational and clinical perspective, EMS is the most complex and data dependent component of the US health care system."

also gives guidance to the content of EMS personnel's initial and continuing education. Information systems provide the framework for ongoing quality management and performance improvement initiatives and data systems feed into the billing and reimbursement systems required to operationally sustain local EMS systems.

At the state level, EMS data are required to determine how to coordinate regional and statewide systems of care such as trauma, acute cardiac, and stroke. Data drive the development of operational and clinical protocols, initial education, continuing education, and medical direction needs. Technical assistance, funding, and advocacy can and should be driven by issues and needs identified and justified through a state EMS data system.

At the national level, a national EMS database is critical to define EMS needs and to support EMS as an industry and a key component of the health care system. Emergency medical service data systems can help shape national educational standards by

Greg Mears, MD, is an associate professor and North Carolina EMS medical director at the EMS Performance Improvement Center in the Department of Emergency Medicine at the University of North Carolina at Chapel Hill. He can be reached at gdm@med.unc.edu or 100 Market Street, Chapel Hill, NC 27516.

identifying the needs of patients. A data system can help prioritize federal EMS funding and support decisions by the Centers for Medicare & Medicaid Services (CMS) for reimbursement levels for Medicare and Medicaid patients. A comprehensive data system can also be used for basic and policy focused research.

Linkage of EMS data to other databases at the local, state, or national level is also needed. Through the linkage of data systems, insight can be obtained beyond what each individual data source can provide. EMS data systems should be linked with vehicular crash and other injury surveillance data to provide insight into improving the safety of roadways, vehicles, and trauma systems. Linkage of EMS data to hospital data can provide insight into the service delivery, personnel performance, and clinical care provided to each EMS patient. Linkage of EMS data to trauma, stroke, injury, and medical examiner data systems can provide information on how to target, design, and implement injury prevention and public education programs.

What is NEMSIS?

In 1999 the US Department of Health and Human Services (US DHHS) through the Health Resources Services Administration (HRSA) Emergency Medical Services for Children Program (EMSC) funded a feasibility study to determine if an organized EMS data initiative could be developed to support the EMS industry as the International Classification of Diseases (ICD-9) and Health Level 7 (HL7) standards have informed the rest of the health care industry. This feasibility study led to the formal funding of the National EMS Information System Project (NEMSIS) through the US Department of Transportation (US DOT) National Highway Traffic Safety Administration (NHTSA) Office of Emergency Medical Services. The NEMSIS Project has 4 primary goals and objectives:

- (1) Establish a standardized national EMS dataset which would be used to document the EMS service delivery, personnel performance, and care for every EMS event in the nation.
- (2) Establish an electronic EMS documentation system in every local EMS system to support service delivery and clinical care operations.
- (3) Establish a state EMS database in every state where a portion of the data collected by each local EMS system could be aggregated to support state EMS regulatory and disaster management functions.
- (4) Establish a national EMS database where a portion of the data maintained by each state's EMS database could be aggregated to support federal EMS program, educational, fiscal, and advocacy needs.

Currently, the NHTSA Uniform PreHospital Dataset (Version 2.2.1) is used. This national standard has been adopted

by 49 of the 50 US states. At the time of this publication New York had not adopted this EMS data standard. A total of 37 states have operational state data systems in place today. Every state has a goal, pending resources and funding, to establish a state EMS data system. In 2007, 4 states (North Carolina, Minnesota, Mississippi, and New Hampshire) are providing data to the national EMS database. Current NEMSIS Project funding and deliverables provide for a staggered implementation of the national EMS database with the addition of 10 new states per year until all states are participating.

North Carolina's EMS Data System

The North Carolina PreHospital Medical Information System (PreMIS) was developed in 2002 and currently maintains data on all EMS events in North Carolina. The data collected from the one million plus EMS events per year are used as a resource to guide local EMS systems across the state in their daily operations. Data from PreMIS are protected by North Carolina statute and are only accessible by the North Carolina Office of EMS and each local EMS System. Funding for PreMIS was initially provided through the Governor's Highway Safety Initiative. Currently, PreMIS is funded through a combination of state and federal funds associated with domestic preparedness.

Data from PreMIS are used daily in North Carolina's Bioterrorism Surveillance Program as well as in local EMS quality management and performance improvement initiatives. The Duke Endowment currently supports EMS through the EMS Performance Improvement Toolkit Project. The EMS Toolkits are detailed reports that cover a specific EMS topic. Each EMS toolkit evaluates the 100 North Carolina EMS Systems and provides custom recommendations to improve EMS service delivery, personnel performance, or clinical care. The web-based EMS toolkits have been developed to assist EMS systems with optimizing EMS system response times, thus improving EMS cardiac arrest, trauma, pediatric, and stroke care. The EMS Toolkit Project is a partnership with the NC OEMS and The Duke Endowment. Future EMS Toolkit funding will be used to assist individual EMS systems in addressing the specific problems identified by each local toolkit.

Summary

The future of EMS and the US health care system is dependent on interactive, real-time data systems that can be used to design, develop, implement, evaluate, and maintain quality evidence-based systems of care. North Carolina is a national and international leader in EMS given its support of the PreMIS System, the EMS Toolkit Project, EMS Bioterrorism Surveillance, and participation in the National EMS Database. **NCMJ**