



CPR/AED for
Professional Rescuers

PARTICIPANT'S HANDBOOK

American Red Cross



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This handbook is part of the American Red Cross CPR/AED for Professional Rescuers program. By itself, it does not constitute complete and comprehensive training. Visit redcross.org to learn more about this program.

The emergency care procedures outlined in the program materials reflect the standard of knowledge and accepted emergency practices in the United States at the time this handbook was published. It is the reader's responsibility to stay informed of changes in emergency care procedures.

The care steps outlined within this handbook are consistent with the 2015 International Liaison Committee on Resuscitation (ILCOR) Consensus on Science and Treatment Recommendations (CoSTR). The treatment recommendations and related training guidelines have been developed by The American National Red Cross Scientific Advisory Council (SAC), a panel of nationally recognized experts in fields that include emergency medicine, emergency medical services (EMS), nursing, occupational health, sports medicine, school and public health, aquatics, emergency preparedness and disaster mobilization.

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INTRODUCTION

The American Red Cross CPR/AED for Professional Rescuers program is designed to train professional-level rescuers to respond to breathing and cardiac emergencies in adults, children and infants until more advanced medical personnel take over. The technical content within this CPR/AED for Professional Rescuers Handbook is consistent with the most current science and treatment recommendations from the International Liaison Committee on Resuscitation (ILCOR) 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations (CoSTR), the 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, and the American Red Cross Scientific Advisory Council (SAC), a panel of nationally recognized experts in fields that include emergency medicine, emergency medical services (EMS), nursing, occupational health, sports medicine, school and public health, aquatics, emergency preparedness and disaster mobilization.

More information on the science of the course content can be found at the following websites:

ilcor.org

redcross.org/take-a-class/scientific-advisory-council

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This handbook is dedicated to the thousands of employees and volunteers of the American Red Cross who contribute their time and talent to supporting and teaching lifesaving skills worldwide and to the thousands of course participants and other readers who have decided to be prepared to take action when an emergency strikes.

Many individuals were involved in the development and revision process in various supportive, technical and creative ways. The American Red Cross CPR/AED for Professional Rescuers Handbook was developed through the dedication of employees and volunteers. Their commitment to excellence made this handbook possible.

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1 The Professional Rescuer

For many professional rescuers, there is a job-related duty to act in an emergency. You may be called on to provide care, and your actions are often critical and may determine whether a seriously injured or ill victim survives.

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5	BLOODBORNE PATHOGENS
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Adults who are awake and alert have a basic right to accept or refuse care.

Consent to treat can be obtained verbally or through a victim gesture. If the victim is a minor, consent must be obtained from a parent or guardian, if available. If a parent or guardian is not present, then consent is implied.

To obtain consent from a victim, follow these steps:

- Identify yourself to the victim (parent or guardian for a minor).
- State your level of training.
- Explain what you observe.
- Explain what you plan to do.
- Ask for permission to provide care.

If a victim is unresponsive, has an altered mental status, or is unable to give

consent verbally or through a gesture, then consent is implied.

While providing care to a victim, you may learn details about the victim that are private and confidential. Do not share this information with anyone except personnel directly associated with the victim's medical care.

Always document care that is provided. By documenting, you establish a written record of the events that took place, the care you provided and the facts you discovered after the incident occurred.

Remember, laws vary from state to state. Table 1-1 highlights some of the common legal considerations.

Table 1-1: Legal Considerations

Duty to Act	The duty to respond to an emergency and provide care. Failure to fulfill these duties could result in legal action.
Standard of Care	Professional Rescuers are expected to meet a minimum standard of care, which may be established in part by their training program and in part by state or local authorities. This standard requires rescuers to: <ul style="list-style-type: none">▪ Communicate proper information and warnings to help prevent injuries.▪ Recognize someone in need of care.▪ Provide emergency care according to their level of training.
Negligence	Failure to follow a reasonable standard of care, thereby causing or contributing to injury or damage.
Refusal of Care	A competent victim's indication that a responder may not provide care. Refusal of care must be honored, even if the victim is seriously injured or ill or desperately needs assistance. A victim can refuse some or all care. If a witness is available, have the witness listen to, and document in writing, any refusal of care.
Abandonment	Discontinuing care once it has begun. You must continue care until someone with equal or more advanced training takes over.
Confidentiality	The principle that information learned while providing care to a victim is private and should not be shared with anyone except personnel directly associated with the victim's medical care.

1-2 BEFORE PROVIDING CARE

While caring for a victim, it's crucial that you protect yourself and others from the transmission of infectious disease.

Throughout this section, you will learn the general procedures for responding to sudden illness or injury, and how to protect yourself and others against the spread of infectious diseases while providing care.

1-3 BLOODBORNE PATHOGENS

Bloodborne pathogens, such as bacteria and viruses, present in blood and other potentially infectious material (OPIM), such as other body fluids, can cause disease in humans. Pathogens are found almost everywhere in our environment. Bacteria can live outside of the body and commonly do not depend on other organisms for life. If a person is infected by bacteria, antibiotics and other medications often are used to treat the infection. Viruses depend on other organisms to live. Once viruses are in the body, they are difficult to kill. This is why prevention is critical. Bloodborne pathogens of primary concern to professional rescuers are the hepatitis B virus, hepatitis C virus and human immunodeficiency virus (HIV) (Table 1-2).

Table 1-2: How Bloodborne Pathogens Are Transmitted

Disease	Signs and Symptoms	Mode of Transmission	Infectious Material
Hepatitis B	Fatigue, abdominal pain, loss of appetite, nausea, vomiting, joint pain, jaundice	Direct and indirect contact	Blood, saliva, vomitus, semen
Hepatitis C	Fatigue, dark urine, abdominal pain, loss of appetite, nausea, jaundice	Direct and indirect contact	Blood, saliva, vomitus, semen
HIV	Symptoms may or may not appear in the early stage; late-contact-stage symptoms may include fever, fatigue, diarrhea, skin rashes, night sweats, loss of appetite, swollen lymph glands, significant weight loss, white spots in the mouth, vaginal discharge (signs of yeast infection) and memory or movement problems	Direct and possibly indirect contact	Blood, saliva, vomitus, semen, vaginal fluid, breast milk

Hepatitis B

Hepatitis B is a liver infection caused by the hepatitis B virus. Hepatitis B may be severe or even fatal; the hepatitis B virus can live in the body for up to six months before symptoms appear. These may include flu-like symptoms such as fatigue, abdominal pain, loss of appetite, nausea, vomiting and joint pain. **Jaundice** (yellowing of the skin and eyes) is a symptom that occurs in the later stage of the disease.

Medications are available to treat chronic hepatitis B infection, but they do not work for everyone. The most effective means of prevention is the hepatitis B vaccine. This vaccine, which is given in a series of three doses,

provides immunity to the disease. Scientific data show that hepatitis B vaccines are safe for adults, children and infants. Currently, no evidence exists indicating that hepatitis B vaccines cause chronic illnesses.

Your employer must make the hepatitis B vaccination series available to you because you could be exposed to the virus at work. The vaccination must be made available after appropriate training has been completed. However, you can choose to decline the vaccination series. If you decide not to be vaccinated, you must sign a form affirming your decision.

Hepatitis C

Hepatitis C is a liver disease caused by the hepatitis C virus. Hepatitis C is the most common chronic bloodborne infection in the United States. The symptoms are similar to those of the hepatitis B infection and include fatigue, abdominal pain, loss of appetite, nausea, vomiting and jaundice. Currently, no

vaccine exists against hepatitis C, and no treatment is available to prevent infection after exposure. Hepatitis C is the leading cause of liver transplants. For these reasons, hepatitis C is considered to be more serious than hepatitis B.

HIV

HIV is the virus that causes AIDS. HIV attacks white blood cells and destroys the body's ability to fight infection. This weakens the body's immune system. The infections that strike people whose immune systems are weakened by HIV are called **opportunistic infections**. Some opportunistic infections include

severe pneumonia, tuberculosis, Kaposi's sarcoma and other unusual cancers.

People infected with HIV initially may not feel or look sick. A blood test, however, can detect the HIV antibody. When an infected person has a significant drop in a certain type of white blood cells or

shows signs of having certain infections or cancers, they may be diagnosed as having AIDS. These infections can cause fever, fatigue, diarrhea, skin rashes, night sweats, loss of appetite, swollen lymph glands and significant weight loss. In the advanced stages, AIDS is a very serious condition. People with AIDS eventually develop life-threatening infections and can die from these infections. Currently, there is no vaccine against HIV.

There are many other illnesses, viruses and infections to which you may be exposed. Keep immunizations current, have regular physical check-ups and be knowledgeable about other pathogens. For more information on the illnesses listed above and other diseases and illnesses of concern, contact the Centers for Disease Control and Prevention (CDC) at 800-342-2437 or go to cdc.gov.

1-4 HOW PATHOGENS SPREAD

Exposures to blood and other potentially infectious materials occur across a wide variety of occupations. Rescuers, healthcare providers, emergency medical services (EMS) personnel, public safety personnel and other workers can be exposed to blood through injuries from needles and other sharp devices, as well as from direct and indirect contact with skin and mucous membranes. For any disease to be spread, including bloodborne diseases, all four of the following conditions must be met:

- A pathogen is present.
- A sufficient quantity of the pathogen is present to cause disease.
- A person is susceptible to the pathogen.
- The pathogen passes through a portal of entry (e.g., eyes, mouth and other mucous membranes; non-intact skin or skin pierced by needlesticks; animal and human bites, cuts, abrasions and other means).

To understand how infections occur, think of these four conditions as pieces

of a puzzle (Figure 1-1). All of the pieces must be in place for the picture to be complete. If any one of these conditions is missing, an infection cannot occur.

At the workplace, bloodborne pathogens, such as hepatitis B virus, hepatitis C virus and HIV, are spread primarily through direct or indirect contact with infected blood or other body fluids. These viruses are not spread by food or water, or by casual contact, such as hugging or shaking hands. The highest risk of transmission while at work is unprotected direct or indirect contact with infected blood.

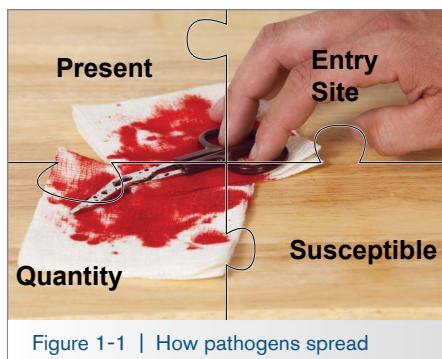


Figure 1-1 | How pathogens spread

Direct Contact

Direct contact transmission occurs when infected blood or other potentially infectious material from one person enters another person's body. For example, direct contact transmission can occur through infected blood splashing in the eye or from directly touching the potentially infectious material of an infected person with a hand that has an open sore (Figure 1-2).



Figure 1-2 | Direct contact

Indirect Contact

Some bloodborne pathogens also can be transmitted by indirect contact (Figure 1-3). **Indirect contact transmission** can occur when a person touches an object that contains the blood or other potentially infectious material of an infected person and that blood or potentially infectious material enters the body through a portal of entry. Such objects include soiled dressings, equipment and work surfaces that have been contaminated with an infected person's potentially infectious material. For example, indirect contact can occur when a person picks up blood-soaked bandages with a bare hand and the pathogens enter through a break in the skin on the hand.



Figure 1-3 | Indirect contact

Droplet and Vector-Borne Transmission

Other pathogens, such as the flu virus, can enter the body through **droplet transmission**. This occurs when a person inhales droplets from an infected person's cough or sneeze (Figure 1-4). **Vector-borne transmission** of diseases occurs

when the body's skin is penetrated by an infectious source, such as an animal or insect bite or sting (Figure 1-5). Examples of diseases spread through vector-borne transmission include malaria and West Nile virus.



Figure 1-4 | Droplet transmission



Figure 1-5 | Vector-borne transmission

Risk of Transmission

Hepatitis B, hepatitis C and HIV share a common mode of transmission—direct or indirect contact with infected blood or other potentially infectious material—but they differ in the risk of transmission. Individuals who have received the hepatitis B vaccine and have developed immunity to the virus have virtually no risk for infection by the hepatitis B virus. For an unvaccinated person, the risk for

infection from hepatitis B-infected blood from a needlestick or cut exposure can be as high as 30 percent, depending on several factors. In contrast, the risk for infection from hepatitis C-infected blood after a needlestick or cut exposure is about 2 percent, whereas the risk of infection from HIV-infected blood after a needlestick or cut exposure is far less than 1 percent.

1-5 PREVENTING THE SPREAD OF BLOODBORNE PATHOGENS

OSHA Regulations

The federal Occupational Safety and Health Administration (OSHA) issued regulations about on-the-job exposure to bloodborne pathogens. OSHA determined that employees are at risk when they are exposed to blood or other potentially infectious material. Employers should follow OSHA requirements regarding job-related exposure to bloodborne pathogens, which are designed to protect you from disease transmission. This includes reducing or removing hazards from the workplace that may place employees in contact with infectious materials, including how to safely dispose of needles.

These regulations and guidelines apply to employees who may come into contact with blood or other body substances that could cause an infection. These regulations apply to professional rescuers because they are expected to provide emergency care as part of their job. OSHA has revised the regulations to include the requirements of the federal Needlestick Safety and Prevention Act. These guidelines can help professional rescuers and their employers meet the OSHA bloodborne pathogens standard to prevent transmission of serious diseases. For more information about the OSHA Bloodborne Pathogens Standard 29 CFR 1910.1030, go to osha.gov.

EMPLOYERS' RESPONSIBILITIES

OSHA's regulations on bloodborne pathogens require employers to protect employees in specific ways, including:

- Identifying positions or tasks covered by the standard.
- Creating an exposure control plan to minimize the possibility of exposure and making the plan easily accessible to employees.
- Developing and putting into action a written schedule for cleaning and decontaminating the workplace.
- Creating a system for easy identification of soiled material and its proper disposal.
- Developing a system of annual training for all covered employees.
- Offering the opportunity for employees to get the hepatitis B vaccination at no cost to them.
- Establishing clear procedures to follow for reporting an exposure.
- Creating a system of recordkeeping.
- Soliciting input from nonmanagerial employees in workplaces where there is potential exposure to injuries from contaminated sharps regarding the identification, evaluation and selection of effective engineering and work practice controls.
- Recording the appropriate information about needlestick injuries in the sharps injury log, including:
 - Type and brand of device involved in the incident.
 - Location of the incident.
 - Description of the incident.
- Maintaining a sharps injury log in a way that protects the privacy of employees.
- Ensuring confidentiality of employees' medical records and exposure incidents.

Exposure Control Plan

OSHA regulations require employers to have an exposure control plan. This is a written program outlining the protective measures that employers will take to eliminate or minimize employee exposure incidents and how to respond should an exposure occur. The plan also should detail how the employer will meet other OSHA requirements,

such as recordkeeping. The exposure control plan guidelines should be made available to rescuers and other personnel who may come into contact with blood or other potentially infectious materials and should specifically explain what they need to do to prevent the spread of infectious diseases.

Standard Precautions

Standard precautions are safety measures that combine universal precautions and **body substance isolation (BSI) precautions** and are based on the assumption that all body fluids may be infectious. Standard precautions can be applied through the use of:

- Personal protective equipment (PPE).
- Good hand hygiene.
- Engineering controls.
- Work practice controls.
- Proper equipment cleaning.
- Spill clean-up procedures.

Personal Protective Equipment

PPE appropriate for your job duties should be available at your workplace and should be identified in the exposure control plan. PPE includes all specialized clothing, equipment and supplies that prevent direct contact with infected materials (Figure 1-6). These include, but are not limited to, breathing barriers, nitrile latex-free disposable (single-use) gloves, gowns, masks, shields and protective eyewear (Table 1-3) on the following page.



Figure 1-6 | Personal protective equipment includes breathing barriers and gloves.

Table 1-3: Recommended Personal Protective Equipment Against Hepatitis B, Hepatitis C and HIV Transmission in Prehospital Settings

Task or Activity	Disposable Gloves	Gown	Mask	Protective Eyewear
Bleeding control with spurting blood	Yes	Yes	Yes	Yes
Bleeding control with minimal bleeding	Yes	No	No	No
Emergency childbirth	Yes	Yes	Yes	Yes
Oral/nasal suctioning; manually clearing airway	Yes	No	Yes	Yes
Handling and cleaning contaminated equipment and clothing	Yes	No, unless soiling is likely	No	No

Guidelines for using PPE to prevent infection include the following:

- Avoid contact with blood and other potentially infectious material.
- Use CPR breathing barriers when giving ventilations to a victim.
- Wear nitrile, latex-free disposable gloves when providing care.
 - Do not use gloves that are discolored, torn or punctured.
 - Do not clean or reuse disposable gloves.
 - Cover any cuts, scrapes or sores, and remove jewelry, including rings, before wearing gloves, if possible.
 - Avoid handling items such as pens, combs or radios when wearing soiled gloves.
 - Change gloves before providing care to a different victim.
- In addition to gloves, wear protective coverings, such as a mask, eyewear and a gown, when there is a likelihood of coming into contact with blood or other body fluids that may splash.
- Remove gloves without contacting the soiled part of the gloves, and dispose of them in a proper container. See the skill sheet located at the end of the chapter for steps to remove gloves properly.

Hand Hygiene

Hand washing is the most effective measure to prevent the spread of infection. Wash your hands before and after providing care, if possible, so that they do not pass pathogens to or from the victim. Wash your hands frequently, such as before and after eating, after using the restroom and every time you have provided care. By washing hands often, you can wash away disease-causing germs that have been picked up from other people, animals or contaminated surfaces.

To wash your hands correctly, follow these steps:

1. Wet your hands with warm water.
2. Apply soap to your hands.
3. Rub your hands vigorously for at least 15 seconds, covering all surfaces of your hands and fingers, giving added attention to fingernails and jewelry.
4. Rinse your hands with warm, running water.
5. Dry your hands thoroughly with a disposable towel.
6. Turn off the faucet using the disposable towel.

Alcohol-based hand sanitizers and lotions allow you to cleanse your hands when soap and water are not readily available and your hands are not visibly soiled. If your hands contain visible matter, use soap and water instead. When using an alcohol-based hand sanitizer:

- Apply the product to the palm of one hand.
- Rub your hands together.
- Rub the product over all surfaces of your hands, including nail areas and between fingers, until the product dries.

- Wash your hands with anti-bacterial hand soap and water as soon as they are available.

In addition to washing your hands frequently, it is a good idea to keep your fingernails shorter than one-fourth inch and avoid wearing artificial nails.

Engineering Controls and Work Practice Controls

Engineering controls are objects used in the workplace that isolate or remove a hazard, thereby reducing the risk of exposure. Examples of engineering controls include:

- Biohazard bags and labels.
- PPE.
- Sharps disposal containers (Figure 1-7).
- Safer medical devices, such as sharps with engineered injury protections or needleless systems.



Figure 1-7 | Sharps disposal container

Work practice controls are methods of working that reduce the likelihood of an exposure incident by changing the way a task is carried out. Examples of work practice controls include:

- Dispose of sharp items (e.g., broken glass) in puncture-resistant, leak-proof, labeled containers.
- Avoid splashing, spraying and splattering droplets of blood or other potentially infectious materials when performing all procedures.
- Remove and dispose of soiled protective clothing as soon as possible.
- Clean and disinfect all equipment and work surfaces soiled by blood or other body fluids.
- Use good hand hygiene.

- Do not eat, drink, smoke, apply cosmetics or lip balm, handle contact lenses or touch the eyes, mouth or nose when in an area where exposure to infectious materials is possible.
- Isolate contaminated areas so other employees or people do not walk through and become exposed.

Be aware of any areas, equipment or containers that may be contaminated. Biohazard warning labels are required on any container holding contaminated materials, such as used gloves, bandages or trauma dressings. Signs should be posted at entrances to work areas where infectious materials may be present.

Equipment Cleaning and Spill Clean-Up

After providing care, you should clean and disinfect the equipment and surfaces. In some cases, you will need to properly dispose of certain equipment. Handle all soiled equipment, supplies and other materials with care until they

are properly cleaned and disinfected (Figure 1-8). Place all used disposable items in labeled containers. Place all soiled clothing in marked plastic bags for disposal or washing (Figure 1-9). Commercial blood spill kits are available.



Figure 1-8 | Clean and disinfect all equipment after use.



Figure 1-9 | Use a biohazard bag to dispose of soiled materials.

Take the following steps to clean up spills:

- Wear disposable gloves and other PPE, such as eye protection.
- Clean up spills immediately, or as soon as possible, after the spill occurs.
- Rope off or place cones around the area so others do not accidentally get exposed by walking through the spill.
- If the spill is mixed with sharp objects, such as broken glass and needles, do not pick these up with your hands. Use tongs, a broom and dustpan or two pieces of cardboard.
- Flood the area with a fresh disinfectant solution of approximately 1½ cups of liquid chlorine bleach to 1 gallon of water (1 part bleach per 9 parts water, or about a 10 percent solution), and allow it to stand for at least 10 minutes.
- Use appropriate material to absorb the solution, and dispose of it in a labeled biohazard container.
- Scrub soiled boots, leather shoes and other leather goods, such as belts, with soap, a brush and hot water. If you wear a uniform to work, wash and dry it according to the manufacturer's instructions.

1-6 IF YOU ARE EXPOSED

If you are exposed to a bloodborne pathogen, immediately take the following steps:

- Clean the contaminated area thoroughly with soap and water. Wash needlestick injuries, cuts and exposed skin.
- If you are splashed with blood or other potentially infectious material around your mouth or nose, flush the area with water.
- If your eyes are involved, irrigate them with clean water, saline or sterile irrigants for 20 minutes.

Following any exposure incident:

- Report the exposure incident to the appropriate supervisor immediately and to the EMS personnel when they take over the care of the victim. This step can be critical to receive appropriate post-exposure treatment.
- Document what happened. Include the time and date of the exposure, as well as the circumstances of the exposure, any actions taken after the exposure and any other information required by your employer.
- Seek immediate follow-up care as identified in your facility exposure control plan.

1-7 TAKING ACTION

When called to an emergency, you must keep in mind a few critical steps for your safety and the safety of your team, in addition to the safety of the victim and bystanders. Use appropriate first aid equipment and supplies, and follow these general procedures:

1. Size-up the scene and form an initial impression.
 - Only move the victim only if necessary for the victim's safety.
2. Perform a primary assessment.
 - Obtain consent if the victim is responsive.
3. Summon EMS, if needed and not already done.
4. Provide care according to the conditions found.

Size Up the Scene

When you size-up the scene, your goal is to determine if the scene is safe for you, other responders, EMS personnel, the victim(s) and any bystanders. You should:

- Use your senses to check for hazards that could present a danger to you or the victim, such as unusual odors that would indicate a gas leak or fire, sights that would indicate anything out of the ordinary or sounds, such as an explosion.
- Use appropriate PPE.
- Determine the number of injured or ill victims.

- Determine the nature of the illness or what caused the injury. Look for clues to what may have caused the emergency and how the victim became ill or injured.
- Form an initial impression that may indicate a life-threatening emergency, including unresponsiveness or severe bleeding.
- Determine what additional resources may be needed.

If the scene appears to be unsafe, move to a safe distance, notify additional members of the safety team and wait for their arrival.

To form an initial impression, look for signs that may indicate a life-threatening emergency:

- Does the victim look sick?
- Is the victim awake and moving?

Signs that may indicate a life-threatening emergency might consist of:

- Unresponsiveness.
- Abnormal skin color.
- Severe life-threatening bleeding.

If you see severe life-threatening bleeding, use any available resources to control the bleeding, including a tourniquet or hemostatic dressing, if one is available and you are trained.

Moving a Victim

Move an injured victim only when:

- You are faced with immediate danger.
- You need to get to other victims who have more serious injuries or illnesses.
- It is necessary to provide appropriate care (e.g., moving a

victim to the top or bottom of steps to perform CPR).

If you must leave a scene to ensure your personal safety, you must make all attempts to move the victim to safety as well.

EMERGENCY MOVES

Your safety is of utmost importance. Lifting and moving a victim requires physical strength and a high level of fitness. If you improperly lift a victim, you can permanently injure yourself or further injure the victim.

When moving a victim, consider the victim's height and weight, your physical strength, obstacles such as stairs and narrow passages, the distance the victim needs to be moved, the availability of others to assist, the victim's condition and the availability of transport aids.

To improve your chances of successfully moving a victim without injuring yourself or the victim:

- Lift with your legs, not your back. Keep your legs shoulder-width apart, head up, back straight and shoulders square.
- Avoid twisting or bending anyone who has a possible head, neck or spinal injury.
- Do not move a victim who is too large for you to move comfortably.
- Walk forward, when possible, taking small steps, and look where you are going.

There are several ways to move a victim. Non-emergency moves include:

- **Walking assist.** Either one or two responders can use the walking assist for a responsive person who simply needs assistance to walk to safety.
- **Two-person seat carry.** The two-person seat carry requires a second responder. This carry can be used for any person who is responsive and not seriously injured.

Emergency moves include:

- **Clothes drag.** The clothes drag can be used to move a responsive or unresponsive person suspected of having a head, neck or spinal injury. This move helps to keep the person's head, neck and back stabilized.
- **Pack-strap carry.** The pack-strap carry can be used with responsive and unresponsive people. Using this carry with an unresponsive person requires a second responder to help position the injured or ill person on your back.

Perform a Primary Assessment

Following the scene size-up, including forming an initial impression, conduct a primary assessment to determine if the victim has any life-threatening conditions and, if so, summon EMS personnel if a call has not already been made. The primary assessment includes checking the victim for responsiveness, breathing and a pulse.

Check the Victim for Responsiveness

A person who can speak is responsive, but may not be alert. Remember, if a person is responsive and alert, you must obtain consent before providing care. Document any refusal of care by the victim on an incident or rescue report. If a witness is available, have them listen to, and document in writing, any refusal of care.

If an adult or child appears to be unresponsive, shout, “Are you okay?” Use the person’s name if you know it. If the victim does not respond, tap the victim on the shoulder and again shout, “Are you okay?” in a shout-tap-shout sequence. If an infant appears to be unresponsive, follow the same shout-tap-shout sequence, but tap the infant’s foot to see if they respond instead of the shoulder. A response may be subtle, such as some slight movement or momentary eye opening that occurs when you speak to the victim or apply a stimulus, such as a tap to the shoulder.

Use the mnemonic AVPU to help you determine the victim’s level of consciousness:

- A** - **Alert**—fully awake, but may still be confused
- V** - **Verbal**—responds to verbal stimuli
- P** - **Painful**—responds to painful stimuli
- U** - **Unresponsive**—does not respond

If the victim is not awake, alert and oriented or does not respond, call EMS if you have not already done so.

Summon EMS Personnel

If you are unsure of the victim's condition or notice that the condition is worsening, summon EMS personnel. As a general rule, summon EMS personnel if victims experience any of the following conditions:

- Unresponsive or an altered level of consciousness (LOC), such as drowsiness or confusion
- Breathing problems (difficulty breathing or no breathing)
- Water inhalation after being recovered from under water
- Chest pain, discomfort or pressure lasting more than a few minutes, that goes away and comes back or that radiates to the shoulder, arm, neck, jaw, stomach or back
- Persistent abdominal pain or pressure
- No pulse
- Severe life-threatening bleeding
- Vomiting blood or passing blood
- Severe (critical) burns
- Suspected poisoning
- Seizures in the water
- Seizures on land, unless the person is known to have periodic seizures; if not, summon EMS personnel for a seizure on land if:
 - This is the person's first seizure.
 - The seizure lasts more than 5 minutes.
 - The person has repeated seizures with no sign of gaining lucidity.
 - The person appears to be injured.
 - The cause of the seizure is unknown.
 - The person is pregnant.
 - The person is known to have diabetes.
 - The person fails to regain consciousness after the seizure.
- Suspected or obvious injuries to the head, neck or spine
- Stroke
- Painful, swollen, deformed areas (suspected broken bone), or an open fracture above the hands or feet
- Victim's condition is unclear or worsening

Open the Airway and Check for Breathing and Pulse

If the victim does not respond, open the victim's airway and quickly check for breathing and a pulse for at least 5 seconds, but not more than 10 seconds (Figure 1-10). Perform these tasks simultaneously. If a victim is able to speak, the airway is functional, and they are breathing. However, even if a victim can speak, you must continue to assess breathing, because breathing status, rate and quality can change suddenly.

Opening the Airway

When a victim is unresponsive, the tongue relaxes and can block the flow of air through the airway, especially if the victim is lying on their back. To check for breathing and give ventilations, you must manually tilt the head or thrust the jaw to move the tongue away from the back

of the throat. The method used to open the airway depends on the number of rescuers responding, the position of the rescuer to the victim and whether you suspect the victim has an injury to the head, neck or spine. You can open the airway from a position either to the side of the victim or the above the victim's head, using the following techniques:

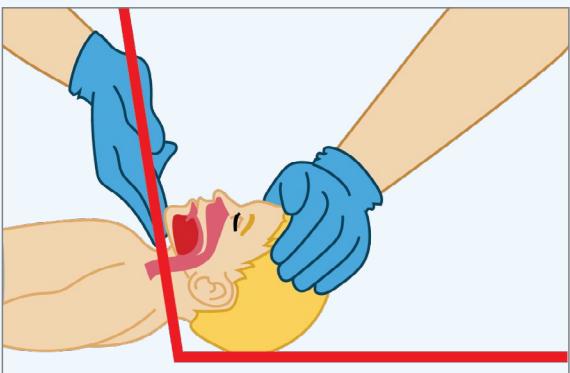
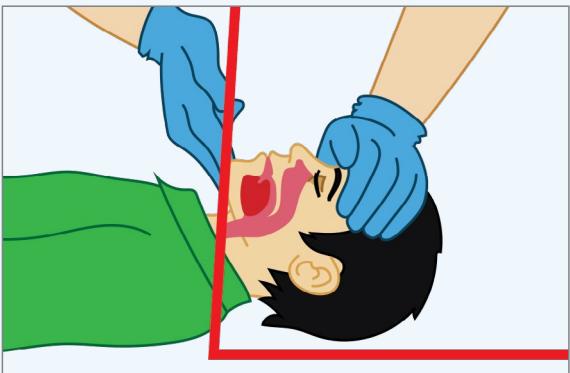
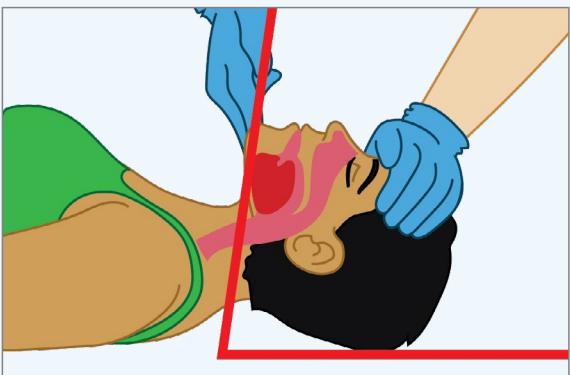
- From the victim's side: Use the head-tilt/chin-lift.
- From above the victim's head: Tilt the head back using the jaw-thrust maneuver.
 - When the victim is suspected of having an injury to the head, neck or spine, use the jaw-thrust maneuver (without head extension) method.

For a child, tilt the head slightly past the neutral position, but not as far as you would for an adult. For an infant, tilt the head to the neutral position (Table 1-4).



Figure 1-10 | When performing a primary assessment, open the victim's airway and check for breathing and a pulse simultaneously for at least 5 seconds, but no more than 10 seconds.

Table 1-4: Head Positions for Giving Ventilations to an Adult, a Child and an Infant



Checking for Breathing

To check for breathing, position your ear over the mouth and nose so that you can hear and feel air as it escapes while you look for the chest to rise and fall. Normal, effective breathing is regular, quiet and effortless. Isolated or infrequent gasping in the absence of other breathing in an unresponsive person may be agonal breaths, which can occur even after the heart has stopped beating. Be aware that this is not normal breathing. **Agonal breaths** are a sign of cardiac arrest. In this situation, care for the victim as though they are not breathing at all.

Checking for a Pulse

With every heartbeat, a wave of blood moves through the blood vessels. This creates a beat called the pulse. You can feel it with your fingertips in the arteries near the skin. Sometimes the pulse may be difficult to find, since it may be slow or weak. If you do not find a pulse within 10 seconds, do not waste any more time attempting to find one. Assume that there is no pulse, and begin care immediately.

To check for a pulse:

- For an adult or child, feel for a carotid pulse by placing two fingers in the middle of the victim's throat; then slide your fingers into the groove of the neck, on the side that is closest to you. Press in lightly; pressing too hard can compress the artery.
- For an infant, feel for the brachial pulse on the inside of the upper arm between the infant's elbow and shoulder. Press in lightly; pressing too hard can compress the artery.

Give 2 Ventilations if Appropriate

- For an unresponsive person who is not breathing and does not have a pulse, it is necessary to immediately begin CPR with chest compressions. However, in certain situations, such as drowning, giving ventilations before beginning CPR is important.
- If you find a victim who is unresponsive and not breathing and has no pulse as a result of drowning, you should give the victim 2 ventilations before starting compressions. Each one should be a quality ventilation that makes the victim's chest clearly rise. If these ventilations do not make the victim's chest clearly rise, re-tilt and attempt another ventilation.
- However, if the victim is not breathing, does not have a pulse and was not in the water, you should assume that the problem is a cardiac emergency. In this case, begin CPR with chest compressions.

Using a Resuscitation Mask to Give Ventilations

You should use a resuscitation mask when giving ventilations (Figure 1-11). To ensure that you are giving adequate ventilations, the mask must be properly placed and sealed over the victim's mouth and nose. Each ventilation should last about 1 second and make the victim's chest begin to rise. Be careful not to overventilate by blowing too long or too forcefully. Overventilation can cause gastric distention—air in the stomach—which results in vomiting. It can also increase the pressure in the chest, making CPR ineffective.

To use a resuscitation mask to give ventilations:

- Position yourself at the victim's head, either on the victim's side or above the head.
- Position the mask over the victim's mouth and nose, using both hands to hold the mask in place to create an airtight seal.
- If you are on the victim's side, tilt the victim's head back while lifting the chin. If you are behind the victim's head, tilt the head back and lift the jaw. For a victim with a suspected head, neck or spinal injury, use the jaw-thrust (without head extension) maneuver.
- Blow into the one-way valve, ensuring that you can see the chest rise. Each ventilation should last about 1 second, with a brief pause between breaths to let the exhaled breath escape.

Recovery Positions

If a victim is unresponsive but breathing and you do not suspect a head, neck or spinal injury, place the victim in a side-lying recovery position. If you suspect a head, neck or spinal injury, leave the victim in a face-up position unless you are unable to maintain an open airway because of fluids or vomit or if you are alone and have to leave the victim (e.g., to call for help); in these cases, a side-lying recovery position will help to keep the airway open and clear.



Figure 1-11 | Use a resuscitation mask when giving ventilations.

CALL FIRST OR CARE FIRST?

If you are alone when responding to someone who is ill, you must decide whether to Call First or Care First.

If you are ALONE:

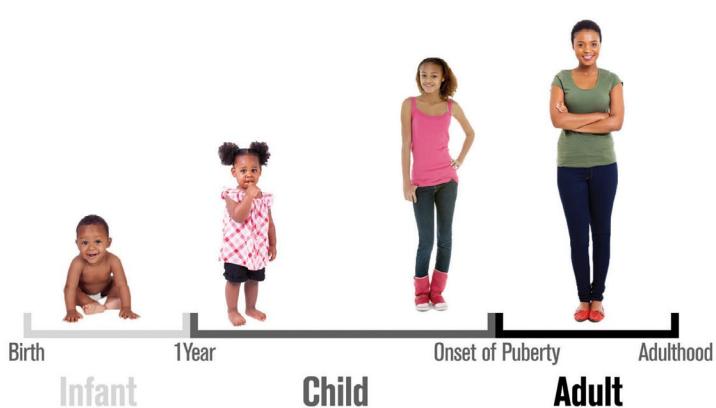
- **Call First** (call 9-1-1 or the designated emergency number before providing care) for:
 - Any adult or child about 12 years of age or older who is unresponsive and not suspected of drowning.
 - A child or an infant whom you witnessed suddenly collapse.
 - An unresponsive child or infant known to have heart problems.
- **Care First** (provide 2 minutes of care, and then call 9-1-1 or the designated emergency number) for:
 - An unresponsive child (younger than about age 12) whom you did not see collapse.
 - Any victim suspected of drowning.

Call First situations are likely to be cardiac emergencies in which time is a critical factor. In **Care First** situations, the conditions often are related to breathing emergencies.

WHEN IS A CHILD A CHILD?

In most instances, determining whether to treat a child as a child or as an adult has been based on age. Typically, an adult is defined as someone about the age of 12 (adolescent) or older; someone between the ages of 1 and 12 has been considered to be a child for CPR care; and an infant is someone

younger than 1 year of age. However, for the purposes of this course, a child is defined as the age of 1 to the onset of puberty, as evidenced by breast development in girls and underarm hair development in boys. An infant is considered under the age of 1 year.



Provide Care According to the Conditions Found

Provide care according to the conditions found during the primary assessment. Always treat life-threatening situations first. Other responders should assist by retrieving equipment and summoning EMS personnel, or in the actual delivery of care, such as giving two-rescuer CPR and using an AED. Care should be continued until EMS personnel take over, if needed.

1-8 WRAP-UP

As a professional rescuer, you are an important link in the EMS system and have a duty to act and to meet professional standards. One of these standards is taking appropriate precautions to protect yourself and others against the transmission of infectious diseases. You also should be familiar with and always follow the general procedures for responding to injury or sudden illness. These procedures include sizing up the scene, performing an initial assessment and summoning EMS personnel by calling 9-1-1 or the designated emergency number after caring for any life-threatening injuries.

BENCHMARKS FOR PROFESSIONAL RESCUERS

Professional Rescuers should:

- Be familiar with and have the ability to operate facility-specific rescue equipment including resuscitation masks and bag-valve-mask (BVM) resuscitators.
- Expect to be equipped with and ready to use:
 - Personal protective equipment.
 - Resuscitation equipment, including resuscitation masks, BVMs and oxygen equipment.
- Obtain consent, identifying themselves as trained responders.
- Conduct a primary assessment for timely determination of a victim's level of consciousness, breathing and pulse.



REMOVING DISPOSABLE GLOVES

Removing Disposable Gloves

Note: To remove gloves without spreading germs, never touch your bare skin with the outside of either glove.

1

Pinch the glove.

- Pinch the palm side of one glove on the outside near your wrist.
- Pull the glove toward your fingertips, turning it inside out as you pull it off your hand.



2

Slip two fingers under the glove.

- Hold the removed glove in the palm of your gloved hand.
- Carefully slip two fingers under the glove at the wrist of the remaining gloved hand.



3

Pull the glove off.

- Pull the glove toward your fingertips, turning it inside out as you pull it off your hand.
- The other glove is now contained inside the first glove.



4

Dispose of gloves and wash hands.

- Dispose of gloves and any other PPE in a proper biohazard container.
- Wash your hands thoroughly with soap and running water, if available. Otherwise, rub hands thoroughly with an alcohol-based sanitizer if hands are not visibly soiled.





USING A RESUSCITATION MASK

Head-Tilt/Chin-Lift

Note: Always select the appropriately sized mask for the victim.

- 1** Kneel to the side of the victim's head.
- 2** Position the mask.
 - Place the mask over the mouth and nose of the victim starting from the bridge of the nose
 - Place the bottom of the mask below the mouth to the chin (the mask should not extend past the chin).



- 3** Seal the mask.
 - Place the thumb and fingers of one hand around the top of the mask. Your remaining fingers can rest on the side of the victim's face.
 - Place the thumb of your other hand (the hand closest to the victim's chest) on the bottom of the mask and slide your first two fingers onto the bony part of the victim's chin.
 - Press downward on the mask with your top hand and the thumb of your lower hand to seal the top and bottom of the mask.



- 4** Tilt the victim's head back and lift the chin to open the airway.
- 5** Blow into the mask.
 - Each ventilation should last about **1** second and make the chest clearly rise. The chest should fall before the next ventilation is given.



USING A RESUSCITATION MASK

Jaw-Thrust (With Head Extension) Maneuver

1 Kneel above the victim's head.

2 Position the mask.

- Place the mask over the mouth and nose of the victim starting from the bridge of the nose.
- Place the bottom of the mask below the mouth to the chin (the mask should not extend past the chin).



3 Seal the mask.

- Place your thumbs and index fingers along each side of the resuscitation mask to create a "C."
- Slide your third, fourth, and fifth fingers into position to create an "E" on both sides of the victim's jawbone.
- Hold the mask in place while you tilt the head back and lift the jaw into the mask.

4 Blow into the mask.

- Each ventilation should last about 1 second and make the chest clearly rise. The chest should fall before the next ventilation is given.



USING A RESUSCITATION MASK

Jaw-Thrust (Without Head Extension) Maneuver

Note: Always select the appropriately sized mask for the victim.

- 1** Kneel above the victim's head.
- 2** Position the mask.
 - Place the mask over the mouth and nose of the victim starting from the bridge of the nose.
 - Place the bottom of the mask below the mouth to the chin (the mask should not extend past the chin).
- 3** Seal the mask.
 - Place your thumbs and index fingers along each side of the resuscitation mask to create a "C."
 - Slide your third, fourth and fifth fingers into position to create an "E" on both sides of the victim's jawbone.
 - Without moving or tilting the head back, lift the lower jaw up with your fingers along the jawbone to seal the mask to the face.
- 4** Blow into the mask.
 - Each ventilation should last about **1** second and make the chest clearly rise. The chest should fall before the next ventilation is given.





MOVING A VICTIM—EMERGENCY MOVES

Pack-Strap Carry

Note: Do not use these non-emergency moves for a victim suspected of having a head, neck or spinal injury.

- 1** Have the victim stand or have a second rescuer support the victim in a standing position.
- 2** Position yourself with your back to the victim. Keep your back straight and knees bent so that your shoulders fit into the victim's armpits.
- 3** Cross the victim's arms in front of you and grasp the victim's wrists.
- 4** Lean forward slightly and pull the victim up and onto your back.
- 5** Stand up and walk to safety.



Clothes Drag

Note: The clothes drag is an appropriate emergency move for a responsive or unresponsive victim suspected of having a head, neck or spinal injury.

- 1** Position the victim on their back.
- 2** Kneel behind the victim's head and gather the victim's clothing behind his neck.
- 3** Pull the victim to safety, cradling the victim's head with their clothes and your hands.





MOVING A VICTIM—NON-EMERGENCY MOVES

Walking Assist

Note: Do not use these non-emergency moves for a victim suspected of having a head, neck or spinal injury.

- 1 Stand at one side of the victim, place the victim's arm across your shoulders and hold it in place with one hand.



- 2 Support the victim with your other hand around the victim's waist.



- 3 Walk the victim to safety.

Note: Either one or two rescuers can use this method to move a victim who needs assistance walking.

Two-Person Seat Carry

- 1 Put one arm under the victim's thighs and the other across the victim's back and under the victim's arms. Have a second responder do the same.



- 2 Interlock your arms with those of a second rescuer under the victim's legs and across the victim's back.

- 3 Have the victim place one arm over each rescuer's shoulder.

- 4 Lift the victim in the "seat" formed by the rescuers' arms and carry the victim to safety.



PRIMARY ASSESSMENT—ADULT, CHILD AND INFANT

Primary Assessment—Adult, Child and Infant

Note: Summon additional resources and get an AED on the scene as soon as possible.

1

Size up the scene while forming an initial impression:

- Use your senses to check for hazards that could present a danger to you or the victim.
- Use appropriate PPE.
- Determine the number of injured or ill victims.
- Determine what caused the injury or the nature of the illness. Look for clues to what may have caused the emergency and how the victim became ill or injured.
- Form an initial impression that may indicate a life-threatening emergency, including responsiveness or severe bleeding.
- Does the victim look sick? Are they awake and moving?
- Determine what additional resources may be needed.

Note: If you see severe life-threatening bleeding, use any available resources to control the bleeding including a tourniquet if one is available and you are trained.

2

Check for responsiveness.

- Shout, “Are you okay?” (use the person’s name if you know it) then tap the victim on the shoulder and shout, “Are you okay?” again in a shout-tap-shout sequence.
 - For an infant, tap the foot.





PRIMARY ASSESSMENT—ADULT, CHILD AND INFANT

Primary Assessment—Adult, Child and Infant *continued*

- 3** If no response, summon EMS personnel, if you have not already done so.
- If the victim is face-down, roll the victim onto their back while supporting the head, neck and back.



- 4** Perform a primary assessment, open the airway and simultaneously check for breathing and a pulse for at least 5 seconds, but no more than 10 seconds.
- To open the airway:
 - From the side, use the head-tilt/chin-lift technique.
 - From above the victim's head, use the jaw-thrust (with head extension) maneuver.
 - If a head, neck or spinal injury is suspected, use the jaw-thrust (without head extension) maneuver.
 - Look, listen and feel for breathing and pulse simultaneously.
 - For an adult or child, feel for a carotid pulse by placing two fingers in the middle of the victim's throat; then slide your fingers into the groove of the neck, on the side that is closest to you. Press lightly.
 - For an infant, feel for the brachial pulse on the inside of the upper arm between the infant's elbow and shoulder. Press lightly.





PRIMARY ASSESSMENT—ADULT, CHILD AND INFANT

Primary Assessment—Adult, Child and Infant *continued*

5

Give two ventilations **ONLY IF** the victim is not breathing as the result of a drowning.

- If the chest does not clearly rise when attempting the first 2 ventilations, re-tilt the head and try to give another ventilation.
- If after the second attempt the chest clearly rises, give 1 more ventilation so there are 2 successful ventilations.
- If after the second attempt, the chest does not clearly rise, immediately begin CPR.

6

Provide appropriate care.

- If the victim is not breathing but has a pulse, give ventilations.
 - **Adult:** Give 1 ventilation about every **5-6** seconds.
 - **Child and Infant:** Give 1 ventilation about every **3** seconds.
- If the victim is not breathing and has no pulse, begin CPR starting with compressions.
- If unresponsive but breathing and you do not suspect a head, neck or spinal injury, place the victim in a side-lying recovery position. To place the victim in a recovery position:
 - Raise the victim's arm that is closest to you.
 - Roll the victim toward you so that their head rests on their extended arm.
 - Bend the victim's knees to stabilize their body.



2 Breathing Emergencies

In a breathing emergency, a person's breathing becomes impaired, causing a potentially life-threatening situation. When air cannot travel freely and easily into the lungs, it greatly reduces the body's oxygen supply or may cut off the oxygen supply entirely. This lack of oxygen can eventually stop the heart (cardiac arrest) and prevent blood from reaching the brain and other vital organs in as little as 3 minutes. Brain cell damage or death begins to occur within 4 to 6 minutes.

As a professional rescuer, you may be called upon at any time to respond to a breathing emergency; therefore, it is important for you to know how to recognize and care for these emergencies.

41	RECOGNIZING AND CARING FOR BREATHING EMERGENCIES
46	GIVING VENTILATIONS
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61	EMERGENCY OXYGEN
64	OXYGEN DELIVERY DEVICES
67	SUCTIONING
68	WRAP-UP

2-1 RECOGNIZING AND CARING FOR BREATHING EMERGENCIES

If a victim suffers a breathing emergency and is deprived of adequate oxygen, hypoxia will result. **Hypoxia** is a condition in which insufficient oxygen reaches the cells. Hypoxia may result from an obstructed airway, shock, inadequate breathing, drowning, strangulation, choking, suffocation, cardiac arrest, head trauma, carbon monoxide poisoning or anaphylactic shock.

Signs and symptoms of hypoxia can include an increased heart rate, **cyanosis** (a condition that develops when tissues do not get enough oxygen and turn bluish, particularly in the lips and nail beds), changes in the level of consciousness (LOC), restlessness and chest pain.

There are two types of breathing (also referred to as respiratory) emergencies: **respiratory distress**, a condition in which breathing becomes difficult, and **respiratory arrest**, a condition in which breathing stops. Respiratory distress can lead to **respiratory failure**, which occurs when the respiratory system is

beginning to shut down, which in turn can lead to respiratory arrest.

Breathing problems can be identified by watching and listening to a victim's breathing and by asking the victim how they feel (Figure 2-1) if they are awake and alert. Because oxygen is vital to life, always ensure that the victim has an open airway and is breathing. Without an open airway, a victim cannot breathe and will die. A victim who can speak, cry or cough forcefully is responsive, has an open airway, is breathing and has a pulse.



Figure 2-1 | Watch and listen for breathing problems in a responsive victim. Ask the victim how they feel.

Respiratory Distress

A victim who is having difficulty breathing is experiencing respiratory distress.

Causes of Respiratory Distress

Respiratory distress can be caused by:

- A partially obstructed airway
- Illness
- Chronic conditions, such as asthma, emphysema and congestive heart failure
- Electrocution, including lightning strikes

Causes of Respiratory Distress, *continued*

- Heart attack
- Injury to the head, chest, lungs or abdomen
- Allergic reactions
- Drug overdose
- Poisoning
- Emotional distress
- Anaphylactic shock

Signs and Symptoms of Respiratory Distress

Signs and symptoms of respiratory distress include:

- Slow or rapid breathing
- Unusually deep or shallow breathing
- Shortness of breath or noisy breathing
- Dizziness, drowsiness or light-headedness
- Changes in LOC
- Increased heart rate

- Chest pain or discomfort
- Skin that is flushed, pale, ashen or bluish
- Unusually moist or cool skin
- Gasping for breath
- Wheezing, gurgling or high-pitched noises
- Inability to speak in full sentences
- Tingling in the hands, feet or lips
- Feelings of apprehension or fear

Caring for Respiratory Distress

You do not need to know the exact cause of respiratory distress to provide initial care. When you find a victim experiencing difficulty breathing:

- Maintain an open airway.
- Summon emergency medical services (EMS) personnel.
- Help the victim to rest in a comfortable position that makes breathing easier, such as sitting and leaning slightly forward.
- Reassure and comfort the victim.

- Assist the victim with any prescribed medication.
- Keep the victim from getting chilled or overheated.
- Administer emergency oxygen and monitor oxygen saturation, if available and you are trained and authorized to do so.

ASTHMA

Asthma is an ongoing illness in which the airways swell. An asthma attack happens when an asthma trigger, such as dust or exercise, affects the airways, causing them to suddenly swell and narrow. This makes breathing difficult, which can be frightening.

ASTHMA, CONTINUED

Recognizing an Asthma Attack

You can often tell when a person is having an asthma attack by the hoarse whistling sound made when inhaling and/or exhaling. This sound, known as **wheezing**, occurs because the small airways have narrowed or become obstructed.

Signs and symptoms of an asthma attack include:

- Coughing or wheezing
- Coughing that occurs after exercise, crying or laughing
- Difficulty breathing
- Shortness of breath
- Rapid, shallow breathing
- Sweating
- Tightness in the chest
- Inability to talk without stopping frequently for a breath or speaking in one- to three-word sentences
- Bent posture with shoulders elevated and lips pursed to make breathing easier
- Feelings of fear or confusion

Caring for an Asthma Attack

When someone is having trouble breathing, it is a life-threatening emergency. Assist the person with any prescribed quick-relief medication, such as an inhaler, if requested and if permitted by state or local regulations. To care for a victim of an asthma attack, follow these guidelines:

- Get the medication to the victim as soon as possible, and call 9-1-1 or the designated emergency number if

breathing does not improve after 5 to 15 minutes or if it worsens.

- A metered-dose inhaler (MDI) is the most common way to deliver medication to a person having a sudden asthma attack. Different companies produce different styles of MDIs, but they all work in basically the same way.
- Use only the medication prescribed for the person and only if the person is having a severe (acute) asthma attack. Some inhalers contain long-acting preventive medication that should not be used in an emergency.
- Ensure that the prescription is in the person's name and is a quick-relief medication prescribed for acute attacks. Ensure that the expiration date of the medication has not passed. Read and follow any instructions printed on the inhaler before administering the medication to the victim.

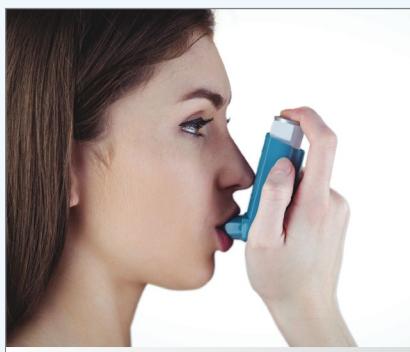


Figure 2-2 | Assist a victim with using an asthma inhaler if local protocols allow.

ASTHMA, CONTINUED

Once delivered, the medication can work quickly but may take as long as 5 to 15 minutes to reach full effectiveness.

To assist a person with asthma with a rescue or quick-relief inhaler, obtain consent and then follow these general guidelines, if local protocols allow (Figure 2-2):

1. Help the person sit up and rest in a position comfortable for breathing.
2. If the person has a prescription for asthma medication, help them take it.
3. Shake the inhaler, and then remove the cover from the mouthpiece. Position the spacer, if the person uses one.

4. Have the person breathe out fully through the mouth, and then place the lips tightly around the inhaler mouthpiece.
5. Have the person inhale deeply and slowly as the person (or you, if the person is unable) depresses the inhaler canister to release the medication, which can then be inhaled into the lungs.
6. Have the person hold their breath for a count of 10. If using a spacer, have the person take 5 to 6 deep breaths with the spacer still in the mouth, without holding the breath.
7. Monitor the person's condition.
8. If breathing does not improve after 5 to 15 minutes, or if it worsens, call 9-1-1.

Respiratory Arrest

A victim who has stopped breathing but has a pulse is in respiratory arrest.

Causes of Respiratory Arrest

Respiratory arrest may develop from respiratory distress, respiratory failure or other causes, including:

- Drowning
- Obstructed airway (choking)
- Injury to the head, chest, lungs or abdomen
- Illness, such as pneumonia
- Respiratory conditions, such as emphysema or asthma
- Congestive heart failure

- Heart attack
- Coronary heart disease (such as angina)
- Allergic reactions (food or insect stings)
- Electrocution, including lightning strikes
- Shock
- Poisoning
- Drug overdose
- Emotional distress

Caring for Respiratory Arrest

Although respiratory arrest may have many causes, you do not need to know the exact cause to provide care. Begin by following the general procedures for injury or sudden illness on land.

To determine if someone is breathing, see if the victim's chest clearly rises and falls (Figure 2-3). Listen for escaping air, and feel for air against the side of your face when simultaneously checking for breathing and a pulse during the primary assessment. You usually can observe the chest rising and falling.

Normal, effective breathing is regular, quiet and effortless. The normal breathing rate for an adult is between 12 and 20 breaths per minute; however, some people breathe slightly slower or faster. In an unresponsive person, you may detect isolated or infrequent gasping in the absence of normal breathing. These are called agonal

breaths. Agonal breathing is isolated or infrequent gasping that occurs in the absence of normal breathing in an unresponsive victim. These breaths can occur after the heart has stopped beating and are considered a sign of cardiac arrest. Agonal breaths are not normal breathing. If the victim is demonstrating agonal breaths, you need to begin CPR.



Figure 2-3 | Check breathing by watching if the victim's chest clearly rises and falls.

Drowning Victims

Anyone who experiences respiratory impairment from submersion in water is a drowning victim. Drowning may or may not result in death. Victims who have been pulled from the water and are not breathing are in immediate need of ventilations. In general, if the victim is rescued quickly enough, giving ventilations may resuscitate the victim. Without oxygen, a victim's heart will stop and death will result. Your objective is

to get the victim's mouth and nose out of the water, open the airway and give ventilations as quickly as possible.

Always ensure that victims who have been involved in a drowning incident are taken to the hospital, even if you think the danger has passed. Complications can develop as long as 72 hours after the incident and may be fatal.

OPIOID OVERDOSE

With a growing epidemic of opioid (commonly heroin, oxycodone, Fentanyl and Percoset™) overdoses in the United States, local and state departments of health have increased access to the medication naloxone (Figure 2-4), which can counteract the effects of an opioid overdose, including respiratory arrest. Naloxone (also referred to by its trade name Narcan™) has few side effects and can be administered intranasally (through the nose). Trained responders should administer the drug

when the victim is in respiratory arrest and an opioid overdose is suspected. Responders should follow local medical protocols and regulations to determine the dosing and timing of naloxone administration.



Figure 2-4: Naloxone

2-2 GIVING VENTILATIONS

If the victim is not breathing but has a definitive pulse, the victim is in respiratory arrest. To care for a victim experiencing respiratory arrest, you must give ventilations. Giving ventilations is a technique to supply oxygen to a victim who is in respiratory arrest. Give 1 ventilation every 5 to 6 seconds for an adult, with each ventilation lasting about 1 second and making the chest rise. Give 1 ventilation about every 3 seconds for a child or infant.

When giving ventilations, it is critical to avoid over-ventilating a victim by giving ventilations at a rate and volume greater than recommended; that is, more than 1 ventilation every 5 to 6 seconds, or for longer than 1 second each.

When giving ventilations to a victim:

- Maintain an open airway by keeping the head tilted back in the proper position.

In addition to causing gastric distension (air in the stomach) and possible vomiting, over-ventilation can lead to increased pressure in the chest and a subsequent decrease in the effectiveness of CPR.

- Seal the mask over the victim's mouth and nose.
- Give ventilations (1 ventilation every 5 to 6 seconds for an adult and 1 ventilation every 3 seconds for a child or infant) for about 2 minutes, and then reassess for breathing and a pulse.
- If the victim has a pulse but is not breathing, continue giving ventilations.

When giving ventilations, if the chest does not rise after the first breath, retilt the victim's head to open the airway,

seal the resuscitation mask and attempt a second ventilation. If the ventilation is not successful, move to compressions and check the airway for an obstruction before attempting subsequent ventilations. If an obstruction is found, remove it and attempt ventilations. However, never perform a blind finger sweep.

Continue giving ventilations until:

- The victim begins to breathe on their own.

CPR Breathing Barriers

CPR breathing barriers create a barrier between your mouth and the victim's mouth and nose. This barrier can help prevent contact with a victim's blood, vomitus and saliva, and from breathing the air that the victim exhales when giving ventilations or performing CPR. CPR breathing barriers include resuscitation masks and bag-valve-mask (BVM) resuscitators. Professional rescuers should carry a resuscitation mask at all times while on duty.

Resuscitation Masks

A resuscitation mask allows you to breathe air (with or without emergency oxygen) into a victim without making mouth-to-mouth contact (Figure 2-5, A-B).

Resuscitation masks have several benefits. They help to get air quickly to the victim through both the mouth and nose; create a seal over the victim's mouth and nose; can be connected to emergency oxygen, if equipped with an oxygen inlet; and protect against potential disease transmission.

A resuscitation mask should:

- Be easy to assemble and use.
- Be made of transparent, pliable material that allows you to make a tight seal over the victim's mouth and nose.

- Another trained rescuer takes over.
- More advanced medical personnel take over.
- You are too exhausted to continue.
- The victim has no pulse or an airway obstruction, in which case you should begin CPR and use an AED if one is available and ready to use.
- The scene becomes unsafe.

For more details, see Table 2-2.

- Have a one-way valve for releasing exhaled air.
- Have a standard 15- or 22-mm coupling assembly (the size of the opening for the one-way valve).
- Have an inlet for delivering emergency oxygen, if facility protocols include administering emergency oxygen.
- Perform well under different environmental conditions, such as in water or under extreme temperatures.

When using a resuscitation mask, make sure to use one that matches the size of the victim. For example, use an adult resuscitation mask for an adult victim and an infant resuscitation mask for an infant. Also, ensure that you position and seal the mask properly before blowing into the mask.



Figure 2-5A | Resuscitation mask



Figure 2-5B | Pediatric resuscitation mask



Figure 2-6 | BVMs come in a variety of sizes for use with adults, children and infants.

Bag-Valve-Mask Resuscitators

A BVM resuscitator is a handheld device used to administer a higher concentration of oxygen than a pocket mask. BVMs are operated by two responders in a multiple-responder situation. A BVM has three parts: a bag, a valve and a mask. By placing the mask over the victim's mouth and nose and squeezing the bag, you open the one-way valve, forcing air into the victim's lungs. When you release the bag, the valve closes and air from the surrounding environment refills the bag. Because it is necessary to maintain a tight seal on the mask, two rescuers should operate a BVM (one rescuer positions and seals the mask while the second rescuer squeezes the bag). BVMs have several advantages, in that they:

- Increase oxygen levels in the blood by using the air in the surrounding environment instead of the air exhaled by a rescuer.
- Can be connected to emergency oxygen.
- Are more effective for giving ventilations than a resuscitation mask when used correctly by two rescuers.
- Protect against disease transmission and inhalation hazards if the victim has been exposed to a hazardous gas.
- May be used with advanced airway adjuncts.

BVMs come in various sizes to fit adult, children and infants (Figure 2-6); you should use the appropriately sized BVM for the size of the victim. Using an adult BVM on an infant has the potential to cause harm and should **not** be used unless a pediatric BVM is unavailable and more advanced medical personnel advise you to do so.

ANAPHYLAXIS

Anaphylactic shock, also known as **anaphylaxis**, is a severe allergic reaction that can cause difficulty breathing, as air passages swell and restrict airflow in and out of the victim's lungs and airways. Anaphylaxis can also cause other responses, such as a combination of shock, swelling and skin reactions. In susceptible people, triggers can include insect bites or stings, certain foods (like peanuts, tree nuts, shellfish, milk, eggs, soy and wheat), animal dander, plant pollen, certain medications (like penicillin and sulfa drugs), latex and chemicals.

Anaphylactic shock is a life-threatening condition and requires immediate care. A person who is experiencing anaphylaxis may develop one or more of the signs and symptoms within seconds or minutes of coming into contact with the allergen. Anyone at risk should wear a medical identification tag, bracelet or necklace and have an epinephrine auto-injector readily available.

Recognizing Anaphylaxis

Some possible signs and symptoms of anaphylaxis include:

- Trouble breathing
- Swelling of the face, neck, tongue or lips
- A feeling of tightness in the chest or throat
- Skin reactions (such as hives, itchiness or flushing)
- Stomach cramps, nausea, vomiting or diarrhea
- Dizziness
- Loss of consciousness
- Signs and symptoms of shock (such as excessive thirst; skin that feels cool or moist and looks pale or bluish; an altered level of consciousness and a rapid, weak heartbeat)

To determine if a person is experiencing anaphylaxis, look at the situation as well as the person's signs and symptoms (Table 2-1).

Table 2-1: Recognizing Anaphylaxis

Situation	Look For:
You do not know if the person has been exposed to an allergen.	<ul style="list-style-type: none">▪ Any skin reaction (such as hives, itchiness or flushing), OR▪ Swelling of the face, neck, tongue or lips <p>PLUS</p> <ul style="list-style-type: none">▪ Trouble breathing, OR▪ Signs and symptoms of shock
You think the person may have been exposed to an allergen.	Any TWO of the following: <ul style="list-style-type: none">▪ Any skin reaction▪ Swelling of the face, neck, tongue or lips▪ Trouble breathing▪ Signs and symptoms of shock▪ Nausea, vomiting, cramping or diarrhea
You know that the person has been exposed to an allergen.	<ul style="list-style-type: none">▪ Trouble breathing, OR▪ Signs and symptoms of shock

ANAPHYLAXIS, CONTINUED

Caring for Anaphylaxis

If you suspect that someone is experiencing anaphylaxis, you should immediately:

- Have someone summon EMS personnel.
- Offer to help the person administer their medication, if the person carries any (e.g., epinephrine), and if local protocols allow. (Epinephrine is a form of adrenaline medication prescribed to treat the symptoms of severe allergic reactions.)
- Help the person administer the medication, and then summon EMS personnel, if you are alone.
- Make sure the person is sitting in a comfortable position while you wait for help to arrive, or have the person lie down if they are showing signs of shock.

- Assist with the administration of a second dose of epinephrine in 5 to 10 minutes if signs and symptoms persist and EMS has not arrived on scene.

Epinephrine

Epinephrine is a drug that slows or stops the effects of anaphylaxis. If a person is known to have an allergy that could lead to anaphylaxis, they may carry an epinephrine auto-injector (a syringe system, available by prescription only, that contains a single dose of epinephrine). Devices are available in different doses because the dose of epinephrine is based on weight (0.15 milligrams for children weighing between 33 and 66 pounds, and 0.3 milligrams for children and adults weighing more than 66 pounds). Many healthcare providers advise that people with a known history

ANAPHYLAXIS, CONTINUED

of anaphylaxis carry an anaphylaxis kit containing at least two doses of epinephrine (two auto-injectors) with them at all times. This is because more than one dose may be needed to stop the anaphylactic reaction. Have the person administer a second dose only if emergency responders are delayed and the person is still having signs and symptoms of anaphylaxis 5 to 10 minutes after administering the first dose.

It is important to act fast when a person is having an anaphylactic reaction because difficulty breathing and shock are both life-threatening conditions. If the person is unable to self-administer the medication, you may need to help. You may assist a person with using an epinephrine auto-injector when the person has a previous diagnosis of anaphylaxis and has been prescribed an epinephrine auto-injector, the person is having signs and symptoms of anaphylaxis, the person requests your help using an auto-injector and your state laws permit giving assistance. Where state and local laws allow, some organizations (such as schools) keep a stock epinephrine auto-injector for designated staff members who have received the proper training to use in an anaphylaxis emergency. If you are using a stock epinephrine auto-injector, follow local protocol, which may include verifying that the person is showing signs and symptoms of anaphylaxis, ensuring that the person has been prescribed epinephrine in the past and making sure to use a device

containing the correct dose based on the person's weight.

Different brands of epinephrine auto-injectors are available, but all work in a similar fashion (and some have audio prompts to guide the user). The device is activated by pushing it against the mid-outer thigh. Once activated, the device injects the epinephrine into the thigh muscle. The device must be held in place for the recommended amount of time (5 to 10 seconds, depending on the device) to deliver the medication. Some medication may still remain in the auto-injector even after the injection is complete. After removing the auto-injector, massage the injection site for several seconds (or have the person massage the injection site). Handle the used device carefully to prevent accidental needlestick injuries. Place the device in a rigid container, and then give the container to EMS personnel for proper disposal.

To assist with administering epinephrine via an Epi-PenTM:

1. Check the label on the auto-injector. If the medication is visible, check to make sure the medication is clear, not cloudy.
 - If the medication is expired or cloudy, do not use it.
2. Determine whether the person has already given themselves a dose of the medication. If the person has, help them administer a second dose only if EMS personnel are delayed and the person is still having signs and symptoms of anaphylaxis 5 to 10 minutes after administering the first dose.

ANAPHYLAXIS, CONTINUED

3. Locate the outer-middle of one thigh to use as the injection site (Figure 2-7).
 - Make sure there is nothing in the way, such as seams or items in a pocket.
4. Grasp the auto-injector firmly in one fist and pull off the safety cap with your other hand.
5. Hold the orange tip (needle end) against the person's outer thigh so that the auto-injector is at a 90-degree angle to the thigh.
6. Quickly and firmly push the tip straight into the outer thigh. You may hear and feel a click.
7. Hold the auto-injector firmly in place for 10 seconds, then remove it from the thigh and massage the injection site with a gloved hand for several seconds or have the victim massage the thigh if gloves are not immediately available (Figure 2-8).
8. Check the person's condition and watch to see how they respond to the medication.
 - If the person is still having signs and symptoms 5 to 10 minutes after administering the first dose and EMS personnel have not arrived, help the person to administer a second dose.
9. Place the used auto-injector in its plastic carrying case or another hard plastic container with the tip facing down. Give it to EMS personnel when they arrive.

Check state and local regulations regarding use of prescription and over-the-counter medications.

Antihistamines

The person's healthcare provider may recommend that the person carry an antihistamine in their anaphylaxis kit, in addition to epinephrine. An antihistamine is a medication that counteracts the effects of histamine, a chemical released by the body during an allergic reaction.

Antihistamines are supplied as pills, capsules or liquids and are taken by mouth. The person should take the antihistamine according to the medication label and the healthcare provider's instructions.



Figure 2-7 | Press the tip straight into the outer thigh.



Figure 2-8 | Massage the injection site with a gloved hand.

Giving Ventilations—Special Considerations

Frothing

A white or pinkish froth or foam may be coming out of the mouth and/or nose of victims of a drowning. This froth results from a mix of mucous, air and water during respiration. If you see froth, open the airway and begin giving ventilations. If an unresponsive victim's chest does not clearly rise after you give a ventilation, re-tilt the head and then reattempt another ventilation. If the ventilation still does not make the chest clearly rise, assume that the airway is blocked and begin CPR, beginning with chest compressions.

Vomiting

When you give ventilations, the victim may vomit. Many victims who have been submerged vomit because water has entered the stomach or air has been forced accidentally into the stomach during ventilations. If this occurs, quickly turn the victim onto their side to keep the vomit from blocking the airway and entering the lungs (Figure 2-9). Support the head and neck, and turn the body as a unit. After vomiting stops, clear the victim's airway by wiping out the victim's mouth using a finger sweep and suction device, if one is available and you are trained to use it, and then turn the victim onto their back and continue with ventilations.



Figure 2-9 | If vomiting occurs, turn the victim onto their side to keep the vomit from entering the airway.

You can use a finger sweep to clear the airway of an unresponsive victim when the blockage is visible, but when available, you should use a manual suction device to suction the airway clear. **Suctioning** is the process of removing foreign matter from the upper airway by means of a suction device.

When using a manual suction device:

- Remove the protective cap from the tip of the suction catheter.
- Measure and check the suction tip to prevent inserting the suction tip too deeply.
- Suction for no more than 15 seconds at a time for an adult, 10 seconds for a child and 5 seconds for an infant.
- Apply suction as you withdraw the catheter from the mouth.

Gastric Distention

When giving ventilations, give just enough air to make the victim's chest rise. The chest should fall before you give the next ventilation. If you over-ventilate the victim, air may enter the stomach, causing gastric distention. The victim then will likely vomit, which can obstruct the airway and complicate resuscitation efforts.

Suspected Head, Neck or Spinal Injury

If you suspect that an unresponsive victim has a head, neck or spinal injury, always take care of the airway and breathing first. Open the airway by using the jaw-thrust (without head extension) maneuver to check for breathing or to give ventilations (Figure 2-10). If the

jaw-thrust (without head extension) maneuver does not open the airway, use the head-tilt/chin-lift technique. See Chapter 11 for more information.

If the victim vomits, quickly roll the victim (the entire body, not just the head) onto their side to prevent aspiration or airway obstruction. After vomiting stops, remove vomit from the victim's mouth using a finger sweep or suction device, if necessary, and turn the victim onto their back and continue with ventilations.

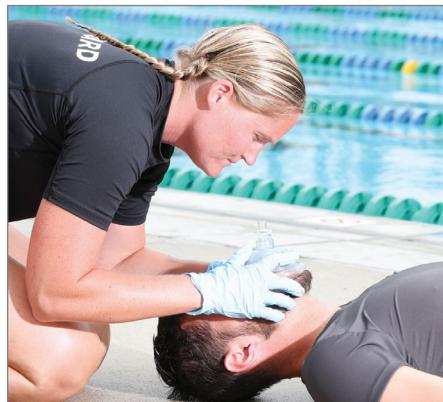


Figure 2-10 | Jaw-thrust (without head extension) maneuver

- Open the airway past a neutral position, using the head-tilt/chin-lift technique.
- Pinch the nose shut, and make a complete seal over the victim's mouth with your mouth.
- Give ventilations by blowing into the victim's mouth. Ventilations should be given one at a time. Take a break between breaths by breaking the seal slightly between ventilations and then taking a breath before re-sealing over the mouth.

With mouth-to-mouth ventilations, the victim receives a concentration of oxygen of approximately 16 percent compared to the oxygen concentration of ambient air of approximately 20 to 21 percent. Giving individual ventilations can help maintain this oxygen concentration level. However, if you do not break the seal and take a breath between ventilations, the second ventilation will contain a decreased oxygen concentration.

Dentures

If the victim is wearing dentures, leave them in place unless they become loose and block the airway. Dentures help to support the victim's mouth and cheeks, making it easier to seal the mask when giving ventilations.

Mouth-to-Mouth Ventilations

While on duty as a professional rescuer, you are expected to have professional equipment either in your hip pack or readily available. However, if you are in a situation off the job in which you do not have a resuscitation mask or BVM available and you need to provide mouth-to-mouth ventilations:

Mask-to-Stoma Ventilations

Some victims may breathe through a stoma—an opening in the neck as a result of surgery. If so, keep the airway in a neutral position as you look, listen and feel for breathing with your ear over the stoma. To give ventilations, make an airtight seal with a round pediatric resuscitation mask around the stoma or tracheostomy tube and blow into the mask.

Table 2-2: Giving Ventilations—Adult, Child and Infant

Adult	<ul style="list-style-type: none">▪ Give 1 ventilation every 5 to 6 seconds.▪ Each ventilation should last about 1 second and make the chest clearly rise.▪ The chest should fall before you give the next ventilation.
Child and Infant	<ul style="list-style-type: none">▪ Give 1 ventilation every 3 seconds.▪ Each ventilation should last about 1 second and make the chest clearly rise.▪ The chest should fall before you give the next ventilation.
When giving ventilations to care for a victim in respiratory arrest, keep the following in mind:	
<ul style="list-style-type: none">▪ Maintain an open airway by keeping the head tilted back in the proper position.▪ Seal the mask over the victim's mouth and nose.▪ Give ventilations for about 2 minutes, then reassess for breathing and a pulse.▪ If a ventilation does not make the chest clearly rise, re-tilt the head and attempt another ventilation.<ul style="list-style-type: none">o If the chest still does not rise after an additional attempt, provide care for a potential airway obstruction by immediately beginning CPR, starting with compressions.▪ If the victim vomits, roll the victim onto their side and clear the victim's mouth using a finger sweep and suction device, if available. Turn the victim onto their back and continue giving ventilations.▪ If the victim has a pulse but is not breathing, continue giving ventilations.	

2-3 AIRWAY OBSTRUCTION

Airway obstruction is a common emergency. You need to be able to recognize that a victim who cannot cough, speak, cry or breathe requires immediate care. Airway obstructions can lead to respiratory and even cardiac arrest if not addressed quickly and effectively. A responsive person clutching their throat is exhibiting what is commonly called the **universal sign for choking**. However, in many cases, a victim will just panic. Other behaviors that might be seen include running about, flailing arms or trying to get another's attention.

There are two types of airway obstruction: mechanical and anatomical. Any foreign body lodged in the airway is a **mechanical obstruction** and requires immediate attention. An **anatomical airway obstruction** is caused by the body itself, most commonly the tongue. An unresponsive victim loses muscle control, which may cause the tongue to fall back and block the airway.

Causes of Airway Obstructions

Common causes of choking include:

- Swallowing poorly chewed food.
- Drinking alcohol before or during meals. (Alcohol dulls the nerves that aid swallowing, making choking on food more likely.)
- Eating too fast, or talking or laughing while eating.
- Walking, playing or running with food or objects in the mouth.
- Wearing dentures. (Dentures make it difficult to sense whether food is fully chewed before it is swallowed.)

Caring for an Adult or Child Airway Obstruction

You must get consent before helping a responsive choking person. If the person is a child, get consent from a parent or guardian, if present. If no parent or guardian is present, consent is implied (Figure 2-11). If you suspect a person is choking, ask the victim, “Are you choking?” Then, identify yourself and ask if you can help. If the victim is coughing, encourage continued coughing. If the victim cannot cough, speak or breathe or has a weak, ineffective cough, summon EMS personnel.

For an adult or child, if the victim can cough forcefully, encourage them to continue coughing until they are able to breathe normally. If the victim cannot breathe or has a weak or ineffective cough, you will need to perform a combination of 5 back blows (blows between the shoulder blades) followed by 5 abdominal thrusts (inward and upward thrusts just above the navel). To perform back blows, position yourself to

the side and slightly behind the victim. For a child, you may need to kneel. Place one arm diagonally across the person’s chest (to provide support) and bend the person forward at the waist so that the person’s upper body is as close to parallel to the ground as possible. Firmly strike the victim between the shoulder blades with the heel of your other hand. Each back blow should be separate from the others.

To perform abdominal thrusts, stand behind the victim and, while maintaining your balance, make a fist with one hand and place it thumb-side against the victim’s abdomen—just above the navel. Cover the fist with your other hand, and give quick, upward thrusts. Perform a combination of 5 back blows followed by 5 abdominal thrusts. Each back blow and abdominal thrust should be a separate and distinct attempt to dislodge the object.



Figure 2-11 | Obtain consent before providing care.

Continue delivering a combination of back blows and abdominal thrusts until the object is forced out; the victim can cough, speak or breathe or the victim becomes unresponsive.

If you cannot reach far enough around the victim to give effective abdominal thrusts, or if the victim is obviously pregnant or known to be pregnant, give chest thrusts (Figure 2-12). To perform chest thrusts, stand behind the victim and place the thumb-side of your fist against the lower half of the victim's sternum (breastbone) and your second hand over the fist. Then give quick, inward thrusts.

If a responsive victim becomes unresponsive, carefully lower the victim to a firm, flat surface, send someone to get an AED and summon EMS if you have not already done so. Immediately begin CPR with chest compressions. Unlike the responsive victim suffering foreign body airway obstruction, consent is implied when a victim is unresponsive. However, you must get consent from a parent or guardian, if present, before caring for an unresponsive child with an airway obstruction.

As you open the airway to give ventilations, look in the person's mouth for any visible object. If you can see it, use a finger sweep motion to remove it. If you do not see the object, do not perform a blind finger sweep, but continue CPR. Remember to never try more than 2 ventilations during one cycle of CPR, even if the chest does not rise.

Continuing cycles of 30 compressions and 2 ventilations is the most effective way to provide care. Even if ventilations fail to make the chest rise, compressions may help clear the airway by moving the blockage to the upper airway, where it can be seen and removed. For more details, see Table 2-3.



Figure 2-12 | If a victim is obviously pregnant, use chest thrusts instead of abdominal thrusts to dislodge the object.

Caring for an Infant Airway Obstruction

If the victim is an infant, get consent from a parent or guardian, if present. If no parent or guardian is present, consent is implied. Identify yourself and ask if you can help. When an infant is choking and awake but unable to cough, cry or breathe, you will need to perform a series of 5 back blows and 5 chest thrusts from a kneeling position. Start with back blows. Hold the infant face-down on one arm using your thigh for support. Make sure the infant's head is lower than their body and that you are supporting the infant's head and neck. With your other arm, give firm back blows with the heel of your hand between the infant's scapulae.

After 5 back blows, start chest thrusts. Turn the infant over onto your other arm, using your thigh for support. Make sure to

support the head and neck as you move the infant. Place two fingers in the center of the infant's chest, just below the nipple line. Give 5 quick thrusts. Continue this cycle of 5 back blows and 5 chest thrusts until the object is forced out; the infant can cough, cry or breathe; or the infant becomes unresponsive.

If an infant does become unresponsive while choking, carefully place the infant onto a firm, flat surface, send someone to get an AED and summon EMS if you have not already done so. Immediately begin CPR, starting with chest compressions. For more details, see Table 8-3.

Table 2-3: Providing Care for Obstructed Airway—Adult, Child and Infant

	Caring for a Responsive Choking Victim	If a Choking Victim Becomes Unresponsive
Adult and Child	<ul style="list-style-type: none">▪ 5 back blows▪ 5 abdominal thrusts◦ Use chest thrusts if you cannot reach around the victim or the victim is pregnant.	<ul style="list-style-type: none">▪ Carefully lower the victim to a firm, flat surface.▪ Send someone to get an AED and summon EMS if you have not already done so.▪ Immediately begin CPR, starting with chest compressions.▪ After each set of chest compressions and before attempting ventilations, open the victim's mouth and look for the object.◦ If you see an object in the victim's mouth, carefully remove it using your finger. Never perform a blind finger sweep.

Table 2-3: Providing Care for Obstructed Airway—Adult, Child and Infant, continued

	Caring for a Responsive Choking Victim	If a Choking Victim Becomes Unresponsive
Infant	<ul style="list-style-type: none"> ▪ 5 back blows ▪ 5 chest thrusts 	<ul style="list-style-type: none"> ▪ Carefully lower the victim to a firm, flat surface. ▪ Send someone to get an AED and summon EMS if you have not already done so. ▪ Immediately begin CPR, starting with chest compressions. ▪ After each set of chest compressions and before attempting ventilations, open the victim's mouth and look for the object. <ul style="list-style-type: none"> ◦ If you see an object in the victim's mouth, carefully remove it using your finger. Never perform a blind finger sweep.
Continue the cycle of care until:	<ul style="list-style-type: none"> ▪ The object is forced out. ▪ The victim begins to cough forcefully or breathe. ▪ The victim becomes unresponsive. 	<ul style="list-style-type: none"> ▪ The victim begins to breathe on their own. ▪ Another trained rescuer takes over. ▪ More advanced medical personnel, such as EMS personnel, take over. ▪ You are too exhausted to continue. ▪ The scene becomes unsafe.
When providing care:	<ul style="list-style-type: none"> ▪ Use less force on a child than you would on an adult when giving abdominal thrusts. ▪ Use two fingers on the center of the chest, just below the nipple line, when giving chest thrusts to an infant. ▪ Keep one hand on the victim's forehead to maintain an open airway when giving chest thrusts to an infant. 	<ul style="list-style-type: none"> ▪ Remember to never attempt more than 2 ventilations during one cycle of CPR, even if the chest does not rise. Continuing cycles of 30 compressions and 2 ventilations is the most effective way to provide care. ▪ If the victim vomits at any time, including during a compression cycle, immediately roll the victim to their side, clear the mouth, reposition the victim on their back and resume CPR.

2-4 EMERGENCY OXYGEN

When someone has a breathing or cardiac emergency, the supply of oxygen to the brain and heart, as well as the rest of the body, is reduced, resulting in hypoxia. Hypoxia is when an insufficient amount of oxygen reaches the cells. If breathing stops (respiratory arrest), the brain and heart will soon be starved of oxygen, resulting in cardiac arrest and ultimately death if not managed quickly and appropriately.

The air a person normally breathes is about 20 to 21 percent oxygen. When giving ventilations or performing CPR mouth-to-mouth or with a resuscitation mask, the air exhaled into the victim is about 16 percent oxygen. By administering emergency oxygen, you can deliver a higher percentage of oxygen, thus improving or eliminating hypoxia (Figure 2-13).

Emergency oxygen can be given for many breathing and cardiac emergencies, but should be administered as a secondary treatment after the priorities of airway management, ventilation, CPR, AED, bleeding control and other lifesaving care have been addressed. Consider

administering emergency oxygen for victims who are hypoxic, as evidenced by an oxygen saturation below 94 percent.

Oxygen should be delivered using equipment that is properly sized for the victim and flow rates that are appropriate for the delivery device.

Emergency oxygen units are available in some jurisdictions, but they require a prescription in most, provided that they contain at least a 15-minute supply of oxygen and are designed to deliver a pre-set flow rate of at least 6 liters per minute (LPM). Medical-grade oxygen cylinders are labeled "U.S.P." and marked with a yellow diamond containing the word "Oxygen" (Figure 2-14).

Oxygen cylinders come in different sizes and various pressure capacities. In the United States, oxygen cylinders typically have green markings. However, the color scheme is not regulated, so different manufacturers and countries other than the United States may use differently colored markings. Oxygen cylinders are under high pressure and should be handled carefully.



Figure 2-13 | Administering emergency oxygen



Figure 2-14 | Oxygen cylinders are marked with a yellow diamond that reads "Oxygen" and, in the United States, typically have green markings.

Variable-Flow-Rate Oxygen

Many EMS systems use variable-flow-rate oxygen, which allows the rescuer to vary the flow of oxygen. These systems are practical because they are able to deliver a specific amount of oxygen based on a victim's need.

To administer emergency oxygen using a variable flow-rate system, assemble the following pieces of equipment: an oxygen cylinder, a regulator with pressure gauge and flowmeter, and a delivery device.

The regulator lowers the pressure of the oxygen as it comes out of the cylinder so that the oxygen can be used safely (Figure 2-15). The regulator also has a pressure gauge that shows the pressure in the cylinder. The pressure gauge shows if the cylinder is full (2000 pounds per square inch [psi]), nearly empty or in-between. The regulator must be carefully attached to the oxygen cylinder. An O-ring gasket makes the seal tight (Figure 2-16). The flowmeter controls how rapidly the oxygen flows from the cylinder to the victim. The flow can generally be set from 1 to 15 LPM.



Figure 2-15 | A pressure regulator is attached to an oxygen cylinder to reduce the pressure of oxygen to a safe level.



Figure 2-16 | An O-ring gasket

Fixed-Flow-Rate Oxygen

Some emergency oxygen systems have the regulator set at a fixed-flow rate. Most fixed-flow-rate tanks are set at 15 LPM; however, you may come across tanks set at 6 LPM, 12 LPM or another rate. Some fixed-flow-rate systems have a dual (high/low) flow setting. Fixed-flow-rate oxygen systems typically come with the delivery device, regulator and cylinder already assembled (Figure 2-17), which makes it quick and simple to administer emergency oxygen.



Figure 2-17 | A fixed-flow-rate oxygen system

A drawback to fixed-flow-rate oxygen systems is that the flow rate cannot be adjusted, which limits how it can be used, including limiting the concentration of oxygen that can be delivered. For example, a fixed-flow-rate unit with a preset flow of 6 LPM can be used only with a nasal cannula or resuscitation mask, whereas a

preset-flow rate of 12 LPM allows the use of only a resuscitation mask or non-rebreather mask.

To operate this type of device, simply turn it on according to the manufacturer's instructions, check that oxygen is flowing and place the delivery device on the victim.

Oxygen Safety Precautions

When preparing and administering emergency oxygen, safety is a concern. Use emergency oxygen equipment according to the manufacturer's instructions and in a manner consistent with federal and local regulations and protocols.

Also, follow these recommended guidelines:

- Be sure that oxygen is flowing before putting the delivery device over the victim's face.
- Do not use oxygen around flames or sparks, including smoking materials, such as cigarettes, cigars and pipes. Oxygen causes a fire to burn more rapidly and intensely.
- Do not use grease, oil or petroleum products to lubricate or clean the regulator. This could cause a fire or an explosion.
- Do not stand oxygen cylinders upright, unless they are well secured. If the cylinder falls, the regulator or valve could become damaged or cause injury due to the intense pressure in the tank.
- Do not drag or roll cylinders.
- Do not carry a cylinder by the valve or regulator.

- Do not hold onto protective valve caps or guards when moving or lifting cylinders.
- Do not deface, alter or remove any labeling or markings on the oxygen cylinder.
- Do not attempt to mix gases in an oxygen cylinder or transfer oxygen from one cylinder to another.
- Do not use a defibrillator when around flammable materials, such as free-flowing oxygen or gasoline. (If oxygen is being administered to a victim when an AED is ready to be used, make sure to close the tank before shocking.)

Never attempt to refill an oxygen cylinder; only an appropriately licensed professional should do this. When high-pressure oxygen cylinders have been emptied, close the cylinder valve, replace the valve protection cap or outlet plug, if provided, and mark or tag the cylinder as empty. Promptly return the cylinder to be refilled according to state, local and facility regulations and policies.

Pay specific attention to the following areas concerning oxygen cylinders:

- Check for cylinder leaks, abnormal bulging, defective or inoperative valves or safety devices.
- Check for the physical presence of rust or corrosion on a cylinder

or cylinder neck, and any foreign substances or residues, such as adhesive tape, around the cylinder neck, oxygen valve or regulator assembly. These substances can hamper oxygen delivery and, in some cases, have the potential to cause a fire or explosion.

2-5 OXYGEN DELIVERY DEVICES

An oxygen delivery device is the equipment used to provide emergency oxygen to a victim. Tubing carries the oxygen from the regulator to the delivery device. When administering emergency oxygen, make sure that the tubing does not get tangled or kinked, which could stop the flow of oxygen to the mask or cannula. Oxygen delivery devices include nasal cannulas, resuscitation masks, non-rebreather masks and BVMs (Table 2-4). Various sizes of these devices are available or adults,

children and infants. Appropriate sizing is important to ensure adequate management.

If young children or infants are frightened by a mask being placed on the face, you can use the “blow-by” technique. To perform this technique, you, a parent or guardian holds the mask about 2 inches from the child's or infant's face, waving it slowly from side to side, allowing the oxygen to pass over the face and be inhaled.

Nasal Cannulas

Nasal cannulas are used only on victims who are able to breathe, most commonly on those with minor breathing difficulty or a history of respiratory medical conditions. They are useful for a victim who can breathe but cannot tolerate a mask over the face. Nasal cannulas are held in place over a victim's ears, and oxygen is delivered through two small prongs inserted into the nostrils. Nasal cannulas deliver between 24 percent and 44 percent oxygen to the victim. These devices are not used often in an emergency because they do not give as much oxygen as a resuscitation mask, non-rebreather mask or BVM.

Victims experiencing a serious breathing emergency generally breathe through the mouth and need a device that can supply a greater concentration of oxygen. Nasal cannulas may not be effective for victims with a nasal airway obstruction, nasal injury or severe cold. With a nasal cannula, you should set the flow rate between 1 and 6 LPM, although a flow rate between 2 and 4 LPM is most common. Avoid using rates above 6 LPM with this device since they tend to quickly dry out mucous membranes, which causes nose bleeds and headaches.

Resuscitation Masks

A resuscitation mask with oxygen inlet can be used to deliver emergency oxygen to a nonbreathing victim. It also can be used to deliver oxygen to someone who is breathing but still requires emergency oxygen. Some resuscitation masks come with elastic straps to place over the victim's head to keep the mask in place.

If the mask does not have straps, you or the victim can hold the mask in place. With a resuscitation mask, set the oxygen flow rate at 6-10 LPM for a responsive victim, or 6-15 LPM for an unresponsive victim. The resuscitation mask can deliver between 25 percent and 55 percent oxygen concentration.

Non-Rebreather Masks

A non-rebreather mask is used to deliver high concentrations of oxygen to a victim who is breathing. It consists of a face mask with an attached oxygen reservoir bag and a one-way valve between the mask and bag, which prevents the victim's exhaled air from mixing with the oxygen in the reservoir bag.

The victim inhales oxygen from the bag, and exhaled air escapes through flutter valves on the side of the mask. The flow rate should be set at 10-15 LPM. When using a non-rebreather mask with a high-flow rate of oxygen, you can deliver up to 90 percent oxygen concentration to the victim.

Bag-Valve-Mask Resuscitators

A bag-valve-mask resuscitator (BVM) can be used on a breathing or nonbreathing victim. A responsive, breathing victim can hold the BVM to inhale the oxygen, or you can squeeze the bag as the victim inhales in order to deliver more oxygen. Set the oxygen flow rate at 15 LPM or higher when using a BVM. The BVM with an oxygen reservoir bag is capable of supplying 90 percent or more oxygen concentration when used at 15 LPM or higher.

Monitoring Oxygen Saturation

A pulse oximeter is a device that can be used to measure the percentage of oxygen saturation in the blood. Pulse oximetry may be used as an added tool, but an assessment of the victim's signs and symptoms should be used to make decisions about care. It is possible for victims to show a normal reading but have trouble breathing, or to have a low reading but appear to be breathing normally. The pulse oximeter reading

never should be used to withhold oxygen from a victim who appears to be hypoxic or when it is the standard of care to apply oxygen despite good pulse oximetry readings.

To use a pulse oximeter, apply the probe to the victim's finger or any other measuring site, such as the ear lobe or foot, according to the manufacturer's recommendation (Figure 2-18). Let the

Range	Percent Value	Delivery Device
Normal	95 to 100	None
Mild hypoxia	91 to 94	Nasal cannula or resuscitation mask
Moderate hypoxia	86 to 90	Non-rebreather mask or BVM
Severe hypoxia	<85	Non-rebreather mask or BVM

machines register the oxygen saturation level and verify the victim's pulse rate on the oximeter with the actual pulse of the victim. Monitor the victim's saturation levels while administering emergency oxygen. If the oxygen level reaches 100 percent and local protocols allow, you may decrease the flow rate of oxygen and change to a lower-flowing delivery device.



Figure 2-18 | Pulse oximeter

Table 2-4: Oxygen Delivery Devices

Delivery Device	Common Flow Rate	Oxygen Concentration	Suitable Victims
Nasal Cannula 	1–6 LPM	24–44%	<ul style="list-style-type: none"> ▪ Victims with breathing difficulty ▪ Victims unable to tolerate mask
Resuscitation Mask 	6–15 LPM	25–55%	<ul style="list-style-type: none"> ▪ Victims with breathing difficulty ▪ Victims who are nonbreathing
Non-Rebreather Mask 	10–15 LPM	Up to 90%	Breathing victims only
BVM 	15 LPM or higher	90% or higher	Breathing and nonbreathing victims

2-6 SUCTIONING

Sometimes injury or sudden illness can cause mucus, fluids or blood to collect in a victim's airway. A finger sweep can be used to clear the airway on an unresponsive victim when the blockage is visible, but a more effective method is to suction the airway clear. Suctioning is the process of removing foreign matter from the upper airway using a manual or mechanical device. Suctioning is not necessary or beneficial in attempting to remove water from the lungs of a drowning victim.

It is important to suction when fluids or foreign matter are present or suspected, because the airway must be open and clear in order for the victim to breathe. Manual suction units (Figure 2-19) are operated by hand. They are lightweight, compact and relatively inexpensive. Because they do not require an energy source, they avoid some of the problems associated with mechanical units and are more suited to the aquatic environment.

If suctioning is part of facility protocols, there should be several sizes of sterile suction catheters on hand to use on victims of various sizes.



Figure 2-19 | Suctioning devices are used to clear a victim's airway.

AIRWAY ADJUNCTS

The tongue is the most common cause of airway obstruction in an unresponsive person. You can use a mechanical device, called an **airway adjunct**, to keep a victim's airway clear.

There are two types of basic airway adjuncts. One type, called an oropharyngeal airway (OPA) is inserted in the victim's mouth. The other type, called a nasopharyngeal airway (NPA) is inserted in the victim's nose.

Oropharyngeal Airways

When properly positioned, an OPA keeps the tongue away from the back of the throat, helping to maintain an open airway (Figure 2-20). An improperly placed airway device can compress the tongue into the back of the throat, further obstructing the airway.

Nasopharyngeal Airways

When properly positioned, an NPA can help maintain an open airway. An NPA may be used on a responsive victim or

an unresponsive victim. Unlike an OPA, the NPA does not cause the victim to gag. NPAs should not be used on victims with suspected facial trauma or skull fracture. Follow local protocols for when, how and who can use NPAs.

OPAs and NPAs come in a variety of sizes. The curved design fits the natural contour of the airways. Once you have positioned the airway adjunct, use a resuscitation mask or BVM to ventilate a non-breathing victim. If using an NPA on a victim who is breathing normally, you may utilize a non-rebreather mask to supply supplemental oxygen.



Figure 2-20 | Insert an OPA with the curved tip along the roof of the mouth to clear a victim's airway. Rotate it to drop it into the back of the throat.

2-7 WRAP-UP

Breathing emergencies are extremely serious. As a professional rescuer, you must know how to recognize the signs and symptoms of respiratory distress, hypoxia and respiratory arrest and react immediately to provide care for victims.

This includes knowing how to give ventilations and care for choking victims. If facility protocols, local laws and regulations allow, it also includes knowing how to administer emergency oxygen and use airway adjuncts and suction devices.

BENCHMARKS FOR PROFESSIONAL RESCUERS

Professional rescuers should provide appropriate care for victims experiencing respiratory emergencies, which includes:

- Caring for drowning as a respiratory event.
- Handling life-threatening situations with a sense of urgency.
- Using resuscitation equipment, including appropriately sized breathing barriers and BVMs.
- Recognizing signs and symptoms of respiratory distress and providing care.
- Recognizing and providing care for responsive and unresponsive victims with an obstructed airway.
- Administering emergency oxygen using a variety of oxygen delivery devices if permitted by local protocols and you are trained and certified.



GIVING VENTILATIONS

Giving Ventilations

Note: Size up the scene while forming an initial impression, obtain consent, use PPE, perform an initial assessment, care for any severe or life-threatening bleeding and get an AED on the scene as soon as possible.

If the victim is not breathing but has a pulse:

1 Position and seal the resuscitation mask.

2 Open the airway and blow into the mask.

- **Adult:** Give **1** ventilation about every **5** to **6** seconds.
- **Child or infant:** Give **1** ventilation about every **3** seconds.
- Each ventilation should last about **1** second and make the chest clearly rise.
- The chest should fall before the next ventilation is given.
- Give ventilations for about **2** minutes.



Notes:

- For a child, tilt the head slightly past a neutral position. Do not tilt the head as far back as for an adult.
- For a victim with a suspected head, neck or spinal injury, use the jaw-thrust (without head extension) maneuver to open the airway to give ventilations.
- For an infant, maintain a neutral position.



GIVING VENTILATIONS

Giving Ventilations *continued*

3

Recheck for breathing and pulse about every **2** minutes.

- Remove the mask and look, listen and feel for breathing and a pulse for at least **5** seconds but no more than **10** seconds.

4

Assess the victim's condition and provide appropriate care.

If unresponsive and no breathing but there is a pulse:

- Continue giving ventilations.

If unresponsive and no breathing, pulse and/or airway obstruction:

- Begin CPR.

Do not stop giving care except in one of the following situations:

- You see an obvious sign of life, such as normal breathing or victim movement.
- An AED is ready to analyze the victim's heart rhythm.
- Another trained responder or responders take over, such as a member of your safety team or EMS personnel, and relieve you from giving compressions or ventilations.
- You are alone and too exhausted to continue.
- The scene becomes unsafe.



GIVING VENTILATIONS

Using a Bag-Valve-Mask Resuscitator—Two Rescuers

Notes:

- Size up the scene and form an initial impression, use PPE, perform a primary assessment and get an AED on the scene as soon as possible.
- Always select the appropriately sized mask for the victim.
- Prepare the BVM for use during the primary assessment.

If the victim is not breathing but has a pulse:

1 Rescuer 1 kneels behind the victim's head and positions the mask over the victim's mouth and nose.

2 To seal the mask and open the airway, use the jaw-thrust (with head extension) maneuver.

Note: For a child, tilt the head back slightly past a neutral position. Do not tilt the head as far back as for an adult. For an infant, position the head in a neutral position.



3 Rescuer 2 gives ventilations.

- Squeeze the bag slowly with both hands.
- For an adult, give **1** ventilation about every **5** to **6** seconds.
- For a child or infant, give **1** ventilation about every **3** seconds.
- Each ventilation should last about **1** second and make the chest clearly rise. The chest should fall before the next breath is given.

4 Rescuer 2 rechecks for breathing and a pulse about every **2** minutes.

- Remove the mask and look, listen and feel for breathing and a pulse for at least **5** seconds, but no more than **10** seconds.



GIVING VENTILATIONS

Using a Bag-Valve-Mask Resuscitator—Two Rescuers *continued*

5

Assess the victim's condition and provide appropriate care.

If unresponsive and no breathing but there is a pulse:

- Continue giving ventilations.

If unresponsive and no breathing, pulse and/or airway obstruction:

- Begin CPR.

Do not stop giving care except in one of the following situations:

- You see an obvious sign of life, such as normal breathing or victim movement.
- An AED is ready to analyze the victim's heart rhythm.
- Another trained responder or responders take over, such as a member of your safety team or EMS personnel, and relieve you from giving compressions or ventilations.
- You are alone and too exhausted to continue.
- The scene becomes unsafe.



CHOKING

Adult and Child

Notes:

- Activate the EAP, size up the scene while forming an initial impression, obtain consent, use PPE and care for any severe or life-threatening bleeding.
- For a child, obtain consent if a parent or guardian is present.
- Stand or kneel behind the child, depending on the child's size. Use less force on a child than you would on an adult.

If the victim cannot breathe or has a weak or ineffective cough:

1

Give 5 back blows.

- Position yourself slightly behind the victim.
- Place one arm diagonally across the victim's chest and bend the victim forward at the waist. The victim's upper airway should be at least parallel to the ground.
- Firmly strike the victim between the shoulder blades with the heel of your hand.
- Each thrust should be a distinct attempt to dislodge the object.



2

Give 5 abdominal thrusts.

- Stand behind the victim while maintaining your balance.
- For a child, stand or kneel behind the child, depending on the child's size. Use less force on a child than you would on an adult.
- Make a fist with one hand and place it thumb-side down against the victim's abdomen, just above the navel.
- Cover the fist with your other hand and give quick, upward thrusts.
- Each thrust should be a distinct attempt to dislodge the object.





CHOKING

Adult and Child *continued*

- 3 Assess the victim's condition and provide appropriate care.

Continue giving 5 back blows and 5 abdominal thrusts until:

- The object is forced out.
- The victim begins to cough, speak or breathe.
- The victim becomes unresponsive.

If the victim becomes unresponsive at any time while choking:

- Carefully lower the victim onto a firm, flat surface, send someone to get an AED, and summon EMS if you have not already done so.
- Immediately begin CPR, starting with **30** chest compressions.
- Open the mouth to look for and do a finger sweep to remove a foreign object only if you see an object.
- Give **2** ventilations.
- As long as the chest does not clearly rise, continue cycles of giving **30** chest compressions, looking for a foreign object, doing a finger sweep only if you see the object and giving ventilations.

Notes:

- During CPR on an unresponsive choking adult or child, when opening the airway to give ventilations, look into the mouth for any visible object.
 - If you see an object, use a finger sweep motion to remove it.
 - If you do not see an object, do not do a finger sweep. Instead, continue CPR cycles.
- Remember to never try more than 2 ventilations during one cycle of CPR, even if the chest does not rise.



CHOKING

Adult and Child *continued*

Use chest thrusts instead of abdominal thrusts if:

- You cannot reach far enough around the victim to give abdominal thrusts.
- The victim is obviously pregnant or known to be pregnant.

To perform chest thrusts:

- 1 Stand behind the victim and place the thumb side of your fist against the lower half of the victim's sternum and the second hand over the fist.
- 2 Give quick, inward thrusts. Look over the victim's shoulder so that their head does not hit your face when you perform the chest thrusts.
- 3 Repeat until the object is forced out; the victim begins to cough, speak, or breathe; or until the victim becomes unresponsive.





CHOKING

Infant

Note: Size up the scene while forming an initial impression, obtain consent if a parent or guardian is present, use PPE, and care for any severe or life-threatening bleeding.

If the infant is awake and cannot cough, cry or breathe:

1

- Carefully position the infant face-down along your forearm.
- Support the infant's head and neck with your hand.
 - Lower the infant onto your thigh, keeping the infant's head lower than their body.



2

- Give 5 back blows.
- Give back blows with the heel of your hand between the infant's shoulder blades.
 - Each back blow should be a distinct attempt to dislodge the object.

3

- Position the infant face-up along your forearm.
- Position the infant between both of your forearms, supporting the infant's head and neck.
 - Turn the infant face-up.
 - Lower the infant onto your thigh with the infant's head lower than their chest.

4

- Give 5 chest thrusts.
- Put two or three fingers on the center of the chest, just below the nipple line and compress the chest about $1\frac{1}{2}$ inches.
 - Each chest thrust should be a distinct attempt to dislodge the object.





CHOKING

Infant *continued*

5

Provide appropriate care.

Continue giving 5 back blows and 5 chest thrusts until:

- The object is forced out.
- The infant begins to cough forcefully or breathe.
- The infant becomes unresponsive.

If the infant becomes unresponsive at any time while choking:

- Carefully lower the infant onto a firm, flat surface, send someone to get an AED, and summon EMS if you have not already done so.
 - Immediately begin CPR, starting with **30** chest compressions.
 - Open the mouth to look for and do a finger sweep to remove a foreign object only if you see an object.
 - Give **2** ventilations.
 - As long as the chest does not clearly rise, continue cycles of giving **30** chest compressions, looking for a foreign object, do a finger sweep only if you see the object and giving ventilations.

Notes:

- During CPR on an unresponsive infant, when opening the airway to give ventilations, look into the mouth for any visible object.
 - If you see an object, use a finger sweep motion to remove it.
 - If you do not see an object, do not do a finger sweep. Instead, continue CPR cycles.
- Remember to never try more than 2 ventilations during one cycle of CPR, even if the chest does not rise.



EMERGENCY OXYGEN

Assembling the Oxygen System

Note: Always follow standard precautions when providing care.

1 Check the cylinder.

- Make sure that the oxygen cylinder is labeled "U.S.P." (United States Pharmacopeia) and is marked with a yellow diamond containing the word "Oxygen."

2 Clear the valve.

- Remove the protective covering.
- Remove and save the O-ring gasket, if necessary.
- Turn the cylinder away from you and others before opening for 1 second to clear the valve of any debris.





EMERGENCY OXYGEN

Assembling the Oxygen System *continued*

3

Attach the regulator.

- Put the O-ring gasket into the valve on top of the cylinder, if necessary.
- Make sure that it is marked “Oxygen Regulator” and that the O-ring gasket is in place.
- Check to see that the pin index corresponds to an oxygen cylinder.
- Secure the regulator on the cylinder by placing the two metal prongs into the valve.
- Hand-tighten the screw until the regulator is snug.

4

Open the cylinder counterclockwise one full turn.

- Check the pressure gauge.
- Determine that the cylinder has enough pressure (more than 200 psi). If the pressure is lower than 200 psi, DO NOT use.



5

Attach the delivery device.

- Attach the plastic tubing between the flowmeter and the delivery device.

Note: When breaking down the oxygen equipment, be sure to bleed the pressure regulator by turning on the flowmeter after the cylinder has been turned off.



EMERGENCY OXYGEN

Administering Emergency Oxygen

Notes:

- Size up the scene and form an initial impression, use PPE, perform an initial assessment and get an AED on the scene as soon as possible.
- Follow local protocols for using emergency oxygen.
- Check the cylinder to make sure the oxygen cylinder is labeled “U.S.P.” and is marked with a yellow diamond containing the word “Oxygen.”
- Determine that the cylinder has enough pressure (more than 200 psi). If the pressure is lower than 200 psi, DO NOT use. Assemble the cylinder, regulator and delivery device prior to delivery.

1

Turn the unit on and adjust the flow as necessary.

- For a variable-flow-rate oxygen system, turn the flowmeter to the desired flow rate:
 - Nasal cannula: 1–6 LPM
 - Resuscitation mask: 6–15 LPM
 - Non-rebreather mask: 10–15 LPM



2

Verify the oxygen flow.

- Listen for a hissing sound and feel for oxygen flow through the delivery device.



3

Place the delivery device on the victim and continue care until EMS personnel take over.



Note: When monitoring a responsive victim’s oxygen saturation levels using a pulse oximeter, you may reduce the flow of oxygen and change to a lower flowing delivery device if the blood oxygen level of the victim reaches 100 percent.



USING A MANUAL SUCTIONING DEVICE

Using a Manual Suctioning Device

Notes:

- Size up the scene and form an initial impression, use PPE, perform an initial assessment and get an AED on the scene as soon as possible.
- If needed, assemble the device according to manufacturer's instructions.

1 Position the victim:

- Roll the body as a unit towards you so that the victim is on their side.
- Open the victim's mouth.

2 Remove any visible large debris from the mouth with a gloved finger.



3 Measure and check the suction tip.

- Measure from the victim's earlobe to the corner of the mouth.
- Note the distance to prevent inserting the suction tip too deeply.
- Check that the suction is working by placing your finger over the end of the suction tip as you squeeze the handle of the device.





USING A MANUAL SUCTIONING DEVICE

Using a Manual Suctioning Device *continued*

3

Suction the mouth.

- Insert the suction tip into the back of the mouth.
- Squeeze the handle of the suction device repeatedly to provide suction.
- Apply suction as you withdraw the tip using a sweeping motion, if possible.
- Suction for no more than:
 - **Adult:** 15 seconds at a time
 - **Child:** 10 seconds at a time
 - **Infant:** 5 seconds at a time





3 Cardiac Emergencies

A cardiac emergency is life-threatening. It can happen at any time to a victim of any age, on land or in the water. You may be called on to care for a victim of a cardiac emergency, including non-specific chest pain, a heart attack or cardiac arrest. Cardiac arrest care includes performing CPR and using an automated external defibrillator (AED)—two of the links in the Cardiac Chain of Survival. By following the Cardiac Chain of Survival, you can greatly increase a victim's chance of survival from cardiac arrest.

87	CARDIAC CHAIN OF SURVIVAL
88	HEART ATTACK
90	CARDIAC ARREST
90	CPR
93	AEDS
100	MULTIPLE-RESCUER RESPONSE
102	WRAP-UP

3-1 CARDIAC CHAIN OF SURVIVAL

To effectively respond to cardiac arrest, it is important to understand the Cardiac Chain of Survival (Figure 3-1). The Cardiac Chain of Survival for adults consists of five links:

- Recognition of cardiac arrest and activation of the emergency response system
- Early CPR to keep oxygen-rich blood flowing and to help delay brain damage and death
- Early defibrillation to help restore an effective heart rhythm and significantly increase the victim's chance for survival
- Advanced life support using advanced medical personnel who can provide the proper tools and medication needed to continue the lifesaving care
- Integrated post-cardiac arrest care to optimize ventilation and oxygenation and treat hypotension immediately after the return of spontaneous circulation

The pediatric Cardiac Chain of Survival is similar to the adult Cardiac Chain of Survival (Figure 3-2). The five links include the following:

- Injury prevention and safety
- Early, high-quality CPR
- Rapid activation of the emergency medical services (EMS) system or response team to get help on the way quickly—no matter the victim's age
- Effective, advanced life support
- Integrated post-cardiac arrest care

For each minute CPR and defibrillation are delayed, the victim's chance for survival is reduced by about 10 percent.



Figure 3-1 | The Cardiac Chain of Survival



Figure 3-2 | The Pediatric Chain of Survival

3-2 HEART ATTACK

When the muscle of the heart suffers a loss of oxygenated blood, the result is a myocardial infarction (MI), or heart attack. A heart attack is not the same as a cardiac arrest, but it can cause a

cardiac arrest. Heart attacks usually result from cardiovascular disease, but can be caused by a myocardial contusion or bruising to the heart caused by a traumatic event.

Recognizing a Heart Attack

A heart attack refers to the necrosis (death) of heart tissue as a result of a loss of oxygenated blood. The sooner the signs and symptoms are recognized and treated, the better the victim's chance of survival. Even victims who have had a heart attack may not recognize the signs because each heart attack may have different signs and symptoms.

Summon EMS personnel and provide prompt care if the victim shows or reports any of the signs and symptoms listed below. Ask open-ended questions, such as, "How are you feeling?" to hear the symptoms described in the victim's own words.

- Chest discomfort or pain that is severe, lasts longer than 3 to 5 minutes, goes away and comes back, or persists even during rest.

- Discomfort, pressure or pain that is persistent and ranges from discomfort to an unbearable crushing sensation in the center of the chest, possibly spreading to the shoulder, arm, neck, jaw, stomach or back, and usually not relieved by resting, changing position or taking medication.
- Chest pain that comes and goes.
- Difficulty breathing, such as at a faster rate than normal or noisy breathing.
- Pale or ashen skin, especially around the face.
- Sweating, especially on the face.
- Dizziness or light-headedness.
- Nausea or vomiting.
- Fatigue, lightheadedness or loss of consciousness.

These warning signs may occur with or without chest pain. When women experience chest pain, it may be atypical—sudden, sharp but short-lived pain outside the breastbone. Like women, other individuals—such as older adults or those with diabetes—are somewhat more likely to experience

some of the other warning signs, such as:

- Shortness of breath
- Nausea or vomiting
- Back or jaw pain
- Unexplained fatigue or malaise

Caring for a Heart Attack

If you think someone is having a heart attack:

- Take immediate action and summon EMS personnel.
- Have the victim stop any activity and rest in a comfortable position.
- Loosen tight or uncomfortable clothing.

- Closely monitor the victim until EMS personnel take over
- Note any changes in the victim's appearance or behavior.
- Comfort the victim.
- Be prepared to perform CPR and use an AED.

Administering Aspirin for a Heart Attack

You may be able to help a victim that is awake and alert who is showing signs of a heart attack by offering an appropriate dose of aspirin, if local protocols allow or medical direction permits. Aspirin never should replace advanced medical care, and you should never delay calling EMS to find or offer aspirin.

If the victim is awake and alert and able to take medicine by mouth, ask:

- Are you allergic to aspirin?
- Do you have a stomach ulcer or stomach disease?
- Are you taking any blood thinners, such as Coumadin® (warfarin)?
- Have you been told by a healthcare provider not to take aspirin?

If the victim answers “no” to all of these questions, and if local protocols allow, consider administering two 81-mg, low-dose aspirins (162-mg total), or up to one 5-grain, 325-mg aspirin tablet, based on what is available. (It is not necessary to give more than two low dose aspirin.) The aspirin must be chewed before swallowing.

Be sure that you only give aspirin and not acetaminophen (e.g., Tylenol®) or nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen (e.g., Motrin® or Advil®) or naproxen (e.g., Aleve®). These medications do not work the same way aspirin does and are not beneficial for a person who is experiencing a heart attack. Enteric-coated aspirin is fine to administer as long as it is chewed.

3-3 CARDIAC ARREST

Cardiac arrest is a life-threatening emergency that may be caused by a heart attack, drowning, electrocution, respiratory arrest or other conditions. Cardiac arrest occurs when the heart stops beating or beats too irregularly or weakly to circulate blood effectively. Cardiac arrest can occur suddenly and without warning. In many cases, the

victim has already been experiencing the signs and symptoms of a heart attack. However, sudden cardiac arrest is often the first sign of sudden death. The signs of a cardiac arrest include:

- Sudden collapse
- Unresponsiveness
- Abnormal breathing
- No pulse

3-4 CPR

A victim who is unresponsive, not breathing normally and has no pulse is in cardiac arrest and needs CPR (Figure 3-3). The objective of CPR is to perform a combination of effective chest compressions and ventilations to circulate blood that contains oxygen to the victim's brain and other vital organs. In most cases, CPR is performed in cycles of 30 chest compressions followed by 2 ventilations.

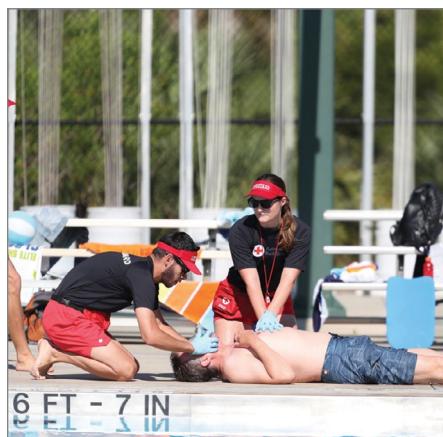


Figure 3-3 | CPR is delivered in cycles of chest compressions and ventilations.

Summoning EMS personnel immediately is critical for the victim's survival. If an AED is available, it should be used in combination with CPR and according to local protocols until EMS personnel take over.

One component of CPR is chest compressions. To ensure optimal victim outcomes, high-quality CPR must be performed. You can ensure high-quality CPR by providing high-quality chest compressions, making sure that the:

- Victim is on a firm, flat surface to allow for adequate compression, such as the floor or ground.
- Chest is exposed to ensure proper hand placement and the ability to visualize chest recoil.
- Hands are correctly positioned with the heel of one hand in the center of the chest on the lower half of the victim's sternum, with the other hand on top. Most responders find that interlacing their fingers makes it easier to provide compressions while keeping the fingers off the chest.

- Arms are as straight as possible, with the shoulders directly over the hands to promote effective compressions. Locking elbows will help maintain straight arms.
- Compressions are given at the correct rate—at least 100 per minute to a maximum of 120 per minute—and at the proper depth to ensure adequate circulation:
 - For an adult, compress the chest at least 2 inches, but no more than 2.4 inches.

For more details, see Table 3-1.

Chest Compression Fraction

Chest compression fraction, or CCF, is the term used to denote the proportion of time that chest compressions are performed. It represents the fraction of time spent performing compressions; that is, the time that the responders are in contact with the victim's chest, divided by the total time of the resuscitation, beginning with the start of CPR until CPR is stopped, for whatever reason. Expert consensus identifies a CCF of at least 60 percent to promote optimal outcomes, with a goal of 80 percent.

To achieve the best CCF percentage, a coordinated team approach is needed, with each member assuming specific roles, anticipating the next action steps for yourself and other team members. This coordinated team approach also includes integrating and assimilating additional safety members and EMS personnel who arrive on the scene.

Keep in mind that there are no national protocols in place for high-performance CPR. How you function within a team

setting, including how additional personnel assimilate into the team, may vary depending on your local protocols or practice.

Remember that when giving ventilations to a victim during CPR, you should:

- Maintain an open airway by keeping the head tilted back in the proper position.
- Seal the mask over the victim's mouth and nose.
- Blow into the one-way valve, ensuring that you can see the chest begin to rise and fall. Each ventilation should last about 1 second, with a brief pause between breaths to let the chest fall.

After ventilations, quickly reposition your hands on the center of the chest and start another cycle of 30 compressions and 2 ventilations.

Two-Rescuer CPR

When an additional rescuer is available, you should provide two-rescuer CPR. One rescuer gives chest compressions and the other gives ventilations (Figure 3-4). Rescuers should change positions (alternate giving compressions and ventilations) at least every 2 minutes (5 cycles of 30 compressions and 2 ventilations) to reduce rescuer fatigue, or during the analysis of the AED. Changing positions should take less than 5 seconds.

When CPR is in progress by one rescuer and a second rescuer arrives, the second rescuer should confirm whether EMS personnel have been summoned. If EMS personnel have not been summoned, the second rescuer should do so before getting the AED or assisting with care. If EMS personnel have been summoned, the second rescuer should get the AED, or if an AED is not available, help perform two-rescuer CPR.

When performing two-rescuer CPR on a child or infant, rescuers should change the compression-to-ventilation ratio from 30 compressions for every 2 ventilations (30:2) to 15 compressions for every 2 ventilations (15:2). This provides more frequent ventilations for children and infants. When providing two-rescuer CPR to an infant, rescuers should also perform a different technique, called the encircling thumbs technique.

Once you begin CPR, do not stop. Continue CPR until:

- You see an obvious sign of life, such as normal breathing or victim movement.

- An AED is ready to analyze the victim's heart rhythm.
- Other trained responders, such as a member of your safety team or EMS personnel, take over and relieve you from compression and ventilation responsibilities.
- You are alone and too exhausted to continue.
- The scene becomes unsafe.

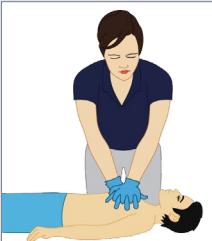
When performing CPR, the victim may vomit, there may be frothing at the nose and mouth, and the scene may be chaotic. The victim also may produce agonal breaths. Remember that agonal breaths are not normal breathing—this victim needs CPR.

Understand that, despite your best efforts, not all victims of cardiac arrest survive.



Figure 3-4 | During two-rescuer CPR, one rescuer gives ventilations and the other gives chest compressions.

Table 3-1: Summary of Techniques for CPR—Adult, Child and Infant

	Adult	Child	Infant
Hand position	Heel of one hand in center of chest (on lower half of sternum) with the other hand on top		Two fingers on the center of the chest (just below the nipple line)
			
Compression depth	At least 2 inches (Try to avoid greater than 2.4 inches if using a feedback device.)	About 2 inches	About 1½ inches
Ventilations	Until chest begins to rise (about 1 second per ventilation)		
Cycles (one rescuer)	30 chest compressions and 2 ventilations		
Cycles (two rescuers)	30 chest compressions and 2 ventilations	15 chest compressions and 2 ventilations	
Rate	Between 100 and 120 compressions per minute		

3-5 AEDs

An automated external defibrillator (AED) is a portable electronic device that analyzes the heart's rhythm and provides an electrical shock (Figure 3-5). Defibrillation is the delivery of an electrical shock that may help re-establish an effective rhythm. CPR can help by supplying blood that contains oxygen to the brain and other vital organs. However, the sooner an AED is used, the greater the likelihood of survival. You must assess victims quickly and be prepared to use an AED in cases of cardiac arrest.



Figure 3-5 | An AED

Did You Know?

For each minute CPR and defibrillation are delayed, the victim's chance for survival is reduced by about 10 percent.

When the Heart Stops

Any damage to the heart from disease or injury can disrupt the heart's electrical system, which normally triggers the contraction—or pumping action—of the heart muscle. This disruption can result in an abnormal heart rhythm, possibly stopping circulation. Two common treatable abnormal rhythms that cause sudden cardiac arrest are **ventricular fibrillation (VF)** and pulseless **ventricular tachycardia (VT)**. In VF, the ventricles quiver, or fibrillate, without any organized rhythm, and the electrical impulses fire at random, creating chaos and preventing the heart from pumping and circulating blood. There is no normal breathing and no pulse. In pulseless VT, an abnormal electrical impulse controls

the heart. This abnormal impulse fires so fast that the heart's chambers do not have time to fill, and the heart is unable to pump blood effectively. As with V-fib, there is no normal breathing or pulse with pulseless VT.

In many cases, VF and VT can be corrected by early defibrillation. If VF or VT is not corrected, all electrical activity will eventually cease, a condition called **asystole**. Asystole cannot be corrected by defibrillation. You cannot tell what, if any, rhythm the heart has by feeling for a pulse. An AED will analyze the heart's rhythm and advise if shock should be applied.

Using an AED on Adults

When cardiac arrest occurs, use an AED as soon as it is available and ready. First, turn on the AED and follow the audible and visual prompts. Apply the AED pads as instructed and allow the AED to analyze the heart rhythm. Ensure that no one is touching the victim during the analysis. Continue to follow the prompts of the AED. If CPR is in progress when the AED arrives, do not interrupt chest compressions and ventilations until the AED is turned on, the AED pads are applied and the AED is ready to analyze the heart rhythm, unless you are the only rescuer able to operate the AED and perform CPR.

After a shock is delivered, or if no shock is advised, immediately resume chest compressions and continue performing about 2 minutes of CPR before the AED re-analyzes the heart rhythm. If there are 2 or more rescuers, you should change positions (alternate performing compressions and operating the AED) about every 2 minutes, or as the AED is analyzing the heart rhythm, in order to reduce rescuer fatigue. If at any time you notice an obvious sign of life, such as normal breathing or movement, stop CPR and monitor the victim's condition. Administer emergency oxygen, if available and you are trained and authorized to do so.

Using an AED on Children and Infants

While the incidence of cardiac arrest in children and infants is relatively low compared with that of adults, cardiac arrest does happen to young children. Causes of cardiac arrests in children include:

- Airway and breathing problems
- Traumatic injuries or accidents (e.g., drowning, motor-vehicle collision, electrocution and poisoning)
- A hard blow to the chest
- Congenital heart disease
- Sudden infant death syndrome (SIDS)

AEDs equipped with pediatric AED pads are capable of delivering the lower levels of energy considered appropriate for infants and children up to 8 years old or weighing less than 55 pounds.

Use pediatric AED pads and/or equipment for a pediatric victim, if available. If pediatric-specific equipment is not available, an AED designed for adults can be used on children and infants. Pediatric pads should not be used on adults.

Always follow local protocols, medical direction and the manufacturer's instructions. For a child or infant in cardiac arrest, follow the same general steps and precautions as when using an AED on an adult. If the pads risk touching each other because of the victim's smaller chest size, place one pad on the child's chest and the other on the back. For an infant, always place one pad on the chest and the other on the back.

DO'S AND DON'TS FOR AED USE

Do's

- **Do** make sure that no one is touching or is in contact with the victim or the resuscitation equipment before shocking a victim with an AED.
- **Do** use an AED if a victim is experiencing cardiac arrest as a result of traumatic injuries. Follow local protocols or practice.
- **Do** use an AED for a victim who is pregnant. The mother's survival is paramount to the infant's survival. Follow local protocols and medical direction.
- **Do** use an AED on a victim who has a pacemaker, other implantable cardioverter defibrillators or metal body piercings. To maintain safety, avoid placing the AED pads directly over these items. Position the pads so they are at least an inch away.

Don'ts

- **Do not** use alcohol to wipe the victim's chest dry. Alcohol is flammable.
- **Do not** touch the victim while the AED is analyzing. Touching or moving the victim could affect the analysis.
- **Do not** touch the victim while the device is defibrillating. You or someone else could be shocked.
- **Do not** defibrillate a victim when around flammable or combustible materials, such as gasoline or free-flowing oxygen. (If oxygen is being administered to a victim when an AED is ready to be used, make sure to close the tank before shocking.)
- **Do not** use an AED on a victim wearing a medication patch on the chest until the patch and medication are removed. With a gloved hand, remove any patches from the chest and wipe away any residual medication before applying the pads.

Special AED Situations

Some situations require special precautions when using an AED. These include using AEDs around water, on victims of trauma or hypothermia, or when confronted with AED protocols that differ than those discussed here. Be familiar with these situations, and know how to respond appropriately. Always follow manufacturer's recommendations.

AEDs Around Water

A shock delivered in water could harm rescuers or bystanders; however, AEDs are safe to use on victims who have been removed from the water. If the victim is in water:

- Remove the victim from the water before defibrillation. A shock delivered in water could harm rescuers or bystanders.
- Be sure that there are no deep puddles of water around you, the victim or the AED.
- Remove the victim's wet clothing to place the AED pads properly, if necessary.
- Dry the victim's chest and attach the AED pads (Figure 3-6).

If it is raining, take steps to make sure that the victim is as dry as possible and sheltered from the rain. Ensure that the victim's chest is wiped dry.

Do not delay defibrillation when taking steps to create a dry environment. AEDs are safe, even in rain and snow, when all precautions and manufacturer's operating instructions are followed. Avoid getting the AED or AED pads wet, and keep them out of any deep puddles of water, if possible.



Figure 3-6 | Before using an AED, be sure the victim is not lying in any puddles of water. Dry the victim's chest, then attach the AED pads.

Pacemakers and Implantable Cardioverter-Defibrillators

Pacemakers are small, implantable devices sometimes located in the area below the left collarbone. There may be a small lump that can be felt under the skin (Figure 3-7). An implantable cardioverter-defibrillator (ICD) is a miniature version of an AED that automatically prevents or corrects irregular heart rhythms. Sometimes, a victim's heart beats irregularly, even if the victim has a pacemaker or an ICD.

- If the implanted device is visible, or you know that the victim has one, do not place the AED pad directly over the device. This may interfere with the delivery of the shock. Adjust AED pad placement, if necessary, and continue to follow the AED instructions.
- If you are not sure whether the victim has an implanted device, use the AED as needed. It will not harm the victim or rescuer.
- Follow any special precautions associated with ICDs, but do not delay CPR or defibrillation.

It is possible to receive a mild shock if an implantable ICD delivers a shock to the victim while CPR is performed. This risk of injury to rescuers is minimal, and the amount of electrical energy involved is much lower than an AED.



Figure 3-7 | Scars or a small lump may indicate that the person has had some sort of device implanted.

Transdermal Medication Patches

A transdermal medication patch administers medication through the skin. The most common of these patches is the nitroglycerin patch, used by those with a history of cardiac disease. Since you might absorb nitroglycerin or other medications, remove the patch from the victim's chest with a gloved hand before defibrillation (Figure 3-8). Never place AED electrode pads directly on top of medication patches.



Figure 3-8 | Remove any type of transdermal medication patch from the victim's chest with a gloved hand before defibrillation.

Hypothermia

Hypothermia is a life-threatening condition in which the entire body cools because of its inability to keep itself warm. Some people who have experienced hypothermia have been resuscitated successfully, even after prolonged exposure to the cold.

If the victim is not breathing and does not have a pulse, begin CPR until an AED becomes available. Follow local protocols regarding whether you should use an AED in this situation.

If the victim is wet, follow these steps:

- Remove wet clothing, dry the victim's chest and protect the victim from further heat loss.
- Attach the AED pads.
- If a shock is indicated, deliver it, following the instructions of the AED.
- Follow local protocols regarding whether additional shocks should be delivered.
- Do not withhold CPR or defibrillation to re-warm the victim.
- Be careful not to unnecessarily shake a victim who has experienced hypothermia, as this could result in an irregular heart rhythm.

Chest Hair

Some victims may have excessive chest hair that may cause difficulty with pad-to-skin contact. Since the time it takes to deliver the first shock is critical, and chest hair rarely interferes with pad adhesion, attach the pads and analyze the heart's rhythm as soon as possible.

- Press firmly on the pads to attach them to the victim's chest. If you get a "Check pads" or similar message from the AED, remove the pads and replace them with new ones if available. The pad adhesive may pull out some of the chest hair, which may solve the problem, but most AED cases contain a safety razor to assist in hair removal.
- If you continue to get the "Check pads" message, remove the pads, quickly shave the victim's chest and attach new pads to the victim's chest.
 - When in doubt, or in a situation when only one set of pads is available, shave the chest first.

Trauma

If a victim is in cardiac arrest resulting from traumatic injuries, you should still use an AED. Administer defibrillation according to local protocols.

Metal Surfaces

It is safe to deliver a shock to a victim in cardiac arrest on a metal surface, such as bleachers, as long as appropriate safety precautions are taken. Care should be taken that defibrillation electrode pads do not contact the conductive (metal) surface and that no one is touching the victim when the shock button is pressed.

Jewelry and Body Piercings

You do not need to remove jewelry and body piercings when using an AED. Leaving them on the victim will do no harm. However, do **not** place the AED pad directly over metallic jewelry or body piercings. Adjust pad placement at least an inch away, if necessary, and continue to follow established protocols.

Pregnancy

The best way to care for a pregnant woman in cardiac arrest is the same for all victims, including CPR and use of an AED. The fetus has the best chance of survival if the mother survives the event, and care should not be altered for fear that the electrical shock from an AED may harm the fetus. Follow local protocols and medical direction.

AED Maintenance

For defibrillators to perform optimally, they must be maintained. AEDs require minimal maintenance. These devices have various self-testing features. Familiarize yourself with any visual or audible prompts the AED may have that warn of malfunction or a low battery. Read the operator's manual thoroughly, and check with the manufacturer to obtain all necessary information regarding maintenance.

If the machine detects any malfunction, you should inform management, who will contact the manufacturer. The device may need to be returned to the manufacturer for service. While AEDs require minimal maintenance, it is important to remember the following:

- Follow the manufacturer's specific recommendations for periodic equipment checks.

- Make sure that the batteries have enough energy for one complete rescue. (A fully charged backup battery should be readily available.)
- Make sure that the correct defibrillator pads are in the package and are properly sealed.
- Check any expiration dates on AED pads and batteries, and replace as necessary.
- After use, make sure that all accessories are replaced and that the machine is in proper working order before placing the unit back in service.
- If at any time the machine fails to work properly, or you recognize any warning indicators, discontinue use, place the unit out of service and contact the manufacturer immediately.

3-6 MULTIPLE-RESCUER RESPONSE

In the professional environment, more than two rescuers often respond to an emergency. In many cases, three or more rescuers provide care for an unresponsive victim. When an unresponsive victim has been removed from the water and needs CPR, care might begin with one rescuer until other rescuers arrive on the scene with additional equipment and begin assisting in providing care.

Roles for multiple-rescuer response for an unresponsive victim may include (Figure 3-9):

- **Circulation:** The rescuer provides compressions and also may operate the AED if giving care alone. If an additional rescuer is available, they should place the pads and operate the AED.
- **Airway:** The rescuer is positioned behind the victim's head to maintain an open airway and ensure the mask is positioned and sealed to provide effective ventilations.

Breathing: Two rescuers provide ventilations using a bag-valve-mask (BVM) resuscitator. Emergency oxygen may be attached to the BVM if rescuers are trained to administer emergency oxygen. If the victim vomits during CPR, the rescuer pauses CPR, rolls the victim on their side and clears the vomit from the victim's mouth by using a finger sweep or a suction device. After clearing the vomit, resume CPR starting with compressions.

Practice multiple-rescuer response drills regularly with your team. Each member of the team should be able to arrive on the scene and perform any of the roles necessary in providing the appropriate care.



Figure 3-9 | In a multiple-rescuer response for an unresponsive victim, professional rescuers work together to provide care.

High Performance CPR

High-performance CPR refers to providing high-quality chest compressions as part of a well-organized team response to a cardiac arrest. Coordinated, efficient, effective teamwork is essential to minimize the time not spent in contact with the chest to improve victim outcomes. Think about all of the activities performed during resuscitation, for example:

- AED pads are applied
- AED must charge
- Pocket mask or BVM may need to be repositioned
- Airway may need to be reopened
- Other personnel arrive on scene

- Responders switch positions
- Advanced airway may need to be inserted
- Pulse checks may be done

All of these activities could affect your ability to maintain contact with the victim's chest.

3-7 WRAP-UP

As a professional rescuer, you should be able to recognize and respond to cardiac emergencies, including heart attacks and cardiac arrest. To do this, you must understand the importance of the five links of the Cardiac Chain of Survival: early recognition of the emergency and early access to EMS, early CPR, early defibrillation, early advanced medical care and integrated post-cardiac arrest care.

When using an AED, always follow local protocols. AEDs are relatively easy to operate and generally require minimal training and retraining. Remember that AEDs are safe to use on victims who have been removed from the water, but you must first make sure you, the victim and the AED are not in deep puddles.

BENCHMARKS FOR PROFESSIONAL RESCUERS

Professional rescuers should:

- Minimize interruptions of high-quality chest compressions.
- Use the appropriate compression depth based on the victim's age.
- Maintain a chest compression fraction (CCF) of at least 60 percent, with a goal of 80 percent.
- Use the appropriate compression rate.
- Allow for a full chest recoil to allow blood to flow into the heart.
- Avoid rescuer fatigue by changing positions at least every 2 minutes.



CPR

One-Rescuer CPR

Notes:

- Size up the scene while forming an initial impression, use PPE, perform primary assessment and get an AED on the scene as soon as possible.
- Ensure the victim is on a firm, flat surface, such as the floor or a table.
- Expose the victim's chest to ensure proper hand placement and the ability to visualize chest recoil.

If the victim is not breathing and has no pulse:

1

Give **30** chest compressions.

- **Adult or child:** Place the heel of one hand in the center of the chest on the lower half of sternum with the other hand on top.
 - Keep your arms as straight as possible and shoulders directly over your hands.
- **Infant:** Place one hand on the infant's forehead. Place two or three fingers from your hand closest to the infant's feet on the center of the chest just below the nipple line. The fingers should be oriented so they are parallel not perpendicular to the sternum.
- Push hard, push fast.
 - Compress the chest at a depth of:
 - **Adult:** At least 2 inches but not more than 2.4 inches.
 - **Child:** About 2 inches.
 - **Infant:** 1½ inches.
 - Compress the chest at a rate of at least **100** per minute but no more than **120** per minute.
 - Let the chest fully recoil between each compression.





One-Rescuer CPR *continued*

2 Give **2** ventilations.

3 Perform cycles of **30** compressions and **2** ventilations.



Do not stop CPR except in one of the following situations:

- You see an obvious sign of life, such as normal breathing or victim movement.
- An AED is ready to analyze the victim's heart rhythm.
- Another trained responder or responders take over, such as a member of your safety team or EMS personnel, and relieve you from giving compressions or ventilations.
- You are alone and too exhausted to continue.
- The scene becomes unsafe.

Notes:

- Keep your fingers off the chest when performing compressions on an adult or child by interlacing your fingers.
- Use your body weight, not your arms, to compress the chest.
- Count out loud or to yourself to help keep an even pace.



Two-Rescuer CPR—Adult and Child

Notes:

- Size up the scene while forming an initial impression, use PPE, perform primary assessment and get an AED on the scene as soon as possible.
- Ensure the victim is on a firm, flat surface, such as the floor or a table.
- Expose the victim's chest to ensure proper hand placement and the ability to visualize chest recoil.

If the victim is not breathing and has no pulse:

1

Rescuer 2 finds the correct hand position to give chest compressions.

- Place two hands on the center of the chest.

2

Rescuer 2 gives chest compressions.

- Push hard, push fast.
 - Compress the chest at a depth of:
 - **Adult:** At least 2 inches but not more than 2.4 inches.
 - **Child:** About 2 inches.
 - Compress the chest at a rate of at least **100** per minute but no more than **120** per minute.

**3**

Rescuer 1 gives **2** ventilations.

4

Perform about **2** minutes of compressions and ventilations.

- **Adult:** Perform cycles of **30** compressions and **2** ventilations.
- **Child:** Perform cycles of **15** compressions and **2** ventilations.

**5**

Rescuers change positions at least every **2** minutes (**5** cycles of **30** compressions and **2** ventilations) and/or while the AED is analyzing the heart rhythm.



Two-Rescuer CPR—Adult and Child *continued*

- Rescuer 2 calls for a position change by using the word “change” at the end of the last compression cycle:
 - **Adult:** Use the word “change” in place of the word “thirty.”
 - **Child:** Use the word “change” in place of the word “fifteen.”
- Rescuer 1 gives **2** ventilations.
- Rescuer 2 quickly moves to the victim’s head with their own mask.
- Rescuer 1 quickly moves into position at the victim’s chest and locates correct hand position on the chest.
- Changing positions should take less than **5** seconds.

**6**

Rescuer 1 begins chest compressions.

- Continue cycles of compressions and ventilations.

Continue CPR until:

- You see an obvious sign of life, such as normal breathing or victim movement.
- An AED is ready to analyze the victim’s heart rhythm.
- Another trained responder or responders take over, such as a member of your safety team or EMS personnel, and relieve you from giving compressions or ventilations.
- You are alone and too exhausted to continue.
- The scene becomes unsafe.

Notes:

- *Keep your fingers off the chest when performing compressions on an adult or child by interlacing your fingers.*
- *Use your body weight, not your arms, to compress the chest.*
- *Count out loud to help keep an even pace.*



Two-Rescuer CPR—Infant

Notes:

- Size up the scene while forming an initial impression, use PPE, perform primary assessment and get an AED on the scene as soon as possible.
- Ensure the victim is on a firm, flat surface, such as the floor or a table.
- Expose the victim's chest to ensure proper hand placement and the ability to visualize chest recoil.

If the victim is not breathing and has no pulse:

1

Rescuer 2 finds the correct hand position to give chest compressions.

- Use the encircling thumbs technique to give chest compressions.
- Place thumbs next to each other on the center of the chest just below the nipple line.
- Place both hands underneath the infant's back and support the infant's back with your fingers.
- Ensure that your hands do not compress or squeeze the side of the ribs.
- If available, a towel or padding can be placed underneath the infant's shoulders to help maintain the head in the neutral position.



2

Rescuer 2 gives chest compressions.

- Push hard, push fast.
- Compress the chest about $1\frac{1}{2}$ inches at a rate of at least **100** compressions per minute but no more than **120** per minute.

3

Rescuer 1 gives **2** ventilations.



**Two-Rescuer CPR—Infant *continued***

- 4 Perform cycles of **15** compressions and **2** ventilations for about **2** minutes.
- 5 Rescuers change positions at least every **2** minutes and/or during the analysis of the AED.
 - Rescuer 2 calls for a position change by using the word “change” in place of saying “fifteen” at the end of the last compression cycle.
 - Rescuer 1 gives **2** ventilations.
 - Rescuer 2 quickly moves to the victim’s head with their own mask.
 - Rescuer 1 quickly moves into position at the victim’s chest and locates correct hand position on the chest.
 - Changing positions should take less than **5** seconds.
- 6 Rescuer 1 begins chest compressions.
 - Continue cycles of compressions and ventilations.

Continue CPR until:

- You see an obvious sign of life, such as normal breathing or victim movement.
- An AED is ready to analyze the victim’s heart rhythm.
- Another trained responder or responders take over, such as a member of your safety team or EMS personnel, and relieve you from giving compressions and ventilations.
- You are alone and too exhausted to continue.
- The scene becomes unsafe.

Note:

- *Count out loud to help keep an even pace.*



USING AN AED

Using an AED

Notes:

- Size up the scene while forming an initial impression, use PPE, perform primary assessment and get an AED on the scene as soon as possible.
- Ensure the victim is on a firm, flat surface, such as the floor or a table.

If the victim is not breathing and has no pulse:

1

Turn on the AED and follow the audible and/or visual prompts.

2

Expose the victim's chest and wipe it dry if necessary.



3

Attach the AED pads to the victim's bare, dry chest.

- Place one pad on the victim's upper right chest and the other pad on the left side of the chest.



- Child: Use pediatric AED pads, if available. If the pads risk touching each other, place one pad in the middle of the child's chest and the other pad on the child's back, between the shoulder blades.

- Infant: Always place one pad on the chest and the other on the back.





USING AN AED

Using an AED *continued*

4 Plug in the connector, if necessary.

5 Stand clear.

- Make sure that no one, including you, is touching the victim.
- Say, “Everyone, stand clear!”



6 Analyze the heart rhythm.

- Push the “Analyze” button, if necessary. Let the AED analyze the heart rhythm.



7 Deliver a shock or perform CPR based on the AED recommendation.

- If a shock is advised:
 - Make sure no one, including you, is touching the victim.
 - Say, “Everyone clear” in a loud commanding voice.
 - Deliver the shock by pushing the “Shock” button, if necessary.
 - After delivering the shock, perform about **2** minutes of CPR, starting with chest compressions.
- If no shock is advised:
 - Perform about **2** minutes of CPR, starting with chest compressions.
 - Continue to follow the prompts of the AED.



USING AN AED

Using an AED *continued*

Notes:

- If at any time you notice an obvious sign of life, such as normal breathing or victim movement, stop CPR and monitor the victim's condition.
- The AED will not advise a shock for normal or absent heart rhythms.
- If two trained rescuers are present, one should perform CPR while the second rescuer operates the AED.
- Do not interrupt CPR (chest compressions and ventilations) until the AED pads are applied and the AED is turned on and ready to analyze unless you are the only rescuer able to operate the AED and perform CPR.
- If there are multiple responders, they should:
 - Hover with their hands a few inches above the chest during the AED analysis and the shock (if indicated) to minimize interruptions to resuming CPR.
 - Resume compressions immediately following the delivery of a shock or after the AED determines that no shock is advised.
 - Switch responsibility for compressions each time the AED performs an analysis to limit their fatigue.
 - Do not wait for the AED to deliver a "resume CPR" prompt before resuming compressions.

GLOSSARY

Abandonment – Ending care of an ill or injured person without that person's consent or without ensuring that someone with equal or greater training will continue that care.

Abdomen – The middle part of the trunk (torso) containing the stomach, liver and other organs.

Abrasions – A wound in which skin is rubbed or scraped away.

Agonal breaths – Isolated or infrequent breaths in the absence of normal breathing in an unresponsive person.

AIDS – When an infected person has a significant drop in a certain type of white blood cells or shows signs of having certain infections or cancers caused by an HIV infection.

Airway adjunct – A mechanical device to keep a victim's airway clear.

Anaphylactic shock – A severe allergic reaction in which air passages may swell and restrict breathing; a form of shock. See also anaphylaxis.

Anaphylaxis – A severe allergic reaction; a form of shock. See also anaphylactic shock.

Anatomical airway obstruction – Complete or partial blockage of the airway by the tongue or swollen tissues of the mouth or throat.

Antihistamine – Drug used to treat the signals of allergic reactions.

Aquatic environment – An environment in which recreational water activities are played or performed.

Ashen – A grayish color; darker skin often looks ashen instead of pale.

Assess – To examine and evaluate a situation carefully.

Asthma – A condition that narrows the air passages and makes breathing difficult.

Asystole – A condition in which the heart has stopped generating electrical activity.

Automated external defibrillator (AED) – An automatic device used to recognize a heart rhythm that requires an electric shock and either delivers the shock or prompts the rescuer to deliver it.

Bag-valve-mask (BVM) resuscitator – A handheld breathing device used on a victim in respiratory distress or respiratory arrest. It consists of a self-inflating bag, a one-way valve and a mask; can be used with or without supplemental oxygen.

Bandage – Material used to wrap or cover an injured body part; often used to hold a dressing in place.

Benchmarks – A set of standards used as a point of reference for evaluating performance or level of quality.

Bloodborne pathogens – Bacteria and viruses present in blood and body fluids that can cause disease in humans.

Bloodborne pathogens standard – A federal regulation designed to protect employees from exposure to bodily fluids that might contain a disease-causing agent.

Body substance isolation (BSI) precautions – An approach to infection control that considers all body fluids and substances to be infectious.

Bone – A dense, hard tissue that forms the skeleton.

Bystanders – People at the scene of an emergency who do not have a duty to provide care.

Carbon monoxide – A clear, odorless, poisonous gas produced when carbon or other fuel is burned, as in gasoline engines.

Cardiac arrest – A condition in which the heart has stopped or beats too ineffectively to generate a pulse.

Chest – The upper part of the trunk (torso) containing the heart, major blood vessels and lungs.

Chronic – Persistent over a long period of time.

Confidentiality – Protecting a victim's privacy by not revealing any personal information learned about a victim except to law enforcement personnel or emergency medical services personnel caring for the victim.

Consent – Permission to provide care given by an ill or injured person to a rescuer.

CPR – A technique that combines chest compressions and rescue breaths for a victim whose heart and breathing have stopped.

Cyanosis – A blue discoloration of the skin around the mouth and fingertips resulting from a lack of oxygen in the blood.

Defibrillation – An electrical shock that disrupts the electrical activity of the heart long enough to allow the heart to spontaneously develop an effective rhythm on its own.

Diabetes – A condition in which the body does not produce enough insulin or does not use insulin effectively enough to regulate the amount of sugar (glucose) in the bloodstream.

Direct contact transmission – Occurs when infected blood or body fluids from one person enter another person's body at a correct entry site.

Droplet transmission – Transmission of disease through the inhalation of droplets from an infected person's cough or sneeze.

Drowning – Death by suffocation in water.

Drug – Any substance other than food intended to affect the functions of the body.

Duty to act – A legal responsibility of certain people to provide a reasonable standard of emergency care; may be required by case law, statute or job description.

Emergency – A sudden, unexpected incident demanding immediate action.

Emergency medical services (EMS) personnel

Trained and equipped community-based personnel dispatched through a local emergency number to provide emergency care for injured or ill people.

Emphysema – A disease in which the lungs lose their ability to exchange carbon dioxide and oxygen effectively.

Engineering controls – Safeguards intended to isolate or remove a hazard from the workplace.

Epinephrine – A form of adrenaline medication prescribed to treat the symptoms of severe allergic reactions.

Fibrillation – A quivering of the heart's ventricles.

Forearm – The upper extremity from the elbow to the wrist.

Fracture – A chip, crack or complete break in bone tissue.

Hepatitis B – A liver infection caused by the hepatitis B virus; may be severe or even fatal and can be in the body up to 6 months before symptoms appear.

Hepatitis C – A liver disease caused by the hepatitis C virus; it is the most common chronic bloodborne infection in the United States.

HIV – A virus that destroys the body's ability to fight infection. A result of HIV infection is referred to as AIDS.

Hypothermia – A life-threatening condition in which cold or cool temperatures cause the body to lose heat faster than it can produce it.

Hypoxia – A condition in which insufficient oxygen reaches the cells, resulting in cyanosis and changes in responsiveness, breathing and heart rates.

Incident – An occurrence or event that interrupts normal procedure or brings about a crisis.

Indirect contact transmission – Occurs when a person touches objects that have blood or body fluid of an infected person, and that infected blood or body fluid enters the body through a correct entry site.

Injury – The physical harm from an external force on the body.

Jaundice – Yellowing of the skin and eyes.

Joint – A structure where two or more bones are joined.

Mechanical obstruction – Complete or partial blockage of the airway by a foreign object, such as a piece of food or a small toy, or by fluids, such as vomit or blood.

Muscle – Tissue in the body that lengthens and shortens to create movement.

Myocardial infarction – A heart attack.

Nasal cannula – A device used to deliver oxygen to a breathing person; used mostly for victims with minor breathing problems.

Negligence – The failure to follow the standard of care or to act, thereby causing injury or further harm to another.

Non-rebreather mask – A mask used to deliver high concentrations of oxygen to breathing victims.

Occupational Safety and Health Administration (OSHA) – A government agency that helps protect the health and safety of employees in the workplace.

Opportunistic infections – Infections that strike people whose immune systems are weakened by HIV or other infections.

Oxygen – A tasteless, colorless, odorless gas necessary to sustain life.

Oxygen delivery device – Equipment used to supply oxygen to a victim of a breathing emergency.

Pathogen – A disease-causing agent. Also called a microorganism or germ.

Poison – Any substance that causes injury, illness or death when introduced into the body.

Professional rescuers – Paid or volunteer personnel, including lifeguards, who have a legal duty to act in an emergency.

Refusal of care – The declination of care by a victim; the victim has the right to refuse the care of anyone who responds to an emergency.

Respiratory arrest – A condition in which breathing has stopped.

Respiratory distress – A condition in which breathing is difficult.

Respiratory failure – Breathing difficult that begins to shut down the respiratory system and may lead to respiratory arrest.

Resuscitation mask – A pliable, dome-shaped device that fits over a person's mouth and nose; used to assist with rescue breathing.

Seizure – A disorder in the brain's electrical activity, marked by loss of consciousness and often by convulsions.

Shock – A life-threatening condition in which the circulatory system fails to deliver blood to all parts of the body, causing body organs to fail.

Standard of care – The minimal customary and quality of care expected of an emergency care provider.

Standard precautions – Safety measures, such as body substance isolation, taken to prevent occupational-risk exposure to blood or other potentially infectious materials, such as body fluids containing visible blood.

Sterile – Free from germs.

Stoma – An opening in the front of the neck through which a person whose larynx has been removed breathes.

Stroke – A disruption of blood flow to a part of the brain, causing permanent damage.

Submerged – Underwater, covered with water.

Suctioning – The process of removing foreign matter from the upper airway by means of manual device.

Universal precautions – Practices required by the federal Occupational Safety and Health Administration to control and protect employees from exposure to blood and other potentially infectious materials.

Universal sign for choking – Clutching of the throat by a responsive person due to an airway blockage.

Vector-borne transmission – Transmission of a disease by an animal or insect bite through exposure to blood or other body fluids.

Ventricles – The two lower chambers of the heart.

Ventricular fibrillation (V-fib) – An abnormal heart rhythm characterized by disorganized electrical activity, which results in the quivering of the ventricles.

Ventricular tachycardia (V-tach) – An abnormal heart rhythm characterized by rapid contractions of the ventricles.

Wheezing – The hoarse whistling sound made when inhaling and/or exhaling.

Work practice controls – Employee and employer behaviors that reduce the likelihood of exposure to a hazard at the job site.

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