9 Emergency Medical Services

A municipality's emergency medical service (EMS) operation performs the critical life-or-death function of stabilizing patients—often the victims of serious illness or injury—and transporting them quickly to a hospital. The adequacy of a community's EMS operations can be assessed in a variety of ways.

The Need for Speed

Among the many key aspects of EMS performance, a crucial dimension is speed of response. For seriously stricken patients or critically injured accident victims, delays of even a few minutes can be catastrophic.

Knowing what to do on arrival is also crucial to effective EMS action. In cardiac care emergencies, for instance, the American Heart Association considers early access (i.e., quick recognition of the problem and prompt response), early CPR (cardiopulmonary resuscitation), early defibrillation, and early advanced care to be the "chain of survival" (Cummins, Ornato, Theis, & Pepe, 1991). Defibrillation administered within 6 minutes dramatically improves the odds of survival (Figure 9.1).

For other medical emergencies as well, the chain begins with prompt response. Because even the most proficient stabilization efforts provided too late may be of little value, response speed is the most frequently reported EMS performance indicator. Paraphrasing comedian Woody Allen only slightly, a big part of success in this business is showing up . . . on time.

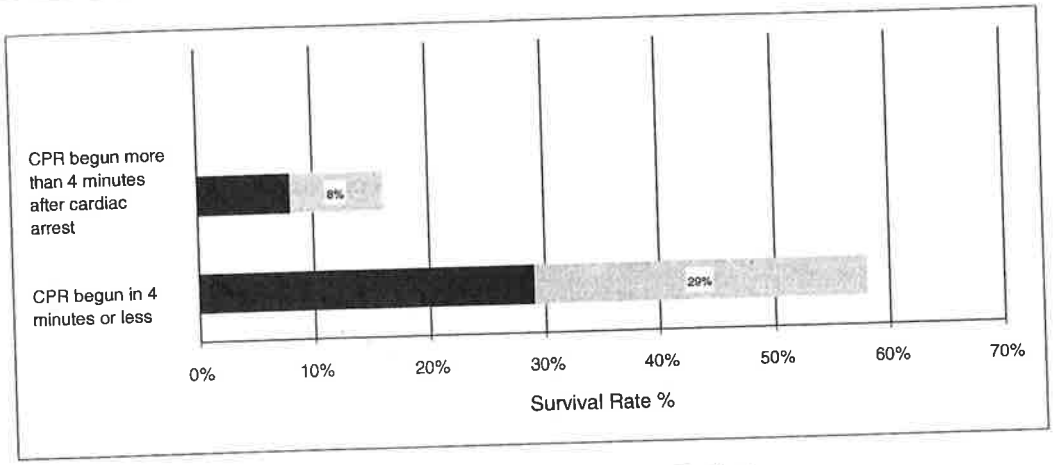

Figure 9.1. Quick EMS Response: A Key to Surviving Ventricular Fibrillation
SOURCE: W.D. Weaver et al., "Factors Influencing Survival After Out-of-Hospital Cardiac Arrest," *Journal of the American College of Cardiology*, 7 (April 1986), p. 754. Reprinted with permission from the American College of Cardiology, *Journal of the American College of Cardiology*, 1986, Vol. 7, p. 754.

Benchmarks

Response Time

A 1989 study of EMS communication services in Washington, D.C. (City of Washington, D.C., 1989b), reported average EMS response times among major cities ranging from 4.8 minutes in Kansas City, Missouri, to 10 minutes in Washington, D.C. (Table 9.1). A broader array of cities examined for this volume reported generally quicker EMS responses (Table 9.2). Several cities reported response times in the 3- to 5-minute range. It should be noted, however, that this second set of cities includes smaller communities with potentially shorter travel distances and less congested routes. Furthermore, self-reporting by these cities might in some cases exclude the time from call receipt until dispatch, a component of total response time explicitly included for all cities in Table 9.1 but mentioned explicitly in reporting documents by only three of the cities in Table 9.2. Even with this possible difference, however, the response times reported by many cities in the second set were quicker even than the time from dispatch until arrival reported for most cities of the first set.

The reasonableness of these EMS response time benchmarks is corroborated by the cities participating in the ICMA (1999a) comparative performance measurement project. Twenty-four cities with populations of 100,000 or greater reported EMS dispatch-to-arrival times for basic life support (BLS) response ranging from an average of 2.1 minutes (Oklahoma City, Oklahoma) to 8.9 minutes in 1997. The median average was 4.7 minutes from dispatch until arrival. For advanced life support (ALS) response, dispatch-to-arrival time averages ranged from 3.1 minutes (Odessa, Texas) to 8.4 minutes among

Table 9.1 Emergency Medical Service Response Times Among Major Cities, as Reported in 1989

City	Time From Receipt of Call Until Dispatch (minutes)	Time From Dispatch Until Arrival (minutes)	Total Response Time (minutes)
Kansas City	0.80	4.00	4.80
Memphis	1.00	5.00	6.00
Philadelphia	1.00	5.00	6.00
Phoenix	1.00	5.00	6.00
Chicago	1.50	4.70	6.20
San Francisco	1.14	5.26	6.40
Cleveland	1.00	5.50	6.50
St. Louis	0.50	6.00	6.50
Los Angeles	0.60	6.00	6.60
Baltimore	1.00	6.00	7.00
Nashville	1.00	6.00	7.00
New Orleans	1.00	6.00	7.00
El Paso	1.00	6.30	7.30
Houston	1.00	6.50	7.50
San Antonio	1.00	6.70	7.70
Honolulu	1.00	7.00	8.00
Oklahoma City	0.70	7.18	8.04
San Jose	1.30	7.00	8.30
Boston	1.50	7.00	8.50
Washington, D.C.	3.10	6.90	10.00

SOURCE: Adapted from City of Washington, D.C., *Improving Emergency Medical Services Communications* (Washington, DC: Office of the City Administrator, Productivity Management Services, June 1989), p. 6.

cities with populations greater than 100,000, and from 3.9 minutes (Santa Monica, California) to 5.7 minutes among smaller cities (pp. 307, 309, 339).

National statistics on EMS response times and the time from arrival on the scene until hospital delivery following serious accidents sheds further light on this topic (Table 9.3). Among urban accidents resulting in fatalities in 1997, EMS response times exceeded 10 minutes in slightly more than 10% of the cases. Delivery to the hospital usually required another 11 to 40 minutes.

Ten local governments participating in the ICMA (1999a) project reported average times from arrival at the scene to delivery of the patient at a medical facility in 1997 for calls requiring an ALS response (p. 310). The median was a

Table 9.2 Emergency Medical Service Response Times Among a Broader Array of Cities

Chapel Hill, NC
3.2-minute average (1999)

Duncanville, TX
3.7-minute average (1996), 4-minute average (1998)

Palo Alto, CA
Targets: Respond to at least 90% of emergency medical requests with EMT-D-trained personnel[a] within 4 minutes in urban response zone, and to at least 90% of paramedic requests within 6 minutes
Actual: 100% (1997)

Cambridge, MA
Target: Within 4 minutes at least 90% of the time

Reno, NV
Target: At least 75% within 4 minutes following dispatch (1999)

Eugene, OR
64% within 4 minutes (1995)

Portland, OR
46% within 4 minutes (turnout and travel time) (1998)

Cincinnati, OH
4.15-minute average (1995)

Long Beach, CA[b]
4.4-minute average from call until arrival (1996)

St. Petersburg, FL
4.4-minute average (1995)

Alexandria, VA
4.77-minute average (1998)

Irving, TX
4-minute 50-second average (1998)

Charlottesville, VA
94% within 5 minutes (1998)

Plano, TX
5-minute 5-second average (1997)

Greensboro, NC
5.3-minute average (1997)

Bellevue, WA[b]
5.8-minute average from initial call until arrival; 22% within 4 minutes (1998)

Orlando, FL
Percentage within 6 minutes following dispatch: 96% (1996)

(continued)

Table 9.2 Emergency Medical Service Response Times Among a Broader Array of Cities (continued)

Albuquerque, NM
Targets: At least 90% of BLS responses on scene within 6 minutes; at least 90% of ALS within 8 minutes (1997)[a]

Corpus Christi, TX
Target: At least 80% within 6 minutes following dispatch (1999)

Philadelphia, PA
6-minute average (1998)

Chesapeake, VA
6-minute 30-second average (1997)

Jacksonville, FL
6-minute 33-second average (1994)

Nashville–Davidson County, TN
6.8-minute average (1998)

San Antonio, TX[b]
Targets: Less than 9-minute average (dispatch and travel time) within the city and suburban areas; travel time average within 6 minutes for city and within 7 minutes for suburbs
Actual: 7.25-minute average (6.06-minute travel time) within city; 8.28-minute average for suburbs (1997)

Shreveport, LA
7.65-minute average medic response time; 71% of ALS responses within 8 minutes; 58% of BLS responses within 4 minutes; 4.35-minute average response time by firefighters to EMS calls; 50% within 4 minutes (1994)

New York, NY
7-minute 54-second average (1998)

Tucson, AZ
Percentage of ALS responses within 8 minutes of dispatch: 89% (1997)

Calgary, Alberta
87% within 8 minutes (1996)

Boston, MA
87.9% within 11 minutes (1996)

San Diego, CA
90% within 12 minutes (1998)

a. EMT-D-trained personnel are emergency medical technicians trained in defibrillation.
b These cities specifically defined response time to include dispatch time and travel time—that is, the time from initial call until arrival on the scene. Many others exclude dispatch time.
c. BLS = basic life suppprt; ALS = advanced life support.

21.5-minute average, with Miami–Dade County's 6.5-minute average leading the group.

Table 9.3 EMS Response Times and Hospital Delivery Times for Urban Crashes Resulting in Fatalities, 1997

Time (minutes)	*Percentage of Response Times Within Specified Range (EMS notification to EMS arrival)*	*Percentage of Delivery Times Within Specified Range (EMS arrival at scene to hospital arrival)*
0 to 10	89.3	7.5
11 to 20	9.4	34.0
21 to 30	0.8	31.2
31 to 40	0.3	14.3
41 to 50	< 0.05	6.4
51 to 60	< 0.05	2.9
61 to 120	0.1	3.8
Total	100	100

SOURCE: U.S. Department of Transportation, *Traffic Safety Facts 1997* (Washington, DC: National Highway Traffic Safety Administration, November 1998), p. 48. Figures are based on records for 7,865 urban accidents with fatalities.

Among cities examined independently for this volume, the city of San Antonio, Texas, reported that for 1995 the average time from receipt of an EMS call until arrival at a hospital by its units was 47.23 minutes for non-life-threatening incidents and 44.91 minutes for life-threatening incidents.

According to the study by the City of Washington, D.C. (1989a), the national medical community and the EMS industry have defined a two-part standard for EMS responsiveness: "90 percent of [Emergency Medical Technician] responses should be within four minutes, and 90 percent of paramedic responses should be within eight minutes" (p. 101). A standard promoted in Pennsylvania calls for an 8-minute response time on at least 90% of all emergency calls (SPRPC, 1990, p. VII-1). Reported performance targets and experience of the cities examined here suggest that an 8-minute standard might be realistic but that a 4-minute standard lies well beyond the reach of many communities.

Workload

Much as in the case of police officers and firefighters, some communities attempt to gauge the adequacy of their EMS services by considering the number of paramedics per 1,000 population. Such indicators can be misleading, because they fail to take into account a given community's distinctive needs for various emergency services. In reality, such measures are not really perfor-

Table 9.4 Quick and Effective Action on the Scene: Selected Cities

Quick Action on the Scene	*Effective Treatment*
Corpus Christi, TX Target: Medic units will initiate transport of critical trauma patients within 15 minutes of arriving on the scene at least 80% of the time (1999)	**Orlando, FL** Patients improved with treatment: 57% (1995)
Orlando, FL Critical patients transported within 20 minutes: 53% (1994), 65% (1995), 43% (1996) Significant trauma patients transported within 10 minutes: 22% (1994), 28% (1995)	**Bellevue, WA** Cardiac arrest survival rate: 33% (1998)
Shreveport, LA Percentage of prehospital time at major trauma less than 36 minutes: 74% (1994)	**Tucson, AZ** Percentage of patients saved after suffering witnessed cardiac arrest: 15% (1997)

mance indicators at all because they do not measure performance. They measure resource inputs—not performance outputs—and can vary greatly from one community to another. For example, at 0.44 paramedics per 1,000 population, the reported paramedic rate in College Station, Texas, in the early 1990s was almost twice that of San Antonio's 0.24 per 1,000 population in the mid-1990s.

More useful indicators of workload may be secured through direct measurement, rather than by population ratio. In that regard, Chesapeake, Virginia, reported 967 responses per paramedic during a recent year, and Sedgwick County, Kansas, reported an average of 810 calls per crew. San Antonio reported 9.6 responses per ambulance per day and 3,516 responses per year. Calgary, Alberta, reported an average of 244 responses per department employee.

Effectiveness

EMS units in College Station, Texas, strive to provide treatment and achieve stabilization within 15 minutes. Corpus Christi, Texas, attempts to initiate transport of most critical trauma patients within 15 minutes following arrival on the scene (Table 9.4). Orlando, Florida, tries to transport critical patients within 20 minutes and "significant trauma patients" within 10 minutes. Shreveport, Louisiana, limited prehospital time at major trauma to less than 36 minutes for most of its EMS patients.

Table 9.5 Fee Collection and Cost Recovery Rates for EMS Services

COLLECTION RATE	
Tucson, AZ	Collection rate for ALS/ambulance service: 74% (1997)
San Antonio, TX	64.5% of net billings collected (1995)
Burbank, CA	63% (1988), 54% (1989)
Shreveport, LA	55% (1994)
Duncanville, TX	54% (1996)
Palo Alto, CA	Paramedic receivables collection rate: 54% (1997)
Norfolk, VA	Medical billing collection rate: 38% (1997)
COST RECOVERY THROUGH FEES	
College Station, TX	Target: 40% to 70%
Calgary, Alberta	40% to 45% (1987–1996)

More significantly, Orlando reported in one recent year's statistics that 57% of its EMS patients improved with treatment. Bellevue, Washington, reported a cardiac arrest survival rate of 33%. Among 17 participating local governments in the ICMA (1999a) project, the median unit delivered 20.7% of those patients suffering full cardiac arrest from medical causes to a medical center with a pulse in 1977 (pp. 311, 341). Lake Forest, Illinois, led the group with a 55.9% average.

Yet another gauge of effectiveness is the rate of complaints. In one recent year, complaints about EMS services received by the city of Boston represented only 0.03% of all ambulance responses.

Collection Rates and Cost Recovery

Fees charged to recipients of EMS services often go unpaid. Reported collection rates among examined cities ranged from 38% to 74% (Table 9.5). Among a variety of proposed performance targets for EMS services in Washington, D.C., was an ambulance fee collection rate of 60% (Exhibit 9.1).

Exhibit 9.1. Performance Targets and EMS Performance Report

EMS Performance Report *Month:*____ *Year:*____

Item Number	*Indicators*	*Last Month*	*This Month*	*YTD*	*Target*
1.1	Number of incidents handled				—
2.1	Average call-to-scene time for first fire-fighting unit (in minutes)				4.0
2.2	Average call-to-scene time for first Emergency Ambulance Bureau (EAB) unit (in minutes)				n.a.
2.3	Average call-to-scene time for first responding unit (in minutes)				4.0
2.4	Average time from call to EAB unit dispatch (in minutes)				0.5
3.1	Percentage of fire-fighting units responding within 4 minutes				90%
3.2	Percentage of calls receiving a response within 4 minutes				90%
3.3	Percentage of urgent calls receiving an ALS response within 8 minutes				90%
3.4	Percentage of urgent calls for which an ALS unit is not dispatched				0%
4.1	Percentage of incidents upgraded in priority on the scene				10%
4.2	Percentage of incidents downgraded in priority on the scene				10%
5.1	Percentage of EAB runs evaluated in the field				25%
5.2	Percentage of fire unit medical runs evaluated				90%
6.1	Ambulance fee collection rate				60%
6.2	EAB absenteeism rate				5%

SOURCE: City of Washington, D.C., *Improving Ambulance Operations in Washington, D.C.: A Blueprint for Change* (Washington, DC: Office of the City Administrator, Productivity Management Services, March 1989), p. 106.

Recognition of the nonpayment factor and the high cost of service leads most cities to anticipate a municipal subsidy of the EMS operation. College Station, for example, sets as its target the recovery of 40% to 70% of EMS costs through fees. Calgary achieved cost recovery of 40% to 45% from 1987 through 1996.