

In the more stable patient, a more thorough primary and secondary survey should be performed.

Field Treatment

A. Airway Control

Methods of airway control depend on the EMT's level of skill and certification. Initial steps to provide an airway include positioning the jaw and suctioning secretions (taking care in the trauma victim not to hyperextend the neck). Should this fail to achieve and maintain airway patency, the basic EMT can insert an oral or nasal airway. Ventilation may be assisted by a bag-valve-mask.

EMTs and paramedics may establish alternative airways, depending on local protocol. The Combitube, a dual lumen tube designed to be placed blindly, can be used to ventilate the patient regardless of whether the tube is placed in the esophagus or the trachea. The laryngeal mask airway (LMA) is designed to be placed without laryngoscopy. It has an inflatable cuff that sits over the glottis. This allows for ventilation while minimizing gastric insufflation and aspiration. It is not as secure an airway as the endotracheal tube. An improvement on the original LMA is the LMA-Classic, which allows for an endotracheal tube to be passed through the LMA. Both the Combitube and the LMA have been implemented successfully in the prehospital setting.

Endotracheal intubation is the preferred method of airway control in patients with inadequate ventilation. Typically the success rate for prehospital intubation is greater than 90%. However, two recent papers have questioned the value of intubation in the field. A randomized trial involving pediatric intubation found that patients did as well with bag-valve-mask ventilation as they did with intubation. Another study found that over 25% of adult intubations in the prehospital setting were misplaced. When intubation is performed in the field it is suggested that end-tidal CO₂ detection and an esophageal detector device be used in addition to more conventional means of confirming location. After the tube is confirmed in the correct location, the risk of dislodgement should be minimized by using a commercial endotracheal tube holder and by securing the patient in a cervical collar and to a long spinal board.

B. Emergency Cardiac Care

1. **Cardiopulmonary resuscitation**—The probability of survival for victims of sudden cardiac arrest is inversely related to the elapsed time before an effective cardiac rhythm is reestablished. CPR is a temporizing measure that, when initiated within 4–6 minutes, increases the chances of survival. In most systems, a paramedic unit cannot routinely reach the scene within this period. Many systems provide first responders with

AEDs. AEDs have been successfully deployed with police and fire first responders. In addition, public access defibrillators provide AEDs to the public at busy venues such as sporting arenas and airports.

2. **Defibrillation**—Ventricular fibrillation is the initial rhythm encountered in many victims of sudden death. The sooner defibrillation is performed, the higher the survival rate. AEDs (Laceral Heartstart 2000, others) can recognize ventricular fibrillation (or tachycardia) and deliver a countershock. The rescuer need not be able to recognize dysrhythmias but must be able to recognize cardiac arrest and operate the device. AEDs have enabled nonparamedic first responders to provide rapid defibrillation and have consequently improved survival rates.

3. **Electrocardiography**—In the treatment of acute coronary syndromes, the prehospital 12-lead electrocardiogram (ECG) significantly shortens the time from arrival in the emergency department to administration of thrombolytic therapy ("door to drug time"). Prehospital fibrinolytic therapy has had mixed results. In European trials, where prehospital care is typically provided by physician-staffed ambulances, 6-month and 1-year survival rates have increased. However, trials in the United States with paramedic-staffed units has not shown a significant improvement over 12-lead ECG in the field with hospital-administered fibrinolytics.

C. Invasive Procedures

1. **Venous catheterization**—(See Chapter 6.) The use of intravenous techniques by EMS field personnel is usually limited to cannulation of peripheral veins of the upper extremities. In most EMS systems, the procedure can be initiated under standing order by intermediate or paramedic EMTs. Basic EMTs who have had special training in intravenous techniques and fluid therapy may also initiate intravenous lines. Studies have demonstrated that skilled paramedics in the field are able to start an intravenous line in approximately 3 minutes and achieve a success rate greater than 90%. However, when transport times are short (ie, 10 minutes or less), venous catheterization is usually unnecessary because the volume of fluid infused or the medications administered during such a short period are unlikely to be life saving. Further, in penetrating trauma to the thorax, fluid boluses may be detrimental by disrupting the clotting process. In addition, field placement of intravenous lines may increase the chances of infection. Needlestick injuries, which may occur during venous cannulation under adverse circumstances, such as in the back of a moving ambulance, are an increasing concern. Intravenous needles may be placed by paramedics in the event that vascular access cannot be obtained in the pediatric patient.

2. **Needle thoracostomy**—Chest decompression for suspected tension pneumothorax may occasionally be life saving and is performed by paramedics in some systems. A 14- or 16-gauge catheter-clad needle is inserted into the second intercostal space, along the midclavicular line immediately above the subaxillary rib using sterile technique. The catheter is sealed with a Heimlich valve or a latex glove with the fingertip removed. (The open fingertip of the glove is secured around the catheter, allowing air to escape but preventing its reentry.)

3. **Cricothyrotomy**—(See Chapter 6.) Emergency entry to the airway may be life saving in cases of supraglottic airway obstruction or laryngeal trauma. Cricothyrotomy may be performed by paramedics in some EMS systems, usually after approval by the base physician via radio. Cricothyrotomy may be performed using a surgical, needle, or Seldinger technique. Because the procedure can be unexpectedly difficult, it should be performed as a last resort and only by properly trained personnel.

D. Medications

Medications are a contentious area in the prehospital realm. Because of the lack of clinical trials, it is difficult to state what interventions are of benefit. The emergency physician should know what medications are available to their EMS providers and under what indication they may be used.

1. **Advanced cardiac life support**—Most drugs for advanced cardiac life support are stocked on most ALS ambulances. Consistently, epinephrine, atropine, lidocaine, sodium bicarbonate, and adenosine are stocked. In addition, nitroglycerin, aspirin, and morphine are available for treatment of acute coronary syndromes. Amiodarone often is not used because of the ongoing debate about its effectiveness and because of cost issues. Some systems do not stock diltiazem because patients with a tachydysrhythmia that requires rate control are relatively stable. Fibrinolytics are rarely used because of their cost, the staffing needed to administer and monitor them, and the minimal benefit shown in prehospital use. Other medications such as labetalol, magnesium, procainamide, and calcium chloride are typically stocked at the discretion of the agency's medical director.

2. **Pulmonary**—Albuterol should be available to all ALS EMS agencies. Ipratropium has been shown to be beneficial to patients with moderate to severe asthma and to those with chronic obstructive pulmonary disease. In addition to sublingual nitroglycerin, furosemide is typically stocked for treatment of pulmonary edema.

3. **Other drugs**—Benzodiazepines are typically stocked for treatment of seizures, anxiolysis, and sedation. The use of prehospital benzodiazepines is beneficial to patients presenting with recurrent seizures. Agents stocked include diazepam, lorazepam, and midazolam.

Glucose, in the form of 50% dextrose in water (D₅₀W) and oral glucose solution (occasionally D₁₀W or D₁₀W for pediatric patients), is stocked for treating hypoglycemia.

E. Extrication

Extrication is the process of removing a patient from a condition of entrapment, usually from a motor vehicle. It requires considerable skill and experience. Often, special tools are necessary, such as heavy bolt and metal cutters or large, powered spreading devices (eg, jaws of Life, Hurst Tool). In most EMS systems, when there is a report of a trapped victim, a fire rescue team is dispatched in addition to the EMS unit to clear fire hazards, wash away spilled gasoline, and provide additional heavy equipment and personnel.

As soon as the patient is accessible with minimal risk to emergency workers, the primary survey should be initiated while further efforts to free the patient continue. Once the patient is immobilized in place, emergency resuscitation can begin.

F. Immobilization and Splinting

1. **Immobilization**—Victims of trauma may have injuries to the spine or extremities, which, if manipulated, can lead to spinal cord or limb damage. Upon reaching a trauma victim, the rescue team must stabilize the patient's cervical spine. Manual stabilization is maintained throughout extrication. A cervical collar is applied as soon as practicable. Spine boards are sometimes difficult to maneuver in closed spaces, but alternative devices are available, such as the Kendrick Extrication Device (KED). In a hemodynamically unstable patient, rapid extrication onto a long spine board can be accomplished by multiple rescuers manually supporting the spine without the aid of a KED. Immobilization is not considered complete until the patient is secured to the spine board with straps, the patient's head is secured to the spine board with tape across the forehead and beneath the chin, and a cervical collar and lateral neck rolls or head immobilization device are in place.

If endotracheal control intubation is necessary, the cervical spine should remain immobilized while the procedure is performed. Should vomiting occur, the patient may be logrolled to face sideways while one rescuer maintains cervical spine traction.

2. **Splinting**—(See Chapters 28 and 29.) In general, extremities should be placed in an anatomic position, especially if pulses cannot be felt below a suspected