EMERGENCY MEDICAL SERVICES

Emergency medical services (EMS) include the personnel, vehicles, equipment, and facilities used to deliver medical care to those with an unpredicted immediate need outside a hospital and continued care once in an emergency facility (127). ' EMS systems are generally organized at the State or regional level to provide coordinated delivery in an appropriate geographic area (62). Implementing comprehensive EMS systems has been shown to save lives and reduce disabilities (76,127). The primary goals of an EMS system are to:

1. provide rapid transportation to a medical facility;
2. provide immediate medical assistance at the scene and while in transit; and
3. have a coordinated, tiered level of hospital care so that the most seriously injured or ill patients are quickly triaged to, and cared for at specialized facilities, and the less severely injured or ill patient cared for at less specialized facilities.

In reaching these goals, EMS systems extend beyond the bounds of what is traditionally viewed as the "medical system," often overlapping with other public safety systems such as local fire and police services. Rural EMS systems rely heavily on community volunteers and may therefore serve as an important interface between the public and the local health care system (85).

EMS systems include several components:

Public Access

Public access to an EMS system is optimally achieved through a coordinated communications system. Centralized communications centers may be accessed directly by telephone or radio using a 911, 800, or designated seven-digit number (sometimes referred to as universal access). EMS systems can also be accessed through fire and police departments, hospitals, or telephone operators.

Prehospital Response

Public Safety Response

Prehospital response may begin shortly after an emergency victim is detected and before EMS professionals arrive. Bystanders trained in cardiopulmonary resuscitation (CPR) or first aid may provide assistance at the site or individuals trained in basic emergency skills may be called to the site as "first responders" until the ambulance or other EMS professionals arrive. Fire and police officials or community members may be trained as first responders.

EMS Professional Response

After the EMS system has been called. a vehicle appropriately staffed and equipped is dispatched to the scene. Depending on the nature of the emergency, extrication may be required, and medical stabilization or treatment initiated. EMS personnel select a facility to take the patient to (sometimes using transport guidelines), and provide transportation to that facility while continually monitoring and administering care to the patient. Prehospital providers are usually emergency medical technicians who provide basic life support care, which includes basic emergency care and CPR, and/or advanced life support, which may include external defibrillation for cardiac arrest patients and more invasive procedures such as starting intravenous lines. Prehospital care providers are ideally provided medical advice from physicians via vehicle-to-hospital communications. In addition to providing such "on-line" medical control, physicians may also participate in ''off-line' medical control through designing medical protocols that guide prehospital providers' care. Any in-transit communication of the patient's condition helps the receiving facility prepare for the arrival of the patient.

Transportation

Most EMS transportation is provided by ambulances. Helicopters are often used to transport trauma patients to trauma centers, while airplanes or helicopters are used to transfer stabilized patients from one hospital to another. The duration of the

[1] Some include rehabilitative care in the definition of an EMS system. While OTA recognizes the importance of the continuum of care required for many EMS patients, rehabilitative care is not specifically discussed in [his report.

transportation phase is dependent on three factors: physical distance to be covered; mode of transportation (land, air, water); and the type and condition of the roadway, airway, or water.

Medical Response

There are three levels of medical response:

- Primary medical response involves nonspecialty providers in facilities such as small community hospitals. Providers at these facilities can resuscitate and stabilize critically ill or injured patients.
- Secondary medical response offers definitive treatment by specialty providers (e.g., surgeons, anesthesiologists). Secondary facilities generally have a physician available 24 hours a day and lab and x-ray services available within 30 minutes.
- Tertiary medical response involves highly specialized and technical services (e.g., burn care, spinal cord injury care). Generally, tertiary facilities such as trauma centers need high patient volumes to operate efficiently.[2]

A number of professional organizations have established guidelines to categorize hospitals by the level of emergency capabilities. The American College of Surgeons, for example, has guidelines for the designation of trauma centers (4). The American College of Emergency Physicians has issued guidelines that include prehospital care (3) (see ch. 5).

The major factor affecting the outcome of a critically injured or ill patient is time to definitive care, therefore, efficient operation of an EMS system by trained personnel is essential. Trauma patient outcomes are best when patients are identified, transported, and cared for within a critical "golden hour' (127). For rural residents, this can be achieved with initial resuscitation and stabilization provided by prehospital providers at the scene and during transport; more advanced stabilization at the rural hospital; followed by rapid transfer to tertiary care facilities (20,21 ,46,1 28). Optimal EMS care in rural areas requires that the levels of medical response located in both rural and urban areas be well coordinated. EMS systems must also be coordinated with other public safety agencies such as fire, police, and disaster programs.

The responsibility of overseeing a State's EMS system generally rests with a State EMS director. The State EMS director may, among other things, be responsible for training and certifying EMS providers, certifying ambulances and air-medical transportation services, and ensuring the coordination of levels of EMS care provided within the State's hospitals. At the local level, EMS care may be organized through the county, as a separate department of local government similar to those offering police and fire protection. Alternatively, EMS services may be offered through an existing municipal agency. such as the fire department, where providers may be cross-trained to assume both EMS and fire-fighting responsibilities. Hospital emergency departments, private ambulance services, or independent voluntary agencies may also operate and manage a community's EMS system (42,75). However EMS services are organized, statewide or regional EMS patient surveillance systems, such as trauma registries, can be used by EMS planners to evaluate the EMS system. All EMS systems need not only an administrative director, but a medical director who prescribes, oversees, and is accountable for medical care provided by the service or system (53). An EMS system may include a single local service or it may encompass an entire State.

RURAL AREAS

Urban and rural areas are often defined using the designations of either the Office of Management and Budget (OMB) or the Bureau of the Census. Rural areas are the remaining areas not captured in either OMB's "metropolitan statistical area" (MSA) designation or in Census' urban or urbanized area definitions. Counties are the building blocks of OMB's MSAs and are easy to use, because county-based data are readily available. One or more counties form an MSA on the basis of population size and density, plus the degree of area-wide economic integration as reflected in commuting patterns. MSAs include a densely populated urban core (called an urbanized area), with at least 50,000 residents, that is part of a county or counties comprised of at least 100,000 residents. The Census'

[2]Trauma centers and trauma systems are one component of EMS care and systems. Trauma centers offer definitive care for the critically injured patient. For patients with noninjury-related medical conditions, the tertiary medical response may involve other specialized hospitals or centers.

urban and urbanized area definitions rely on settlement size and density without following county boundaries, making them more difficult to use.[3]

Both methods identify about a quarter of the U.S. population as rural or "nonmetropolitan." but these populations are not identical. For example, about 40 percent of the Census-defined rural population live within MSAs, and 14 percent of the MSA population live in Census-defined rural areas.

This report will refer to nonmetropolitan areas as rural unless specified otherwise. It seems appropriate to use MSAs to describe ''urban' and ''rural' access to, and organization of, EMS services, because EMS systems are generally organized along these lines. Specialized EMS services, such as trauma centers, for example, are generally located within the more densely populated urban areas of MSAs and become less available as you move out into the less populated non-MSAs. Nonmetropolitan hospitals are generally smaller than metropolitan hospitals and tend to have fewer specialized services available (6).

Unfortunately, statistics relevant to EMS are not presented in a standardized fashion. Comparing EMS-related data from one source to another, therefore, is almost impossible. The Department of Health and Human Services (DHHS), for example, publishes vital health statistics (e.g.. injury-related deaths) for metropolitan and nonmetropolitan counties,[4] but the Department of Transportation (DOT) provides data in their Fatal Accident Reporting System and National Accident Sampling System (122) using their own definition of rural.[5]

In addition to using a standard definition of ''rural, ' it is important to present data for rural subpopulations. Dichotomous measures of urbanity/rurality not only obscure important differences between urban and rural areas but also wide variations within rural areas. Consequently, there have been recommendations to implement a standard rural typology that would capture the elements of rural diversity and improve use and comparison of data. Several rural "topologies" or classification schemes have been developed for nonmetropolitan areas that may prove useful in presenting rural health data (50). It would be helpful to use such topologies to present data on rural injury so that injuries unique to such environments as farms and mining areas could be identified.

[3]For detailed information on definitions of rural areas, see "&finlng 'Rural' Areas: Impact on Health Care policy and Research," OTA Staff Paper, July 1989 (available through GPO stock No. 052-003 -01156-5 or by calling the OTA Health Program at 202-228-6590).

[4]DHHS subdivides metropolitan and nonmetropolitan areas into urban and ''not urban'' places. DHHS defines nonmetropolitan urban places as areas with populations of 10,000 or more.

[5]According t- DOT, urban areas are areas Within boundaries fixed by State or local officials that have a population of 5,000 or more, and are 1101 within another urban area, Rural areas are those outside of the boundaries of 'urban areas (122). Approximately one-quarter of the population of MSAs meet DOT's definition of 'rural and nearly one-third of non-MSAs meet DOT's definition of 'urban.