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Rural Systems

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As pediatrics is not just caring for little adults, a rural EMS system is not simply an urban system spread over a larger area with lower run volumes. It has lengthier response times and greater distances to definitive care.[28] A rural EMS system shares with its urban counterpart the primary goals of timely assessment, appropriate stabilization, and expeditious transport of the critically ill or injured patient. The means to that end are challenging and often found only through trial and error and with the willingness of dedicated individuals to help their neighbors. The concept of neighbor helping neighbor is not unique to rural EMS systems, but it is crucial. Developing an EMS system in a rural area presents some challenges not encountered in the urban setting. Recently, many of those difficulties were outlined in a special report to the Congress of the United States by the Office of Technology Assessment.[28] These include personnel shortages, inadequate educational opportunities, limited medical supervision, limited resources of equipment and training, limited financial resources, poor communications and public access, lengthy response times, and a preponderance of volunteer providers. Rural personnel also have fewer opportunities to gain experience and reinforce skills. New innovative teaching strategies are being used to overcome this deficit. The rural population, especially farmers, tends to be more stoic and does not use EMS services as readily. Rural residents travel poorer roads at higher speeds, use seatbelts less often, and drive four-wheel drive vehicles and pickup trucks more often, increasing the likelihood of fatalities in automotive accidents.[28] Finally, the three occupations with the highest mortality and disability rates (farming, lumbering, and mining) are commonly located in rural areas.[18] Whereas urban emergency departments are frequently called the knife and gun clubs, rural emergency departments can be considered centers of blunt trauma.

What is Rural?

Multiple definitions exist as to what distinguishes an area as rural. With respect to health care and EMS, the U.S. Congress Office of Technology Assessment published a paper defining rural areas.[26] A rural area can be a few small villages with a hospital over 100 miles away or towns of several thousand people with a multi-bed hospital nearby. The definition used by the Office of Technology Assessment in their special report included all areas not designated as a metropolitan statistical area (MSA), the term used by the Office of Management and Budget. MSAs have 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.[28]

In addition, wilderness areas are considered rural. Numerous training programs have been developed for providers and physicians in wilderness EMS and caring for patients when there are prolonged transport times.[3, 8, 14, 17, 20]

Evaluating Rural EMS Needs

The first step in developing or managing a rural EMS system is to study the numbers, types and distribution of medical and traumatic emergencies, and the basic demographics. Although data have been evaluated for a few states, they should not be generalized to all rural areas. The higher demand in rural areas for ambulance services for medical conditions other than injuries is believed to be due to "the older

age distribution of rural residents."[26] Ambulance calls are more likely to be "urgent" or "critical" in rural areas of Texas and South Carolina.[28] This is supported by data showing that 69% of ambulance arrivals at one rural hospital required admission to the hospital.[25] Death rates are inversely related to population density, and unintentional injuries result in death twice as often in remote rural areas than in the largest cities.[28] Such data may be difficult to obtain; however, prehospital care reports, emergency department data, dispatch records, and public health department statistics may provide insight into system development.

Once needs have been assessed, specific EMS goals can be logically established for each community in the EMS system.[28] Information from the state EMS office can help determine the appropriate level of personnel and training necessary to meet specific goals in a geographic area.

In addition, every EMS system should be part of a larger statewide system. This is particularly true in rural areas where resources for planning and provision of EMS may be scarce. Planners at the state level may not be fully aware of the specific needs or capabilities of the rural areas. The medical director must become familiar with the state EMS office, the regulations, and laws covering prehospital care and EMS systems. The medical director must also become involved in the process of developing appropriate regulations that have an impact on rural EMS.

Personnel and Training

In most rural areas the EMS system is dependent on volunteer providers often at the EMT-A or lower level. The unique problems of volunteers must be recognized. Although most volunteers have a deep commitment to public service and a caring attitude, many may not be adequately prepared by the EMS system for the stresses they will encounter. They are frequently required to make decisions concerning patient care that their training and experience does not prepare them for. They often lack adequate supervision by qualified, experienced direct and indirect medical control physicians and often have to pay out of their own pockets for supplies and training. A high turnover rate can be expected among volunteer providers. The average volunteer remains active less than 5 years.[19] In some successful rural programs common characteristics were identified, including a strong community need and social fabric, integration of sound business practices into the volunteer organization, admission criteria for volunteer members, participation and commitment of community leaders, high visibility of the service, a formal organizational structure, cohesive community environment, strong physician involvement, and good interagency relationships.[19]

In many rural areas the pool of volunteers is small and may be getting smaller.[27] It is frequently hard to maintain a cadre of volunteers available during weekday working hours.[12] Retention is of primary importance when dealing with volunteers, and ongoing recruitment is essential.

It is difficult to determine the level of training necessary for rural EMS personnel. Ideally, it is based on the expected frequency of types of emergencies; however, responders in rural areas may need additional advanced level training simply because of long transport times and prolonged patient contact. The procedures taught and used should be medically sound and show over time that they have a positive impact on patient outcome. Procedures should not be instituted just because they can be taught or performed in the prehospital arena. It is hoped the establishment of the Center for Rural Emergency Medicine at the University Hospitals of West Virginia will start a nationwide process of data collection and evaluation to determine what is needed and what really works in rural EMS systems.[1] In some areas it may be more cost-effective to educate 10 EMT-As than to train a lesser number of paramedics.[30,32] In 1972, advanced education for rural EMTs was introduced in New York state.[23] The concept was to introduce a module of education concerning an advanced procedure to be used under specific conditions. Once the technicians mastered that process they advanced to the next module. Brief courses of instruction (initial modules of 10 to 20 hours) were followed by fairly long periods of functioning at that level, allowing the technician to become successful and confident with the procedure. It also spread the educational process out over a period of time so the levels of advanced training were completed by the time the technician was required to refresh the EMT-A course. This approach was well received by the personnel. Many of the technicians in that initial module are still actively involved in the EMS system 20 years later. Unfortunately, so many different levels of education developed across the United States that the federal government finally grouped them into a single category of Emergency Medical Technician-Intermediate (EMT-I); however the modular educational process was not allowed to continue.[33] Rather than completing each procedure with successful clinical experience before progressing to the next, each level of training must usually be completed in its entirety within a set period of time.

First Responders and EMT-Ambulances (As) are usually the foundation of a rural system.[31] Strategically

spaced within a rural area, First Responders can provide early, definitive prehospital care and reduce response times significantly. If there is a need for a particular medical skill in a jurisdiction, such as automated external defibrillation (AED), it is logical and possible to teach that specific skill without the expense of developing other less valuable skills. In farming areas, it is important that prehospital personnel be taught the FARMEDIC course.[10] The medical director should be involved in these courses since extrication from farm machinery and silos can be prolonged. The special problems of manure pit extrication, injuries caused by farm animals, the organic dust syndrome, and silo filler's and unloader's disease should all be included in rural areas' EMT-A training. These are unique problems associated with farming. Rural fire departments and EMS personnel that might respond with them, need to be taught the dangers of fighting silo fires and extricating persons trapped in grain bins.

It is important that the skill levels of rural providers be upgraded only when it is appropriate for the system and area within which they function. It is possible for providers to learn advanced skills though ambulances, basic skills, medical control, or communications may be inadequate. Improved capabilities of a technician or service should be the result of a system planning process involving all types of participants, ambulance agencies, technicians, hospitals, and physicians.

Once the appropriate level of education for providers has been determined, the initial educational process and a program of continuing education must be planned and established. Remote locations frequently require that services share the use of audiovisual lectures, programmed texts, and mannequins.[2] As often as possible instruction should be given close to the homes of the providers. Remote telecommunication programs (both television and telecomputer) allow several agencies to participate in a regional presentation at the same time, while the students remain at their local facilities. At times the networks are already established in cooperative public school systems. In Idaho and Alaska, mobile EMS trauma training units providing lectures as well as psychomotor skills practice have been developed that literally drive education to the rural EMS services.[1] The New York State Health Department Office of Emergency Health Services traveled throughout the state providing education and practice in rapid extrication of motor vehicle victims.[7] It is equally important to provide appropriate continuing education programs for nurses and physicians supporting the EMS and the emergency departments. As a minimum, courses such as Advanced Cardiac Life Support (ACLS), Pediatric Advanced Life Support (PALS), Advanced Trauma Life Support (ATLS), and a medical oversight course should be made available and encouraged. Educating prehospital providers to a high-level of care does little good and may prove detrimental to relationships if local physicians and nurses cannot provide the appropriate continuum of care. New video-electronic transmission of real-time video via telephone lines allows communication between the rural facilities and larger facilities. While the patient is being evaluated and cared for at the rural facility, practitioners with needed expertise and greater resources can give advice and guidance.[9]

Prehospital providers should receive feedback on a regular basis. Recognition from the community for exemplary services should be routinely provided. Whenever possible recognition should be provided in person by the medical director or designee. It is preferable to provide a means for providers to participate in evaluation of the prehospital activities.

The term *critical incident stress management* describes the psychological and emotional support and debriefing needed following a major EMS incident.[13] In rural EMS a critical incident may occur with only one patient, especially if the patient is a child, friend, or family member of the provider. The provider looks to the medical director for emotional support and debriefing as soon as possible after a critical incident. The medical director should be specifically alert for such incidents when performing run reviews. Often the field providers do not realize the personal impact that a particular incident may have on their lives.[3]

Financial Considerations

Finances are a significant problem for all areas of EMS, especially rural systems. Numerous recommendations for federal, state, and local financing have been made.[28] All avenues should be evaluated so that volunteers and paid rural personnel are provided adequate financial support to purchase supplies and keep ambulances running. The less time and money a volunteer has to invest in fund-raising the more likely the volunteer is to be retained in the system. The National Rural Health Association determined that "EMS in rural areas have not achieved the same level of advancement that it has in urban areas. Following are just a few of the reasons why. Sparse populations covering large geographic areas make the cost of providing emergency care more expensive, state and local governments in rural areas have a lower capacity to fund programs through taxes, failing rural economies often have difficulty maintaining the public service and

responding to change, rural communities don't have the volume and profit potential to operate private sector EMS services when the public support system is absent."[29] All efforts to support volunteer, part-volunteer/part-paid services, or fully paid services in rural areas should be attempted including grants and third party billing. In several states avenues for financial assistance including surcharges on insurance policies (life, health, accident, and automobile), fees on telephone access lines, and portions of all fines for vehicle infractions such as driving while intoxicated, have been tried. One possible area of funding for individual ambulance services is charging third-party reimbursers for allowable fees. This route, however, is frequently frowned on by volunteers that survive on donations, fund drives, barbecue dinners, raffles, and auctions supported locally by the people the providers serve.

Medical Oversight

The local medical director may have to travel hours to meet with the providers under his control. The remote medical director should endeavor to meet with providers frequently but must meet with them at least 4 times a year. The medical director or EMS system quality improvement coordinator should try to review cases by mail monthly providing negative and positive feedback to the providers. Before instituting such a system the review should be planned with the agencies to prevent adverse interactions resulting from any negative findings.[22] The more time the medical director is able to devote to these meetings, the more enthusiasm will be built among the prehospital personnel.

Medical oversight in a rural EMS system is complicated by long response and transport times, extreme distances, and frequently inadequate communications.[29] It is important for the medical director or the hospital to maintain direct communications with the prehospital personnel throughout patient care and transport. Transport times are long and changes in the patient's condition often occur. However, in many rural areas, communications systems are lacking and extensive use of indirect medical control is required. Standing orders and protocols for this indirect medical control need to be reviewed frequently to ensure they meet the evolving needs of the community. Reviews are most important in EMS systems using intermediate levels of advanced technicians. Protocols and standing orders should include medical care, special rescue or extrication, other specialized services, hazardous material response, when to contact direct medical control, when normal direct medical control orders can be used as standing orders in the event of communication failure, interhospital transfers, and aeromedical transports.

It is important that the medical director educate others who will have contact with the EMS system so they are aware of the providers' skills and abilities. In rural areas a physician is *not* available 24 hours a day, therefore the medical director should monitor calls via radio and be aware of the system activities as much as possible. As an alternative, on-line assistance from the emergency department or nearby EMS systems may be arranged. It is also possible to use direct telephone contact between the patient's location and the medical director of an adjacent EMS system; the use of a radio-telephone switching station allows relatively long-distance communication. These methods allow voice and bioelectronic transmission of data from the prehospital provider to a direct medical control facility or physician.

The more personally a medical director knows the providers and the system, the easier it is to determine how the system should grow and what levels of care should be authorized. The medical director, whether in control of a single prehospital service or multiple services in several counties with several hospitals providing initial and definitive care, is ultimately responsible for every patient in the system. This fact may be a significant disincentive for a physician to provide medical oversight to a rural EMS system. Consequently, many states have enacted legislation that protects physicians from civil liability when they assume medical control responsibilities.[15] In addition, familiarity with the protocols, standing orders, and providers helps relieve the sense of insecurity remote supervision often stimulates.

Communications

Providing EMS communications in rural areas can be an expensive and complicated operation requiring the assistance of technical experts and electrical engineers. Frequently, detailed advice on rural EMS communications is available from experts in the particular geographic area or the state EMS office. Multiple problems have been identified with respect to communications.[15]

Access to EMS is frequently hampered by lack of 9-1-1 services. In rural areas, emergency call boxes along highways, citizen's band (CB) radios, or very high frequency (VHF) marine radios may be used for access; however, radio dead spots and congested frequencies are frequent. Many emergency agencies in rural areas are accessed by local telephone numbers. These are often party lines meaning several households may share one line and getting to use the line

may be difficult. People living in the area sometimes know the number but most new people or visitors do not have that information. Some areas advertise the number on telephone stickers.[29] In other areas calling the telephone operator (dialing zero) may access a centralized operator many miles from the area who may not have the necessary information to generate a response by the required agency. Public education in rural areas should focus on accessing the system and providing first aid and CPR until EMS arrives.

Once an emergency call is received the dispatcher must send the first responders or an ambulance to the scene. It is important that the dispatchers have had emergency medical dispatch training.[16] This training should be geared to the rural environment where there are few house numbers. Landmarks and the correct names of roads may be the only way to describe a patient's location.

Medical control communication is needed once the providers arrive but may not be available or accessible for the reasons previously noted. It is important to remember that in most medical emergencies access to direct medical control is possible with a telephone.[22]

EMS communication systems are not always planned and coordinated with other services such as police, fire, or rescue. They frequently vary in quality from area to area within a rural EMS region, and an ideal system configuration is not a reality. It is important, therefore, to consider the radio frequencies of other local providers when determining mutual aid agreements or addressing disaster plans. A comprehensive radio communications plan has been successfully implemented. It consists of a VHF mountain-top repeater system supported by the sheriff's department and an ultra high frequency (UHF) repeater system supported by the state health department. The systems are placed on mountain tops so that access is provided throughout the region.[29] One county system in New York state maintains economic support for its multichannel VHF and 10 channel UHF multiple repeater system by allowing county agencies access to some frequencies for transmission of long-distance, business phone calls. The savings in long-distance calls has helped provide financial support for the EMS radio system. The tower with the strongest signal can be manually selected by the communications control center to receive the EMS signal, which can then be repeated between the towers and transmitted to the receiving facility.

Transportation

Ideally, in rural areas, response vehicles should be located and able to transport so that most areas can be reached within a reasonable time frame. Th goal should be to provide an adequate number o strategically placed ground vehicles and aircraf Where this is not possible efforts should be mad to recruit and train First Responders to provid initial stabilization until a transport vehicl arrives. It is important that there be a clear agree ment between independent First Response unit and transporting ambulance services concernin mutual aid responsibilities and the provision o continued care at the facility. This agreemen should be written, and a copy should be approve by the medical director of the system. The level o service provided by each component should b identified and agreed on before starting the pro gram.

In farming areas, the farmer and family should b considered first responders and should receive edu cation in preplanning acute events, initial emer gency care, and accessing EMS system. This shoul include painting large numbers on every farm build ing and putting a map of the farm in the mailbox s that EMS providers can locate them if the famil returns to the injured person to provide assistance The FARMEDIC program addresses these issue but again the medical director needs to be involve in the process.

Aeromedical Services

In rural or wilderness areas, aeromedical evacua tion is often provided by commercial airlines an governmental agencies such as state police service or Air National Guard units. It is important to edu cate field providers about aeromedical evacuatio so they may serve as escorts when needed.[11, 21] rotorcraft are used the prehospital personnel nee to know how to properly package the patient for th type of helicopter used. The patient should be wel wrapped in a blanket, and then the restrainin straps to the long board should be fastened over th blanket. Rear tunnel patient access helicopters ma not allow use of the lower extremity traction splir because its length may prevent closure of the rea hatch door. It is also important that personnel kno the protocols for controlling access to the aircraf the dangers involved, and the process of loading th patient. It is essential that educational programs b completed before use of these aircraft to prever injury to the patient or providers. Aeromedica transport should also be incorporated in local an regional EMS planning and medical control sys tems. The mechanism and process of accessing th aeromedical service should be clearly defined with in the EMS medical control protocols. The EM

medical control within the area should have the most knowledge of the regional resources, can act as a consultant, and can provide direction to prehospital services and smaller hospital facilities requesting aeromedical assistance. A patient should not be held at the scene until arrival of a helicopter if the time for transport to an appropriate facility would be shorter. The helicopter can be routed to that facility if additional transfer is required. In areas where fixed-wing aircraft are used for transport (wilderness areas or islands), it is usually necessary to initially transport the patient to a predesignated landing site.

Patient Recordkeeping

It is not unusual in rural areas for two or more services to be involved in treating and transporting a patient. In these cases, extra attention should be given to coordinating patient recordkeeping. Patient records should be easy for all prehospital responders to use. It is often best to use a series of check boxes rather than lengthy narrative reports so that copies of the primary responders' reports can be given to the secondary services without significantly delaying patient transfer. This information should be related to the receiving hospital by the primary responders so that the condition of the patient can be followed continuously throughout the course of prehospital care. Copies should be retained by the service initiating the care and the service providing transport for review by the medical director. Interfacing services should collaborate on the design and use of the form, unless there is already a systemwide or state approved form. A good recordkeeping system provides access to statistics that aid in prehospital research and rural EMS system development. The data will become crucial as quality improvement activities and research in prehospital care begin to sort the beneficial actions from those that are of no help or even harmful.

Major Incidents

All rural EMS systems should actively participate in developing and testing disaster and major incident protocols. Sooner or later every EMS system will respond to a major incident involving more patients that the system routinely handles. Planning and preparation will reduce the stress of the incident and help the providers deliver better care. In addition to having a detailed plan the entire system including hospitals and other involved facilities should participate in periodic drills (using moulaged victims) to assure that the plan and communications work. A critique of the drill including the prehospital personnel, the moulaged victims, and the hospital staff should be conducted as soon as possible. This is necessary to identify problems and obtain suggestions on how the plan can be improved. Including all persons involved provides insight not otherwise obtained and builds camaraderie and mutual respect.

Mutual Aid

Rural EMS systems should have mutual agreements not only with other ambulances, but also with other public safety agencies, extrication teams, and search and rescue groups. Often agreements need to be made with agencies such as the military, depending on their availability and the remoteness of the area. It is better to start a mutual aid response early in an incident and cancel if not needed than to start late and lose time and lives.[44]

As part of the EMS system, any rural hospital that does not have the range of services required to care for the gamut of emergencies expected in a rural setting should develop close relationships with a facility that does. This may be a neighboring rural hospital, a rural referral center, or a suburban or urban center. The time to find resources for a particular problem is not when that problem requires a rapid solution. If there are designated specialty facilities near the rural facility that provide the service, under federal legislation a patient that needs to be transferred must be accepted.[46] The rural facility will evaluate and stabilize the patient, receive the patient's consent, contact the facility and physician at the receiving hospital, and transfer all the necessary records. The plan for assistance from the larger facility should also include educational programs such as triage and transfer processes and protocols, the provision of ACLS, ATLS, and PALS, and other services that the smaller facility may not be able to do on their own.

Summary

All EMS systems share common goals. Rural systems tend to be less structured, coordinated, and educated in advanced emergency care techniques than urban systems. Each is characterized by its own unique set of problems, usually centered around geography and demographics. The thorough knowledge of these parameters coupled with thoughtful needs assessment will lead to a smoothly functioning rural EMS system.

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