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Urban Systems

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In the rural United States, EMS generally developed as a volunteer activity; in most cities EMS began as hospital-based ambulance services staffed by full-time career personnel. Over the last 30 years the hospital-based ambulances have, for the most part, given way to municipally sponsored fire department or third-service programs. However, a few hospital-based or hybrid urban services exist.[3] The concept of full-time professionals or at least a mixture of paid and volunteer personnel is spreading to suburban areas and will eventually develop in all but the most sparsely populated areas. The problems facing urban medical directors differ from those of their rural or suburban counterparts; the most significant differences are addressed in this chapter.

Higher Call Volume

Throughout the country a relatively large number of medically underserved individuals increasingly turn to 9-1-1 and EMS systems as their entry point to health care services. In urban systems the total call volume is higher and units are generally busier. Consequently, urban units are used more efficiently because there is less downtime. Operationally the result is an effectively lower reserve capacity when call volume increases, and patients wait for ambulances more often than ambulances wait for patients; as call volume increases, response times also increase. In low-volume systems, inactivity occurs between calls, and travel time becomes a more dominant factor in response time.

Assuming no overcrowding at the receiving hospitals, efficient urban EMS ambulance units can handle approximately one call every hour. This can be translated into a staffing pattern, depending on time of day and usage patterns, requiring one ambulance for every 40,000 people. As a general rule, early evening periods (5PM to 9PM) require nearly twice as many units as early morning periods (2AM to 6AM), and other times fall between the two extremes. Depending on citizen use characteristics, some areas require more ambulances, while others require fewer.[4] Analysis of usage patterns must be combined with continual monitoring of call volume so that a fluid system of unit redeployment meeting local needs occurs.

The increased call volume of urban areas is an advantage for research and evaluation of innovations. On the negative side, however, there is also more wear and tear on the vehicles; the street life of an urban ambulance is shorter than its rural counterpart, resulting in proportionately higher capital costs for ambulance replacement. Other recent advances increasing the efficiency of the high-volume urban system, which also contribute to increased cost, are the automatic vehicle locator (AVL) system, priority dispatch, and computer-aided dispatch terminals or printouts in all ambulances.

More Paid Full-Time Employees

In urban systems the prehospital care providers are usually paid full-time fire department or third-service employees. However, there are EMS systems in a significant number of municipalities which provide services effectively through contracted commercial ambulance operators. Full-time personnel acquire more field experience, require less refresher training, and burnout more rapidly than volunteer providers in relatively low-volume environments, unless effective stress management programs are in place. Employed providers present a myriad of labor management issues in a paid system, all of which

complicate the job of the medical director. Of course, there is also a higher probability that urban EMS employees will be represented by a union, which must be factored in as well. Additionally, political relationships and equal opportunity issues are more likely to affect staffing and planning.

These realities cannot be ignored. Unions demand that skill upgrades are accompanied by labor and contract negotiations and increased salary. The larger the number of employees, the higher the absolute cost to management for salary and benefit increases. There is also greater potential for labor relation cases in a paid urban system. Issues of infection control (AIDS and TB), homelessness, and drug-related and domestic violence resulting from differences in the urban and rural case mix, point to the need for a strong employee health service. These health services must work in close liaison with the infection control departments of the hospitals to which patients are transported and with the police department to ensure safety for crews. An effective urban medical director must also develop an independent employee assistance program and a large number of crisis intervention teams to meet the physical and emotional needs of personnel and their families.

Advantages of a Tiered System

A tiered response usually makes sense in an urban EMS system. Many urban programs are two-tiered, with the more advanced and the basic tiers occasionally working for different agencies. The relatively constant stream of calls in high-volume urban systems coupled with modern priority dispatch allows for more efficient use of the more expensive and relatively scarce paramedic personnel. In a priority dispatch system, the routine dispatch of both components is not necessary except for the most serious calls or when the paramedic unit lacks transport capabilities. For example, basic providers with pneumatic anti-shock garment (PASG) capability and rapid transport may be the response of choice for trauma in an urban environment. Although a minimum of one *ambulance* is generally required for every 40,000 people, a single paramedic unit with adequate transport support and state-of-the-art priority dispatch may be adequate for up to 200,000 people.[7] Despite arguments by some for all-paramedic systems, a two-tiered system allows a given number of paramedic units to serve a large population while maintaining a rapid response time.[1]

Nontransporting First Responder or emergency medical technician-defibrillator (EMT-D) programs, which have automated external defibrillation (AED) capability, are proliferating and add yet another potential tier in many urban environments. These programs can improve survival statistics but must be tightly linked with an ambulance transport service and more advanced medical backup. Difficulties can occur if AED programs are not integrated, resulting in a lack of coordinated protocols, program management, medical oversight, or contracts.

Possibility of Using Nontransport Vehicles

Responses by personnel in nontransport vehicles require that a secondary transport capability be readily available. Where that capability exists, system efficiency may be improved by using relatively inexpensive vehicles (costing a third of the price of an ambulance) as the nontransporting responder.

It is logical to use medically sophisticated personnel in nontransport vehicles and to dispatch them to cases in which such an intervention is the type most likely necessary. The use of basic personnel in nontransport vehicles makes little sense, except when ambulances are in short supply and all advanced personnel are already in nontransport vehicles. Of course, if fire or police personnel with basic first aid, First Responder, or EMT-B training are available, the urban system should seriously consider using them as the initial tier, responding in fire apparatus or police cars.

Different Response Time Factors

Ambulance cycle times of about 1 hour are usual in both rural and urban systems; however, the system variables differ. Whereas cycle times are often extended in rural systems because of scattered population and long travel times, in urban areas they may be prolonged by vertical access requirements, traffic congestion, or the lack of immediately available ambulances because of call volume surges and extended turnaround times in overcrowded emergency departments.[10]

In overtaxed systems, dispatchers must hold calls while waiting for an available ambulance more often than in relatively low-volume systems. Delayed response outliers are not only significant patient care issues, but political and media time bombs for the urban medical director.

Because of the higher usage rates, adding ambulance resources usually has a greater positive impact on response time in an urban system than in a rural area. However, in densely populated cities, traffic

congestion related to rush hours, lunchtime pedestrians, construction, more frequent mass-media events plus demonstrations, plus public and political figure appearances may limit the expected benefits of adding more ambulances.

In cities with high-rise buildings, actual response times to the patient may be significantly greater than recorded response times to the address because of difficulties in vertical access from street level. For example, a response time of 6 minutes in a low-rise locality results in quicker treatment of the patient than a 6-minute response time in a high-rise area. For the urban medical director to develop medically optimal response time goals, the high-rise factor must be considered.[10,11]

Need for Standardization of Quality Management and Education

The large number of providers in urban systems requires highly structured medical oversight and quality management. A single urban medical director should be limited to control approximately 30 providers. Because urban prehospital providers use numerous receiving hospitals, there may be a tendency for medical control to be fragmented in large EMS systems. Although this is not necessarily bad, it can be confusing if the same level of providers in a single system have different protocols, educational backgrounds, or direct medical control physicians. If state or regional protocols and education requirements are not mandated, the medical directors in urban areas should voluntarily work together and with legislators to develop minimum local standards.

Because an urban medical director may be required to supervise a large number of providers, he often lacks personal contact with the individual providers. Assuming no cohesive regional quality management program is in place, an individual providing poor patient care can get lost in the numbers and float through a large urban service. If the solution is developing multiple "surrogate" medical directors at a number of medical facilities, a confusing variability of patient care can result unless there is a predetermined consensus on training, treatment, and operational protocols. Quality management programs must be proactive and ubiquitous. All sectors, government, volunteer, and commercial, must be brought into the system. Emergent and interfacility transports must be evaluated. There is an even greater need in the more densely populated urban system than in rural areas to actively interface quality management activities with receiving hospital facilities.

Need for Complex Organization and Supervision Structure

As the number of personnel increases, the supervisory and support staff requirements also expand within the agency and systemwide. Financial issues require expertise in areas such as budget, payroll, contract negotiation, and bid processing. A separate materials management section may be necessary to coordinate purchasing and inventory. Another unit may be needed to process prehospital care reports (PCR). As call volume increases, so do insurance claims and legal exposure necessitating an expanded risk management unit and perhaps even on-site legal counsel. Not surprisingly an unwieldy bureaucracy may develop both within the agency and among the various providers; in the urban EMS system care must be taken so that neither a multitude of uncoordinated small fragmented systems nor a truly unmanageable colossus evolves.

Availability of More Medical Facilities

There are usually more hospitals, both general and specialized, in an urban system. Consequently, greater consideration should be given in choosing the most appropriate institution for a prehospital patient. This not only means that field personnel must be taught to be more discriminating in facility choices but also that the local EMS system must take the lead in evaluating and designating emergency facilities of the receiving institutions.[4]

Increased institutional competition may lead to excessive political interference in site selection, direct medical control, and post locations of active units. The urban medical director must interface with all interested parties during development of the EMS system.

Less Medical Consensus

In urban environments there are often diverse and divergent medical opinions concerning appropriate medical care in the field. The greater the number of physicians involved in protocol development, the less likelihood of consensus. Although a single, responsible medical director should have ultimate authority for approving medical protocols and responsibility for supervising prehospital care, a formal, interdisciplinary, areawide medical advisory committee is critical to assist in developing prehospital medical policies and protocols. Strong negotiating skills assist in bringing the diverse opinions to a compromise. There are few situations more demor-

alizing to a system and its medical director than retrospective criticism and "monday morning quarterbacking" by the medical community.

Greater Physician On-Scene Medical Presence

In many urban areas there is an increased likelihood of a physician unknown to the prehospital providers being present at the scene of an emergency. These physicians may not be licensed in the jurisdiction or may not even be capable of dealing with the medical situation at hand. Therefore, it is essential to have a structured procedure for dealing with unsolicited physician interventions at the scene.

Increased Numbers of Non-English Speaking Patients

Generally, individuals who do not speak English are concentrated in urban areas; therefore the likelihood of non-English speaking patients accessing urban EMS systems is significant. Problems for the systems are accentuated by recent immigrants who not only have minimal English skills but who are also unfamiliar with the appropriate use of the emergency health care system. The urban EMS system communication center must have a large language bank of translators readily available.

Increased Nonemergent Use

Most residents of rural and suburban areas, regardless of financial status, have access to private vehicles and use them for transportation of nonurgent problems as well as emergencies; however, in the urban setting, demand for transport to hospitals is greatest in the low income communities. Because private and public transportation are often bypassed, medical directors of urban systems experience a much higher percentage of nonemergent requests for ambulances and a greater per capita usage rate than directors in suburban and rural systems.[9]

The percentage of nonemergent calls in urban systems is reported to be between 20% and 50%, depending on the local definition and circumstances. Although nonemergent use is on the decline, it is still one of the most vexing problems for urban systems and must be aggressively addressed.[8]

Limited Use for Aeromedical Capability

Medevac helicopters are usually less important and more rarely accessed on a per capita basis in urban areas. They are used to overcome difficulties of geographic access or traffic rather than long distances. Even in dense metropolitan areas, there will be an occasional need for the helicopter medevac. Thus a degree of aeromedical capability should be developed in all EMS programs with triage, dispatch, and quality improvement oversight mandated. In urban areas, competing hospitals may attempt to develop medevac programs; however, hospital-based medevac programs should be limited and must be coordinated by the regional EMS system.[9]

Testing Disaster Plans

Although disaster planning is no less important in rural settings, the more common occurrence of multiple casualty incidents (MCIs) and even disasters in urban systems allow for the evaluation of disaster response procedures on a more frequent basis. It is important that urban systems follow standard MCI procedures when dealing with all serious incidents so that the operational procedures are familiar and routine when providers face major disasters.[3,4]

A region-specific disaster plan is essential to every EMS system, but because the spectrum and consequences of possible disasters (natural and planned) are more varied in the urban environment, urban medical directors should spend time with liaisons from other agencies developing and testing many different disaster scenarios.

Summary

Although every jurisdiction requires development of a "tailored" EMS system, the issues often differ between urban and rural systems. It should be noted that around the country and around the world, urban systems are becoming remarkably similar in design and operation.

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