The delivery of Emergency Medical Services (EMS) in the United States can best be characterized as being as diverse as the population of the United States. Just as the peoples of the USA are from many different races and cultures, so too are the means of delivering Emergency Medical Services.

Thirty years ago, ambulance services were strictly a "load and go" enterprise. Ambulance attendants were trained in first aid and paid minimum wage. The service was provided by small private ambulance companies, fire departments, hospitals, and city health departments. In many communities the service was operated by funeral homes, which of course had experience with vehicles where you could place a patient in a prone position (by that time the ambulances were separate from the hearses).

EMS Systems in the USA today have evolved from those traditional ways of providing services in each community. There has been rather dramatic change in the training of the ambulance attendant and the equipping of the ambulance and the use of technology to improve efficiency. What has not changed as much are the organizations that provide that service and the management structure of those organizations. Only a handful of cities in the USA have radically changed the way that the services are delivered, and those changes occurred in times of crisis for the system (the provider was going out of business).

This article will give the reader an overview of how and who provides emergency medical services today. We will also discuss some of the changes taking place in the USA’s health care delivery system and how that may affect the EMS system.

**Organizations that Provide Ambulance Service.**

Ambulance services are provided in many different organizations. However, they can generally be broken down into the types that are listed in Table 1.

**Table 1**

<table>
<thead>
<tr>
<th>Type of Organization</th>
<th>1993</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Dept. - Paid/Vol.</td>
<td>6,100</td>
<td>37.1%</td>
</tr>
<tr>
<td>Vol. Ambulance</td>
<td>3,250</td>
<td>19.8%</td>
</tr>
<tr>
<td>Private</td>
<td>2,058</td>
<td>12.5%</td>
</tr>
</tbody>
</table>
Table 2 shows the EMS providers in the 200 most populous cities of the USA. Virtually all of these are cities of over 100,000 population.

**Table 2**
EMS in the 200 Most Populous Cities in the USA

<table>
<thead>
<tr>
<th>Type of Transport Provider</th>
<th>1994</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Department</td>
<td>70</td>
<td>35.0%</td>
</tr>
<tr>
<td>Private</td>
<td>48</td>
<td>24.0%</td>
</tr>
<tr>
<td>Fire Dept. &amp; Private</td>
<td>32</td>
<td>16.0%</td>
</tr>
<tr>
<td>City/County Third Svc.</td>
<td>32</td>
<td>16.0%</td>
</tr>
<tr>
<td>Hospital</td>
<td>14</td>
<td>7.0%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>2.0%</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>100.0%</td>
</tr>
</tbody>
</table>


Nationwide, the single largest group of providers of ambulance service are local fire departments. In 1993, 37.1% of the ambulance services were provided by fire departments. Most of these rely on volunteers to provide staff to some extent. In the largest cities the fire departments generally provide transportation to patients that call in emergencies. In many small cities they provide inter-facility medical transport as well.

The next most frequently found is the volunteer ambulance service, referred to as a rescue squad in many places. This is commonly organized as a non-profit corporation that uses volunteers for virtually all of the functions of the, typically
serving towns of less than 30,000. These organizations are independent of the fire
departments and exist in areas where the volunteer fire departments do not
provide ambulance service. These organizations rely on private donations; sales
of donated goods; gambling (bingo); and, state and local government grants.
They typically do not charge patients for their services, although this is slowly
changing. Eastern seaboard states have strong traditions of volunteer rescue
squads that provide service in urban areas as well. In fact, almost 50% of the
ambulance services in the USA are fully staffed by volunteers.

The private for profit ambulance company is the third most common form of
delivery of service. The private ambulance companies provide virtually all of the
non-emergency inter-facility transports in the urban and suburban areas of the
USA.

EMS operated by city and county government independent of the other public
safety departments make up the next most common services. Known generically
as “third services,” these are usually associated with the health department in
larger cities and counties. In other cases, they are a separate department within
the government.

Hospitals make up 5.1% of the provider organizations. They typically operate the
service in rural communities where there is no other organization that is willing
to provide the service. However, they do operate the service in 7% of the 200
most populous cities. They are found in mid-sized to larger communities where
there is sufficient revenue to cover most of the costs of the service.

The balance of the publicly operated services are provided by police departments.
These are normally operated as a separate division of the police department. The
EMS personnel are not necessarily police officers.

Other EMS services, including air ambulances, industrial, military, American
Indian serve specific populations. The air ambulances serve regional areas and
supplement the ground ambulance forces. The industrial units typically are
ambulance services dedicated to serving a large industrial complexes, mining
operations or remote site facilities. The American Indian services operate on
Indian reservations and in the villages of the Alaska Natives. The military
provides services to their bases. Each of these dedicated services may serve the
general community as back-up resources, or in the case of geographically remote
locations, may provide all of the services.

Levels of Care Provided by US Prehospital Personnel

All care provided at the emergency scene is provided by para-professional
personnel. There are two generic levels of care: Basic Life Support (BLS) and
Advanced Life Support (ALS). BLS is provided by the Emergency Medical
Technician-Basic (EMT-B). ALS is provided by the Emergency Medical Technician-Intermediate (EMT-I) and the Emergency Medical Technician-Paramedic (EMT-P). The training and licensing/certification of these personnel is controlled by each state. There is no national license. Table 3 shows the 1993 distribution of EMS personnel by level of certification.

<table>
<thead>
<tr>
<th>Certification Level</th>
<th>1993</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMT-Basic</td>
<td>506,000</td>
<td>76.1%</td>
</tr>
<tr>
<td>EMT-Intermediate*</td>
<td>79,400</td>
<td>11.9%</td>
</tr>
<tr>
<td>EMT-Paramedic</td>
<td>79,200</td>
<td>11.9%</td>
</tr>
<tr>
<td>Total</td>
<td>664,600</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

* EMT-Intermediate includes the EMT-Defibrillation level.

From: *EMS Universe*, Emergency Care Information Center, Carlsbad, California, USA

The Emergency Medical Technician-Basic (EMT-B) course was developed in 1969 by the US Department of Transportation and has been the national standard curriculum since. It involves 110 hours of course work, 10 of which is observation in an emergency department. It includes patient assessment, basic airway management, CPR, administration of oxygen, spinal immobilization, splinting, control of external bleeding, occlusion of sucking chest wounds, patient handling to minimize aggravation of illness or injury and transport skills.

The course was completely revised in 1994 to add automatic or semi-automatic defibrillation and endotracheal intubation as optional skills. It permits the EMT-Basic to assist a person suffering angina to take their nitroglycerine. It also permits the EMT-Basic to administer epinephrine for anaphylaxis using pre-loaded auto-injectors.

The EMT-Basic level is most often found in personnel providing non-emergency inter-facility transport, for fire department first response, and as primary EMS responders in rural areas of the country served by volunteers.

Whereas the EMT-Basic training program is virtually the same in each state, the EMT-Intermediate and EMT-Paramedic levels have a lot more variation. The variation is in the number of ALS interventions that each level is permitted to do by their respective state. ALS interventions typically include:

- Oral endotracheal intubation
- Nasal endotracheal intubation
- Needle Cricothyrotomy
- Intravenous lines
- Central lines
- Needle chest decompression
- Advanced Cardiac Life Support (ACLS) includes 3 lead EKG interpretation, defibrillation, synchronized cardioversion, and drug administration
- Administration of emergency medications, including narcotics for pain management
- Some states have added the following as permitted skills:
  - Intraosseous infusion for children
  - 12 lead EKG with or without administration of thrombolytics
  - Transcutaneous cardiac pacing

The **EMT-Paramedic** is the highest level of training. This level was developed in urban areas to "bring the emergency department to the patient." The training programs vary from state to state from a low of 500 hours of classroom and clinical time to as many as 1500 hours. The average is 900 hours. The EMT-Paramedic level personnel is the EMS system standard in all but 3 of the 200 most populous cities in the USA. It is also the standard for many cities as small as 10,000 population.

The **EMT-Intermediate** has evolved to varying degrees in the states. This is the least standardized level of training. There are 40+ variations of this level of personnel. Six states do not recognize this level of training. Typically, the EMT-Intermediate adds the ALS skills for the care of the trauma patient (IV therapy, and use of the esophageal obturator airway or the pharyngeal tracheal lumen airway) and/or the cardiac arrest patient (defibrillation with some basic medications including lidocaine and epinephrine) to the EMT-Basic training.

The EMT-Intermediate levels evolved in the rural parts of the country where volunteers could not be found that were willing to complete the full paramedic training program of 1500+ hours in a distant city. Instead, the skills were taught in modules locally. This provided some of the limited, but crucial ALS skills in areas that would not otherwise have them.

**Medical Supervision**

Since the first paramedics were trained in the late 1960’s, medical supervision of the ALS provider has been the norm. In the early years, the paramedic was required to contact a physician or specially trained nurse at a "base hospital" to get permission to treat the patient. The radio systems also included the ability to transmit the EKG to the hospital. However, as systems evolved, there has been a trend to allow the ALS personnel to practice based on written standing orders and
protocols. The transmission of EKGs has all but disappeared.

The physician medical director is responsible for the medical practice of all of the personnel under his/her supervision. This involves signing the state license applications, signing the medical standing orders and reviewing the medical practice of the personnel via chart reviews and other quality assurance activities. For the most part, this is either a volunteer or part-time paid position held by an emergency department physician. In the survey of 200 most populous cities in 1994, 54.3% had a part-time medical director and the balance relied on a committee of physicians for the medical control function.

**System Characteristics of EMS in the USA**

EMS System designs in the USA are as varied as anyone can imagine. However, there are some characteristics that are common to the best systems, regardless of the organization providing the ambulance service. These include:

*Fire Department First Response*

Most urban communities of the USA have located their fire stations to achieve a 5 minute average response time to fire calls. The stations are staffed with at least one fire apparatus and between 3 and 5 fire fighters. Consequently, they typically have many more locations than the ambulance service and quicker response times. This has led to their use as first responders to life-threatening medical calls.

Responding on fire engines, fire fighters are trained to provide CPR and administer defibrillation with automatic defibrillators. They also provide assistance to ambulance crews after they arrive on the scene. Fire departments also provide heavy rescue and extrication for motor vehicle crashes and specialized rescue situations.

Table 4 shows the incidence of first responder programs among the largest cities in the USA. In some communities, the first response program is provided by other agencies, including the police. Rochester, Minnesota has placed automatic defibrillators in police vehicles to provide an even quicker response to cardiac problems. In 1993, 34% of the agencies reported having defibrillation programs. In 1994, 42.4% of the first-response agencies provide defibrillation on all of the first-response units.

<table>
<thead>
<tr>
<th>Table 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Transporting</strong></td>
</tr>
<tr>
<td><strong>First-response Program</strong></td>
</tr>
</tbody>
</table>
By City Population

<table>
<thead>
<tr>
<th>Population</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000,000+</td>
<td>66.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>500,000 - 1,000,000</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>250,000 - 500,000</td>
<td>90.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>200,000 - 250,000</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>150,000 - 200,000</td>
<td>96.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>100,000 - 150,000</td>
<td>84.9%</td>
<td>15.1%</td>
</tr>
<tr>
<td>Less than 100,000</td>
<td>80.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>All Cities</td>
<td>89.8%</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

Source: 1994 Survey of EMS in the 200 Most Populous Cities in the USA (unpublished data)

**ALS Level Staffing on all Ambulances**

It has become generally accepted that all of the on-duty ambulances of an organization providing EMS transportation should be staffed with at least one ALS trained provider. There are some large urban systems, New York and Boston for example, still use a tiered system of BLS and ALS ambulances, but they generally lose the ability to have all of their assets capable of responding to all types of calls. All system designs and redesigns today recognize that not as many personnel and vehicles are needed if all of the vehicles are capable of responding to any call.

**Priority Dispatch Systems**

Most of the USA has the uniform emergency telephone number of 9-1-1. What happens after the call is answered has a lot more variability. The best systems use a priority dispatch system that uses structured interrogation of the caller to determine the severity of the chief complaint and then assigns response priorities. The priorities determine the resources to be sent to the patient as well as the need to proceed with red lights and siren (RLS). For example, a patient complaining of shortness of breath would receive the closest first responder and the closest ALS ambulance. Both would proceed with RLS. A person complaining of a possible broken wrist would be sent the closest ambulance at normal speeds.

Priority dispatch, pioneered by Dr. Jeff Clawson of Medical Priority Consultants in Salt Lake City, Utah, has several benefits. First, it assigns the most appropriate resources for each chief complaint to minimize over-utilization. Second, it reduces the risk of crashes caused by proceeding RLS through busy streets and intersections. This includes crashes involving the responding emergency vehicles as well as crashes caused by motorists that are distracted by the emergency vehicles and crash into other motor vehicles, the "wake effect." Finally, it
provides a systematic approach to dispatch that can be quantified and measured as part of a quality improvement program.

**Pre-Arrival Medical Instructions**

Pre-Arrival medical instructions are given by the dispatcher/call-taker to the caller. The purpose is to provide the caller with medical interventions that can be immediately taken, such as how to perform CPR. There has been some reticence to implement pre-arrival medical instructions due to the expense and an unfounded fear of liability. Table 5 shows the status of the use of pre-arrival instructions in the major cities.

**Table 5**

% Cities Using Pre-Arrival Instructions by Dispatch Center

<table>
<thead>
<tr>
<th>Population</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000,000+</td>
<td>100.0%</td>
</tr>
<tr>
<td>500,000 - 1,000,000</td>
<td>91.7%</td>
</tr>
<tr>
<td>250,000 - 500,000</td>
<td>96.7%</td>
</tr>
<tr>
<td>200,000 - 250,000</td>
<td>77.8%</td>
</tr>
<tr>
<td>150,000 - 200,000</td>
<td>71.9%</td>
</tr>
<tr>
<td>100,000 - 150,000</td>
<td>69.8%</td>
</tr>
<tr>
<td>Less than 100,000</td>
<td>40.0%</td>
</tr>
<tr>
<td>All Cities</td>
<td>78.2%</td>
</tr>
</tbody>
</table>

Source: 1994 Survey of EMS in the 200 Most Populous Cities in the USA (unpublished data)

**System Status Management**

System Status Management (SSM) is the most widely accepted method for managing ambulance resources in the private and third service government environment. SSM has several components:

**Dynamic Deployment** - Ambulances are geographically deployed based on projected demand by the time of day and day of week by using historic demand data. This model responds to the fact that as populations move from home to work and back, geographic demand patterns vary. Using SSM, ambulances do not respond from fixed stations, but are "posted" to street corners on an hour to hour basis. The "posts" are selected to provide the best response times for the projected demand at that time of day.

**Peak Demand Staffing** - Shift schedules are designed to provide the number of
ambulances needed for the time of day and day of week projected demand. Consequently ambulances typically begin duty every hour from 5:00 a.m. until noon and then the numbers start declining about 5:00 p.m. until midnight. Shift lengths are typically 8, 9, 10, 11, 12 and 24 hours in a large and busy system.

SSM enables the provider to match resources to demand more accurately than using a more traditional model of fixed staffing and fixed stations for all hours of the day and days of the week. Peak demand staffing is not found in most fire departments in the US where a tradition of 24 hour shifts predominates.

**Computer Aided Dispatch Systems**

In order to practically implement the concepts noted above, the EMS system is becoming increasingly reliant on computer aided dispatch (CAD) systems. Modern CAD Systems such as the VisiCAD™ offered by American TriTech in San Diego, California can do the following:

1. Display the caller’s location both in text form and graphically with fully integrated mapping.

2. Provide an interactive caller interrogation protocol to facilitate adherence to the priority dispatch system.

3. Recommend the unit to send to the call based on the priority of the call and the system status plan.

4. Interact with units in a voiceless environment using mobile data terminals and/or alpha-numeric pagers to display dispatch instructions and patient information and transmit unit status information.

5. Accept global positioning system (GPS) data from the ambulances for complete status monitoring.

6. Provide interactive pre-arrival instructions for the call-taker to use with the patient.

7. Provide alarms for monitoring such things as scene time, hospital time and welfare check time for each active unit.

8. Provide an easy to use client-server database for quality improvement programs for both dispatch and ambulance utilization monitoring.

9. Support real-time database queries from mobile data terminals of any database attached to the system, including patient and location history files.

**Ambulance Vehicles**
Through the 60s and early 70s, the typical ambulance was built on the same chassis as an hearse, typically a Cadillac. These vehicles made great transport vehicles known for their smooth ride, however they had little head room and little space for working on the patient. During the mid 70s the federal government did develop a standard ambulance specification to address these concerns.

The result is what is known as the KKK1822 specification that has become the national standard. It identifies minimum standards for space, systems capacity, dimensions, and safety factors. This specification includes 3 types of vehicles: a van cab with a modular box patient compartment; a van chassis with a raised roof; and a truck chassis with a modular box patient compartment.

One of the criticisms the authors have heard from our UK friends is that the American ambulances seem to be quite heavy and overpowered. The weight is explained by the desire to make the patient compartment crush-proof in a roll-over type crash. The high-powered diesel engines are designed to move all of that weight and provide reasonable maneuvering ability.

**Performance Standards**

There are no national performance standards for EMS. The closest are standards adopted by the voluntary Commission on the Accreditation of Ambulance Services. The commission has recommended that in urban areas, all calls prioritized as life-threatening should receive an ALS ambulance in 8 minutes 59 seconds or less. The commission further recommends that each community should establish a reliability factor, i.e. the goal should be achieved for 90% of the calls, or 80%, etc. The reliability factor is what determines the number of resources needed to meet the goal in an urban setting. Thus a community has to decide what it can afford to do. The most typical reliability factor used in the USA is 90%.

This standard was first promulgated by Jack Stout when he was designing the first high-performance EMS systems in the USA. It was based on the early work out of Seattle that indicated that 8 minutes seemed to be a threshold for viable cardiac resuscitation. It was also based on the need to devise a better way of measuring performance reliability other than using the average, which can be skewed by some very low and or very high response times. The standard has been adopted by the American Ambulance Association in their recently published book *Contracting for Emergency Ambulance Services*.

**Accountability**

Performance standards do not mean much unless the provider is being held accountable to meet those standards. In the USA, the only time you really find accountability to meet standards is when the ambulance service is provided under contract to a government agency. The systems with the greatest accountability are
typically part of a Public Utility Model where a governmental purchasing
authority contracts with a private ambulance company to provide all ambulance
service, both emergency and inter-facility transport, in return for a fixed price
contract. The contracting agency is typically a quasi-governmental purchasing
authority that has been established by one or more cities or a county.

System Coordination

A key part of the EMS systems is that they are true systems. There is typically
very good coordination and cooperation among the various public safety agencies
in a community even when the ambulance service is provided by a private
company. Most major communities have established trauma centers at a few
hospitals with surgeons in-house 24 hours per day. When a patient needs to be
taken to the trauma center, there is a pre-planned system to identify the patients
that qualify and to bypass the nearest hospital emergency department and to take
the patient directly to the trauma center. Most urban areas also have a helicopter
air ambulance.

Finally, there is coordination and planning for the mass casualty incident with the
federal government supporting civilian Urban Search and Rescue Teams for
disasters with a lot of physical damage, i.e. earthquakes, building collapses (i.e.
the recent Oklahoma City bombing), and hurricanes. The federal government has
also established Disaster Medical Assistance Teams that use civilian health care
providers to establish temporary hospitals in the event of widespread damage to
the medical infrastructure of an area.

Future of EMS in the USA

Healthcare delivery in the USA is in the midst of the most fundamental shift in
organization and financing since the advent of private health insurance in the
1930s. Under the current system, providers are paid only when they provide
medical services, and then the more individual services they provide the more
they are paid. The system is now evolving to one of managed care, where
individual health care providers are paid a fixed amount to provide services for a
designated population. The less service provided the more money is made. The
theory is that this new system will provide incentives for physicians to do more
preventive medicine and to order only those tests and hospitalizations that the
patient absolutely needs and nothing more.

These changes have not yet had much impact on EMS, but they ultimately will
because the current reimbursement scheme results in many transports to
emergency departments for minor ailments and injuries. However, there have
been discussions within the ambulance industry about the inevitable changes that
are coming. Those discussions have resulted in several innovative ideas about
how the industry can adapt to managed care.
Adapting to Managed Care

The first approach is to expand the use of ALS first response by fire departments. By using fire department ALS trained first responders a system can improve service delivery to the life-threatened patient with better response times. The cost of this service is the additional training and equipment over and above the fire suppression and BLS costs. These new expenses can be reimbursed by the ambulance company. The ambulance company would provide the transport for those patients that need it, but their costs would be reduced because their response time requirements would be relaxed for life threatening calls, which in turn would reduce the number of on-duty ambulance units required.

Another approach looks at value-added services that ambulance companies can provide to the managed care organizations. For example, in the USA, hospital emergency departments have become a source of after-hours primary care. Many minor illnesses, fevers, minor injuries, that could be cared for at home or be seen in the doctor’s office the following day are being treated in the ED. The same thing is true of the use of the 9-1-1 system. It is estimated that between 40 and 60% of all 9-1-1 medical calls could be handled on scene without an ambulance transport.

By expanding the role of the dispatch center to include triaging of calls and giving the caller other appropriate options a reduction in 9-1-1 usage may occur. The options could include providing self-care instructions, arranging an appointment at the closest urgent care clinic, arranging an appointment with the patient’s primary care physician for the next day; sending a primary care-trained paramedic, physicians assistant or nurse practitioner to the house in a mobile medical office to provide on-site care and referral; and sending a paramedic ambulance for evaluation and referral as necessary. Much of the scheduling could be accommodated by the ambulance dispatcher if the major medical clinics provided on-line access to the clinic scheduling calendar systems.

Another area of service is to contract with the managed care organizations to provide telephone referral service. Most managed care organizations ask their members who have questions about their health care to call their primary care physician first and if he is not available to call a central telephone number that has a registered nurse to answer questions and/or authorize a visit to the urgent care clinic. This function fits naturally into the dispatch center of an ambulance company and when integrated with the dispatch function really does assure that the patient receives the most appropriate care.

Finally, the advent of managed care is pushing the consolidation of the industry. Up until just a few years ago, private ambulance companies were typically owned and operated by a sole proprietor. Over the last few years there has been a frenzy of mergers and acquisitions of these small companies by 4 publicly-owned companies (as of this writing two of those companies have announced a merger).
Two of the largest, MedTrans and American Medical Response, each has over 10,000 employees and more than 2,000 ambulances each. The hope of the investors is that these large companies can achieve economies of scale and finance the information technology needed to continue the improvement of efficiency and profitability. Ultimately, managed care should assist in the standardization of the EMS system throughout the country. This will occur as managed care buyers seek to assure that their customers receive the same level of care anywhere in the country.

**Summary**

In spite of a lack of significant national funding, variable support from the states and cities, the people of the USA enjoy a high level of pre-hospital care provided by para-professional personnel. The reorganization of the healthcare system is likely to improve that care even more by bringing EMS into the healthcare system and improving national standards.