

Medical Emergencies

Overview. A man collapses on the street outside his home, and a bystander calls 9-1-1. A team of paramedics on a break between calls a few blocks away is dispatched to the scene for someone in cardiac arrest and is told to drive “Code 3”, with lights and sirens, to the scene.

How does the execution of a medical emergency call take place from the time of the incident to the time of the patient’s transport to the hospital? There are a number of organizing systems in play, working together to coordinate the dispatch call center, the ambulance company, and the individual emergency medical service (EMS) personnel.

What is being organized? The dispatch center receiving the call must manage resources such as call location technology and radio to communicate with the EMS personnel. The questions the dispatcher must ask the caller are also organized resources, structured to take up as little time as possible while still being thorough enough to suit the situation.

The ambulances of an ambulance company are resources organized in posts around a city, and the tools within the ambulance are organized systematically across ambulances in a company to support interactions that are fast and repeatable. Personal Protective Equipment (PPE) is positioned within easy reach for the EMS providers to put on while en route to the scene. Life-saving items such as oxygen tanks, defibrillators, and ventilation devices are situated to allow for easy access to bring to a patient on scene. Items that can only be used by personnel trained in advanced as opposed to basic life support are stored under lock and key further out of reach. These items include medications such as morphine and tools such as IV bags and needles.

The EMTs and paramedics are also managed resources, arranged to be in charge of specific roles. Some of these distributed duties include driving, documenting, and questioning. The questions the EMTs ask the patient or bystanders are organized in a hierarchical manner into a decision tree to determine treatment necessary and type of transport required. The patient is also a resource of the EMS provider, who must be classified based on factors including gender, medical condition, and history in order to provide the most effective possible treatment. Bystanders at the scene are additional resources who need to be managed by the EMS providers in a manner that is appropriate to the situation. Questioning bystanders may fall under the role of one provider, or bystanders trained in basic life support may be further utilized in care under the orders of the EMS team leader.

Figure 1 depicts a general overview of how a 911 call unfolds over time, separated into levels of visibility of the dispatcher, the EMS provider, and the patient. The resources described above increase the granularity of each level of this organization system. The level of the EMS provider is allotted more detail in the “on scene” section of the figure to serve as an example of some of the nodes that make up the decision tree of questioning during patient assessment preceding treatment.

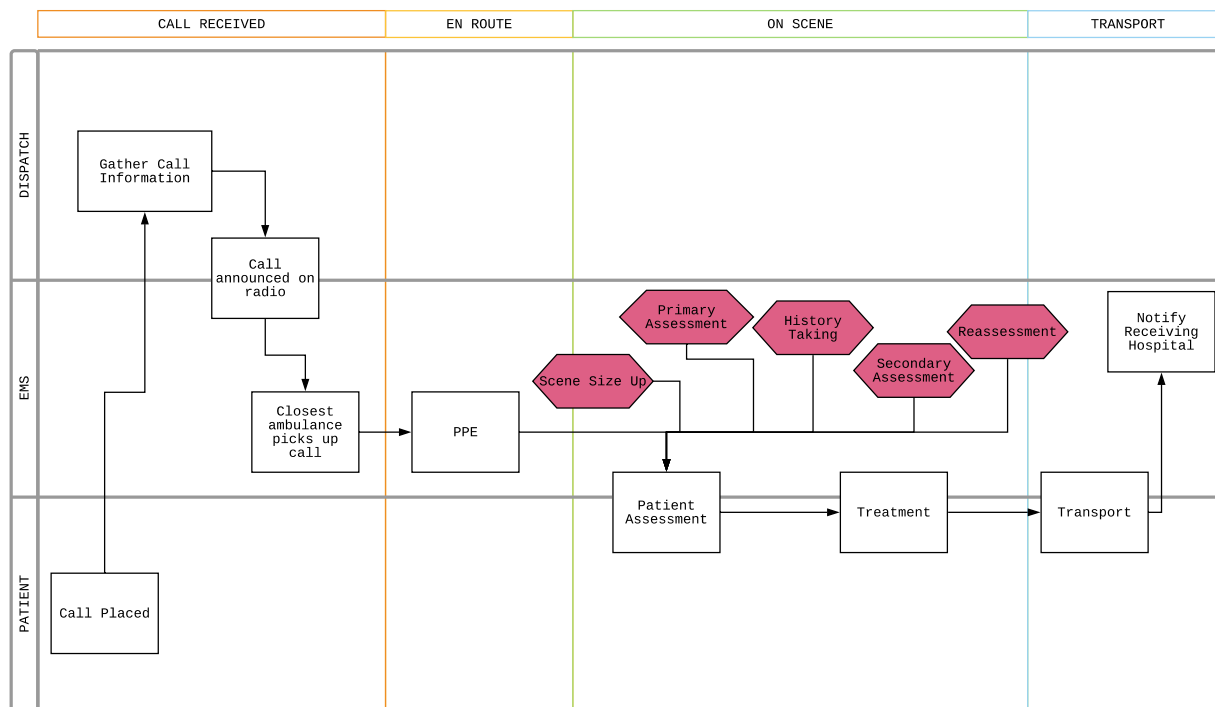


Figure 1 Emergency Medical Transport Overview

Why is it being organized? EMS was not systematically organized until the 1960s, when the dismally disorganized state of emergency medical care in the United States was compared to the regimented tactics used on the battlefield to serve trauma patients during the Vietnam War. It became evident that the high mortality rates due to trauma from motor vehicle accidents in the US could be reduced if emergency medical care were more organized.¹ In 1960, few states had rescuer courses or standards for ambulance maintenance, and standards varied widely across states and counties.²

A highly organized system reduces time to get to the scene of an incident, which is important for patients who are in critical condition. For instance, a 1 minute increase in response time to a patient in cardiac arrest decreases chances of survival by 7-10%.³ Rapid response times also in turn decrease the number of necessary procedures performed at the hospital, reducing costs for the patient and hospital, as well as reducing property damages that result from incidents such as fire. Hospitals and ambulance companies also need to be highly organized in order to avoid preventable injury or death and the legal repercussions that accompany such incidents, as well as to be able to provide evidence to support their case in the event of legal action.

How much is it being organized? The organization system for EMS is constantly being improved upon due to changes in technology and the relatively new induction of systematized emergency medicine in the states. The large scale of the EMS system across the US, in addition to the fact that it is a system in constant use, has resulted in uneven implementation of technological improvements that serve to improve the organization scheme. Heterogeneity exists within the scope of the emergency response system due to discrepancies in state laws and funding insufficiencies.

Improvements that increase the granularity of the system at the level of the dispatcher include enhanced 9-1-1 (E911) and Next Generation 9-1-1 (NG911), which both involve location tracking information about where the call was made.⁴ E911 automatically transmits the caller's number if the call was made on a landline, while NG911 provides information about wireless numbers and allows the caller to text pictures to 911 dispatch. These improved methods are important because a patient may be unable to provide verbal location information due to their injury. They alternatively may provide a location that is a colloquial as opposed to an authoritative name, which could be difficult to find on a map. For example, if someone were to have a heart attack in the outdoor food court located on Durant Avenue in Berkeley, California, a bystander would likely refer to it by the name "Asian Ghetto," since that is the name it is commonly referred to by students at UC Berkeley. Someone unfamiliar with this term could have difficulty locating it on a map, which would increase response time to the scene.

Emergency medical dispatch organizing systems still vary based on placement across the country, but most major U.S. cities use the Medical Priority Dispatch System (MPDS), in which calls are assigned to a medical unit based on the need for a basic or advanced life support team and how fast of a response time is necessary. This information is then assigned a code that is used to deploy the most appropriate EMS providers.⁵ A common vocabulary between the dispatch and ambulances is important to support interoperability between the two systems.

The scope of practice, or the treatments an EMT or paramedic is allowed to legally administer, vary by state and depend upon local legislation. The scope of practice defines the scope of the organization system for which each provider is responsible. Providers trained in advanced techniques have a larger scope of resources and require more extensive organization. While differences exist among states, the requirements for each state are not supposed to fall below the expectations outlined in the National EMS Scope of Practice Model.⁶

When is it being organized? When the patient makes a call to 9-1-1, the call is sent to the closest dispatch center based on either the location of the landline or the closest cell towers to the cell phone from which the call was made. The call is answered by this dispatch center, at which time information such as the location of the emergency, type of emergency, and how long ago the incident occurred is documented. If an ambulance is required, this information is communicated to the EMTs or paramedics via radio.⁷

The EMS crew organizes their plan of action while en route to the scene, at the scene, and during transport of the patient to the hospital. This organization system must be flexible enough to allow for continuous changes in organization, as the information received from dispatch is not always entirely accurate and a patient's condition could quickly deteriorate at any point during the running of a call.

The treatments and systems used to assess the patient must be thoroughly documented while en route to the hospital, and must be verbally and electronically transmitted to the emergency room staff upon arrival.

How or by whom is it being organized? The initial call information is organized by the dispatcher receiving the call. Depending on the state and county, E911 or NG911 methods may be in place to more accurately determine the patient's location. Location tracking information

can also be organized by third parties, such as in OnStar automatic crash reporting. When a driver is in a crash, the location of the car outfitted with this technology is transmitted to OnStar advisors, who can then report the location to 911 dispatch without the involvement of a patient or bystander.⁸

The deployment of ambulances is organized by some ambulance companies through what is now referred to as dynamic deployment, where ambulances are given posts around a city based on time of day and day of the week, which aims to predict response needs in real time. The exact implementation of this system varies based on the company and location.⁹

The EMS providers organize their roles and patient assessment on scene, tailoring them to meet the needs of the specific patient. These resources are organized on a larger scale by the standards laid out at the national and state level, which are based on EMS research.

Other considerations. While the rules in place for EMS personnel at first appear to be set in stone, companies and regulations are continuously being updated to reflect changes in technology or leadership. E911 and NG911 techniques provide improvements in patient location tracking, but issues may arise due to increased paranoia over invasion of privacy. Additionally, the implementation of these practices varies from state to state and among ambulance companies, with some states unable to even report statistics due to lack of resources or legal restrictions.¹⁰

Other confounding factors in this organization scheme include on-scene issues such as cultural considerations that may impact a treatment plan. Patients from some cultures may refuse treatment based on religion or tradition, or patients of a certain gender may only wish to be treated by a caregiver of that same gender. A flexible treatment system is vital to allow for such factors, which are often not made apparent until arrival at the scene.

Often times an ambulance will not be the only service dispatched on a call. The inclusion of firefighters often occurs in critical medical calls, where two partners in an ambulance are not sufficient to provide care for someone in a life-threatening situation. The number of firetrucks may outnumber the available ambulances in a region, so dispatching a fire unit often makes the most sense in terms of resource distribution.¹¹ In such cases, the firefighters, who are all trained as paramedics or EMTs, become additional resources for the team leader of a call to organize and utilize in caring for patients.

The wide variation in standards across the United States makes creating a comprehensive organization scheme for medical emergencies challenging. Considerations such as variations in regulations and funding across states contribute to the flexibility in national standards for emergency medical services. This means that the question of what exactly takes place on the other side of a 911 call does not have a straightforward answer.

Sources

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