



ELLISEDUCATION
SERVICES

COMMUNITY CPR & AED

Helping Others With Emergency Care



MEETS CURRENT ILCOR CPR & ECC GUIDELINES



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Chapter 1

Introduction to Emergency Care

Learning Outcomes

After reading this chapter and completing any related course work, you will be able to:

- Recognize the significance of injuries and medical emergencies.
- Define first aid.
- Describe basic life support.
- Identify legal considerations when providing emergency care.
- Provide examples of conditions when emergency medical services (EMS) should be called.
- Identify questions a dispatcher is likely to ask when you call 9-1-1.
- Describe steps you can take to prevent disease transmission during first aid.

Chapter Quick Look

- Knowing what to do matters
- Basic Life Support
- Emergency care and the law
- Recognizing an Emergency and taking action
- Scene safety
- Understanding how disease is transmitted
- Checking for responsiveness
- Calling for help (EMS)

Knowing What to do Matters

Emergencies can happen anywhere, and at any time. Knowing what to do can save lives and reduce the consequences of injuries and medical emergencies. Each year more than 800,000 people in the United States die from heart disease, making it the number one killer in America. More than 300,000 of these deaths occur from sudden cardiac death (arrest). Unintentional injury is another significant cause of death, claiming more than 130,000 lives annually.

First Aid is the immediate care provided to an ill or injured victim. This care may be as minimal as washing a wound and applying a bandage, with no further need for assistance. But it could also involve more extensive care for serious conditions requiring **Emergency Medical Services (EMS)** and hospital care.

In serious situations you need to know how to summon more advance medical personnel, what care to give immediately, and how to provide continued care until more qualified help arrives.

Basic Life Support

The care provided by laypersons in the first few minutes for those experiencing conditions such as breathing and heart emergencies is referred to as **basic life support (BLS)**. BLS is provided for adults, children, and infants, and involves specific skills that you will learn in this course to help you save lives, including:

- Clearing an airway obstruction for a person who is choking.
- Helping someone experiencing a life threatening sudden illness
- Providing **Cardiopulmonary Resuscitation (CPR)** for a victim of assumed cardiac arrest, including using an accessible Automated External Defibrillator (AED) to correct specific electrical disturbances within the heart (**Figure 1.1**).

Figure 1.1



CPR and AEDs save lives.

Emergency Care & the Law

Though laws vary somewhat from state to state, there are several basic legal considerations that you should be aware of when rendering emergency care:

Good Samaritan Laws. State laws enacted to protect responders from legal actions that might arise from emergency care provided while not in the line of duty. These laws vary from state to state but are generally designed to encourage bystanders to help someone in need of assistance. When acting in good faith and without negligence, you are afforded protection.

Negligence. Negligence is the failure to follow a reasonable standard of care, which causes or contributes to injury or damage.

Abandonment. Abandonment involves leaving a victim without returning after you started to give care (or had a responsibility to provide care) without first ensuring the victim will receive care at an equal or higher level.

Duty to act. Most laypersons do not have a legal duty to act. But this could apply to you in these situations:

- Your job requires you to render care, such as the designated first aid responder established to meet Occupational Safety and Health Administration (OSHA) requirements for a safe workplace.
- A pre-existing relationship to others makes you responsible for their well-being, such as a parent's responsibility to his or her child.

Consent. To provide care you must first obtain consent from an ill or injured victim, either verbally or through understood gestures. If a victim is unable to grant consent due to mental impairment, confusion, or loss of consciousness, then consent is implied. In this case, the law assumes that people experiencing a medical emergency would grant consent if they were able to do so.

Recognizing an Emergency

Some indications that an emergency exists include unusual sights, sounds, odors, appearances, and actions. Examples of possible emergencies include:

- Smoke or fire
- Screaming
- Screeching tires
- Sounds of a collision
- Collapsing structure
- Downed electrical wires
- Strong odors
- A person collapsing

If something seems out-of-the-ordinary, it may mean that an emergency is in progress or perhaps it means that something that will result in an emergency is about to happen. Your ability to recognize an emergency and subsequently take action may save a life!

Taking Action

Everyone acts differently when confronted with an emergency, and training helps individuals act more appropriately. Some people worry about taking action. They must first overcome concerns that may delay their actions.

Common factors that keep people from acting include:

- Assuming others will act
- Fear of making a mistake / potential liability
- Fear of disease transmission
- Uncertainty about the care to provide or ability to make a difference

You may be the first person to encounter the emergency or the first with skills to help - it will be up to you to take action! Never assume that other bystanders will help or that “those responsible to help” will arrive quickly. You may be the best trained person at the scene of the emergency. While others may panic, you can keep a cooler head. If others are also on the scene, ask one or several to also help. If you take charge of the scene until professional rescuers arrive or EMS responds, you will give the person in need of help, the best chance of survival.

The care steps you will learn in this course are few, simple and follow common sense. With this in mind, do not fear doing anything wrong. If you are uncertain about the need for EMS or about the care to provide, it is still better to call. Dispatchers will provide you with instructions for care. Follow the steps of care that you learn in this manual and course and you will be providing appropriate care until higher level care can be provided.

Ensuring your Safety at the Scene

When you encounter someone needing assistance, it is important to first quickly determine if it is safe for you to directly help. This action is known as **Survey the Scene** for safety. While maintaining a safe distance, checking the scene for safety involves you using your senses to determine the answers to the following questions:

- What might have caused this situation and what might be wrong with the person or people in need of assistance?
- Are there any existing or potential dangers to myself or others?
- If dangers are present, is there a way for me to eliminate them?
- Do I have what I need by way of equipment or supplies to safely help this person? If not, is there a bystander who may be able to retrieve these items?



While you may not be able to fully know what happened or what you may need until you enter the scene, it is critical that you are certain that there are no immediate or potential dangers present before proceeding. Also, it is important to remember that while there may not be any dangers at present, this could change and you need to remain vigilant to any emerging threats to your safety. If dangers are present and you are unable to eliminate them, your remaining option is to call 9-1-1. By calling 9-1-1, you can request the professional emergency services needed to handle the dangers of the scene. For example, requesting police if the scene is dangerous due to criminal activity, or the fire department if there is a fire.

Disease Transmission Risks to Your Safety

With few exceptions, your risk of acquiring a harmful disease from the person you are trying to help is extremely low (the exceptions being pandemic situations or when it is known that the person you are helping has such a disease and is contagious). Generally speaking, you are no more likely to acquire an illness from a victim of cardiac arrest through the act of CPR, than you would be through any other close interaction. In fact, given that most cardiac arrests happen in or around the victim's home, it is very likely that if you do encounter someone needing CPR (or similar care), it will be a family member. You routinely share airborne and possibly even bloodborne pathogens with your family, simply by being in regular close contact. This means you likely already have been exposed to any potential disease causing pathogen. Depending on your frequency of contact with your co-workers and friends, this may be true for them as well.

While most people would not think twice about helping a family member without concern for possible pathogens, performing close contact care, such as CPR to a complete stranger may be a different story. To help reduce these concerns, it is important to understand how pathogens cause disease.

Regardless of the pathogen in question, there are three conditions that must be met for disease transmission to occur:

- The pathogen must be present in adequate quantity to cause disease.
- A person must be susceptible to the pathogen.
- The pathogen must enter the body through an opening such as the eyes, nose, mouth, mucus membrane, skin cuts, abrasions, bites, needlestick, or puncture with a contaminated object.

Under normal circumstances, your primary risk for disease transmission is from **bloodborne pathogens** - *but only if blood or other body substances are present at the scene*. If body substances are present, transmission might occur if infected body substances splash into your eyes, nose, mouth, or comes into contact with an open sore (even just a scratch) on your skin. Transmission of select viruses and bacteria can sometimes occur through direct contact with a person or indirect contact with a contaminated object such as soiled clothing or surface. Disease transmission may also occur when the skin is penetrated by an infectious source, such as an insect bite or sting.

Accidental punctures with sharp objects such as needles is a common means for this type of transmission. However, any sharp object that punctures the skin may contain an adequate pathogenic load to confer disease. The pathogen may even be present on your skin, at or near the location of the puncture and this may be how it enters your body (which is why medical professionals always use an alcohol wipe to prepare the location of any injection).

You may be at risk for the transmission of **airborne pathogens** if an infected person is in your immediate vicinity and coughs or sneezes. This produces aerosols and droplets which may broadcast for several feet. To become infected, you may inhale those aerosols or make contact with infected droplets on the surfaces on which they land. Touching or handling something contaminated with an infected respiratory droplet or body fluid and then later touching your mouth, nose, or eyes is a common means of pathogen transmission. You may also inhale the airborne pathogen if you are performing an **aerosol generating procedure**, such as when performing CPR to someone who is infected and contagious with an airborne pathogen.

Standard Precautions and PPE

Standard Precautions are measures put in place to reduce the risk of disease transmission. For your protection, you assume that all body substances which originate from the victim during care are contaminated. Body substances include both bodily fluids and aerosols (such as exhaled breath). With this in mind, you can protect yourself through the use of **personal protective equipment (PPE)**.

PPE provides effective barriers between yourself and the victim of a sudden illness, injury, or life threatening condition (**Figure 1.3**). Healthcare providers of CPR and other individuals with the expectation to help during an emergency are given PPE by their employers since it is a necessity of their job or function.

Examples of PPE that may be used by those with the responsibility to act, include:

- Medical exam gloves to avoid contact with bodily fluids.
- Breathing devices to avoid contact with bodily fluids and airborne disease.
- Goggles or eye glasses with side shields to protect against fluid splatter.
- Gowns that can cover the entire body.
- Hand sanitizer for sanitizing hands immediately after providing care.

Common sense hygiene practices, such as proper hand washing can always be done and at a minimum are always recommended. Where you may have control (such as your home) you may take measures that isolate or remove a particular danger, reducing the risk of disease transmission. This can be done by having PPE such as nitrile gloves and a resuscitation mask readily available. If a mask is not possible, small barrier devices that could be stored on a key chain are also available (**Figure 1.4**). You can also protect yourself from pathogens through clean up procedures when a surface or an equipment item used becomes potentially contaminated.

To prevent disease transmission when providing first aid or basic life support:

- Use barriers, such as rescue breathing shields and disposable nitrile gloves, to avoid contact with blood or body fluids.
- Use resuscitation masks for more protection during CPR (rescue breathing).
- If you are unwilling to include rescue breaths with CPR because of disease transmission risk, perform **Compression Only CPR** (described in Chapter 3)
- Do not eat, drink or touch your mouth, nose or eyes when giving care.
- Wash your hands thoroughly with clean, running water and soap (hand rubbing with soap for at least 20 seconds), or use hand sanitizer, after giving care.
- Do not touch any items soiled with bodily fluids.
- Clean and disinfect any surfaces where bodily fluids such as blood have spilled.

Figure 1.3



Personal protective equipment includes items such as gloves and breathing masks.

Figure 1.4



Example of a barrier device that may be used if a resuscitation mask is not available

The Centers for Disease Control (CDC) recommend a mixture of 1 part household bleach to 9 parts cool water. Let this sit for 20 minutes and then wipe it up.

- Dispose of all soiled items properly (**Figure 1.5**).

If you come in contact with an injured or ill victim's bodily fluids while providing first aid or basic life support, remove and launder exposed clothing and thoroughly clean potentially exposed body surfaces. Seek advice from a physician, including an in office evaluation. In a workplace setting, follow your company's exposure control plan for reporting the incident and follow-up (post-exposure) evaluation.

Figure 1.5



Dispose of soiled items properly.

Checking for Responsiveness

Once you have determined that the scene is safe, enter the scene and approach the person in need of assistance. If the person is obviously conscious and alert, identify yourself and try to find out what has happened (see chapter 2). If you approach and it is not clear if the victim is alert or the victim is motionless on the ground, you will need to check for responsiveness (**Figure 1.6**).

Tap and Shout

To check for responsiveness, **Tap and Shout**:

- Kneel next to the victim, near the head
- Gently tap the shoulders as you shout: **"Are you OK?"** or **"Can you hear me?"**

Figure 1.6



Check a motionless victim for responsiveness using the **Tap and Shout**

Do this for a few seconds. If the victim does not respond to the gentle pressure you are applying along with the loud verbal questioning, you should consider the victim to be **unresponsive**. You should also consider the victim to be unresponsive if your taps and shouts result in an awakening that is only sustained with further "taps and shouts". The victim is also unresponsive if, once awakened, appears to be mentally incoherent or intoxicated. To be **responsive**, the victim should remain awake without further stimulation and be mentally aware enough to respond to your questions. If you have determined that the victim is unresponsive, it is critical that 9-1-1 be called and EMS requested, as soon as possible. Even if the victim is breathing, medical care is needed if they remain unresponsive.

Calling for Help

9-1-1 is the emergency number to call in most parts of the United States (**Figure 1.6**). Call for medical help if after checking the person in need of help, you find that:

- The person is unresponsive (as described previously)
- The person is having a seizure
- The person is having difficulty breathing (see chapter 2)
- The person reports chest pain or pressure or is demonstrating signs of a stroke (see chapter 2)
- The person has a serious wound that involves bleeding or an extensive burn
- Vomiting blood or any uncontrolled vomiting
- The person reports severe abdominal pain or pressure
- The person suffered a blow to the head, neck, or back, or has possible broken bones (e.g. fractured arm or leg), dislocations, or sprains
- The safety of the scene cannot be maintained or controlled
- If you are unsure if EMS is needed, always err on the side of calling

Figure 1.6



Call 9-1-1 for police, fire, and emergency medical services.

If you are alone at the scene, start by calling 9-1-1 on your mobile phone as you initiate care (or if a land line phone is immediately available). If you are not alone, directly task another person at or near the scene with making the call. Do this by pointing at the individual you have selected and stating loudly and clearly: “You there, do have a phone? Call 9-1-1 and request EMS.” “Inform the dispatcher that someone trained in CPR is at the scene providing care.” (Or something similar to this). Once the bystander begins speaking with the dispatcher, ask for the phone to be placed on speaker and set it near the victim as you continue care.

If the bystander needs to leave the scene to make the call (due to poor reception, or no mobile phone), make it clear that they need to immediately return to you to report that EMS is on the way. Another important task to be performed by a different bystander or by the bystander upon their return is the retrieval of any accessible rescue equipment, especially an AED.

When you or a bystander call 9-1-1 the dispatcher will ask a few questions to gather important information or to confirm what information appears on the dispatcher’s screen. If the call is being made on a mobile phone, the dispatcher may not have a precise location, it may be incomplete, or it may be completely incorrect. Make sure that the location of the victim is not in doubt to avoid unnecessary delays in the arrival of EMS.

Do not hang up the phone until the dispatcher advises to do so. Dispatchers can give specific instructions for care until EMS personnel arrive, so if you are unsure about any care you are providing, request their help.

When you call 9-1-1:

- Place mobile phone in speaker mode and set next to the victim (if mobile)
 - Continue to talk with the dispatcher as you provide any needed care to the victim
- Provide your name and phone number to the dispatcher
- Provide the location of the victim
 - Confirm physical address or approximate cross streets
 - Specify the location within a building or sprawling environment
- Detail how many people need help and condition of the victim(s)
 - Provide updates when appropriate while the dispatcher remains on the call
- Describe what happened or believe happened
- Confirm that care is being provided
 - Specify what care is being provided while the dispatcher remains on the call
- If you need the dispatcher to help you with care, let them know right away
- Never hang up - wait for the dispatcher to hang up the call. The dispatcher will likely want to remain on the call until EMS personnel arrive at the scene

When You are Alone without a Phone at the Scene

If you are alone and you do not have a mobile phone available, and the victim is unresponsive over the age of 8 years, you need to make sure EMS is on the way before beginning care. If this means you need to leave the scene, place the victim in the recovery position (see chapter 2) and quickly make the call. However, if the unresponsive victim is under the age of 8 years and you are alone without immediate access to a phone, initiate care first (for about two minutes) before pausing to locate a phone to make the call. If it is safe to do so, carefully carry the child with you to make the call.

You “phone first” for adults (over the age of 8 years) who are unresponsive, because their condition is most likely cardiac (heart related) in nature. As such, getting EMS to the scene as quickly as possible will afford an adult victim the best chance for survival. However, you “phone fast” for any unresponsive child or infant and perform about two minutes of care before phoning EMS. This is because an infant or a child is most likely to be unresponsive due to a respiratory issue and your *immediate* care may result in the victim to begin breathing normally.

Chapter One Review

Key Terms

- Abandonment
- Basic life support (BLS)
- Cardiopulmonary resuscitation (CPR)
- Consent
- Duty to act
- Disease transmission
- Emergency medical Services (EMS)
- First Aid
- Good Samaritan Laws
- Negligence
- Personal protective equipment (PPE)
- Pathogens (Airborne and Bloodborne)
- Scene safety
- Standard Precautions

Key Points

- ✓ Bystanders are often the first on the scene capable of rendering basic care for a victim with a breathing or cardiac problem.
- ✓ “Good Samaritans” are given legal protections if they provide reasonable care - acting in good faith (after first gaining consent from a responsive victim).
- ✓ You should always make sure the scene is safe for yourself and others before attempting to directly help. If the scene is unsafe, call 9-1-1.
- ✓ Your risks for contracting a harmful disease while providing CPR and similar care are very low, even without PPE. However, following Standard Precautions and using PPE (if available) will further reduce those risks.
- ✓ If a victim is found to be unresponsive, EMS must be called and an accessible AED retrieved (if available) as soon as possible.

Check Your Progress

Now that you have read this chapter and completed any accompanying class activities, answer the following questions:

- ✓ What are some basic legal considerations that apply to emergency care?
- ✓ What are you looking for when you survey the scene?
- ✓ Where do most cardiac arrests occur?
- ✓ What are the risks of disease transmission during CPR and what precautions can you take?
- ✓ What are some reasons for calling 9-1-1 and what information will the dispatcher likely ask when you or a bystander calls?
- ✓ What should you do if you are alone and do not have access to a phone at the scene?

Chapter 2

Assessing Medical Emergencies

Learning Outcomes

After reading this chapter and completing any related course work, you will be able to:

- Describe the basic function of the respiratory and circulatory systems.
- Describe recommended care for victims of cardiopulmonary emergencies, including: respiratory distress, opioid overdose, heart attack, and stroke.
- Describe the purpose of the primary check and how to determine if an unresponsive victim is breathing adequately to sustain life.
- Demonstrate placing an unresponsive victim who is breathing into the recovery position.
- Describe the purpose of the secondary check when assessing a victim.
- Demonstrate how to assess responsive and unresponsive victims using the primary and secondary check.

Chapter Quick Look

- Cardiopulmonary system and associated medical emergencies
- Primary Check
- Secondary Check

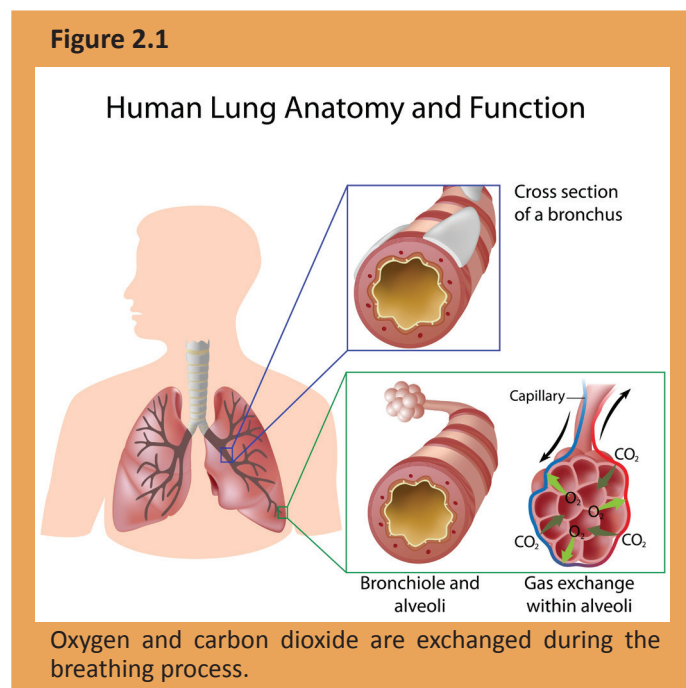
Cardiopulmonary System and Medical Emergencies

When you encounter someone who is responsive but in need of assistance, it is critical that you are able to recognize any signs of medical emergencies that may become life threatening. Your quick assessment and basic care may save the victim's life and avoid needing to provide CPR at the scene.

While there are many sudden medical emergencies that may be life threatening, the ones of most concern are those directly affecting the **cardiopulmonary system** (the combined respiratory and circulatory systems). If these emergencies are not identified and cared for quickly, cardiac arrest is a likely result.

How We Breathe and Respiratory Emergencies

Breathing is normally an effortless process. It involves inhaling **oxygen** from the air into the lungs, and exhaling by-product such as **carbon dioxide**. Air entering the mouth and nose is filtered, warmed, and humidified before passing down the throat and entering the windpipe and the lungs. Deep within the lungs tiny air sacs (alveoli) exchange oxygen and carbon dioxide through small blood vessels known as capillaries (**Figure 2.1**). This continuous process is necessary to sustain life. Any interruption in this process can result in death within minutes.



Common causes of respiratory emergencies:

- Asthma attack
- Oxygen deprivation
- Drug Overdose (Opioid)
- Choking
- Inhaling toxins/poisons
- Inhaling smoke
- Drowning
- Chest injury
- Heart Attack
- Sudden Cardiac Arrest
- Electrocutation
- Aspiration (stomach contents entering the lungs)
- Long term lung conditions/ailments such as COPD
- Lung infections causing bronchitis or pneumonia

Breathing problems are not hard to identify. Look and listen to how a victim breathes. Ask a responsive victim how he or she feels when breathing, if pain or pressure is being experienced. Ask the victim if this has happened to them in the past or if they have a known condition or illness that may be causing the issue.

Signs of breathing problems can include (Figure 2.2):

- Labored breathing (struggling to breathe)
- Noisy breathing (wheezing, gurgling or high-pitched sounds)
- Unusually slow or fast breathing
- Unusually deep or shallow breathing
- Irregular breathing
- Gasping for breath
- Inability to speak in full sentences
- Excessive coughing
- Restlessness, anxiety, and confusion
- Changes in level of consciousness
- Flushed, pale, or bluish (cyanotic) skin
- Chest pain or discomfort when breathing
- Tingling sensations

Figure 2.2



A victim experiencing difficulty breathing needs immediate help.

Follow these guidelines when helping someone experiencing breathing problems:

- Help the victim rest in a position that makes breathing easier.
 - A seated position is often the best position.
 - Place on their back if the victim appears weak or possibly faint.
 - Look for signs of heart attack and stroke (see page)
- Ask the victim if they use an inhaler or have other prescribed medications.
 - Retrieve or ask a bystander to retrieve if not immediately accessible.
 - Assist the victim with the medication once it is available.
- Call 9-1-1.
- Comfort and reassure - be prepared to help to the ground (if seated) if the victim becomes unresponsive.

If the victim stops breathing as a result of prolonged difficulty breathing, the delivery of oxygen to the body, especially the brain, will be interrupted. The victim will become unresponsive. Without adequate oxygen the heart will eventually stop beating (cardiac arrest). Death is certain if left untreated, but is potentially reversible if cared for promptly.

Opioid Respiratory Emergencies

Opioids, also generally referred to as narcotics, are substances that are powerful depressants often used to relieve pain. These substances include illegal and legally prescribed pain medications such as morphine, hydrocodone, and oxycodone. These are often sold under brand names such as OxyContin®, Percocet®, Vicodin®, and Demerol®. Opioids depress the central nervous system resulting in loss of consciousness and depressed or absent breathing. Approximately 115 people die every day in the United States due to an opioid overdose or complication and this is trending to get worse. The opioid crisis affects nearly every demographic, with the primary age range of victims being aged 25 - 65. With the impact of intentional and accidental opioid overdose becoming more prevalent, it is important for you to understand how to help someone in this situation.

Naloxone is a medication administered to those who overdose on opioids and are unresponsive and not breathing, not breathing effectively, or before depressed breathing occurs following accidental overdose. Naloxone is considered to be generally safe and non-toxic, even if accidentally administered to an individual not suffering from opioid intoxication. If you are unsure if the overdose victim took an opioid or if they consumed another drug/toxic substance (or if you do not have access to naloxone), contact Poison Control Centers at 800-222-1222, in addition to calling 9-1-1.

Naloxone comes in two forms (**Figure 2.3**). It can be delivered using a naloxone nasal spray or it can be administered using an auto-injector, similar to how epinephrine is administered to sufferers of a severe allergic reaction.

To use the muscle auto injector on someone suffering from an opioid overdose:

1. Remove the safety guard
2. Place the black side of the injector near the outer thigh. Push firmly and hold in place for five seconds

To use the nasal spray to aid an overdose patient (Figure 2.4):

1. Position the guest face up
2. Insert the nozzle into a nostril and depress the plunger with your thumb

Figure 2.3



Examples of Naloxone delivery systems.

Figure 2.4



Insert the nozzle of the naloxone device into a nostril and depress the plunger.

If after confirming the safety of the scene, you find a victim of an opioid overdose, consider the following recommendations (note that layperson recommendations differ slightly from health care provider recommendations):

If you find a responsive opioid overdose victim:

1. Keep the victim talking / mentally stimulated.
 - Ask the victim what they took, how much, and when.
 - If the drugs or medication are present, attempt to secure it (if safe to do so).
2. Get bystander assistance if available and call 9-1-1.
3. Locate naloxone (and an AED if available)
4. Administer a dose of naloxone.
5. Continue to keep the victim talking / mentally stimulated until EMS arrives and takes over care. Be ready to begin CPR and AED care if needed.

If you find an opioid overdose victim who is unresponsive but is breathing:

1. Get bystander assistance if available and call 9-1-1.
2. Locate naloxone (and an AED if available).
3. Administer a dose of naloxone.
3. Place the victim in the recovery position and closely monitor breathing while trying to mentally stimulate (on going tap and shout) until EMS arrives and takes over care. Be ready to begin CPR and AED care if needed.

If you find an opioid overdose victim who is unresponsive and not breathing:

1. Get bystander assistance if available and make sure 9-1-1 has been called.
2. Locate naloxone (and an AED if available).
3. Administer a dose of naloxone before CPR if it is *immediately* available.
 - If naloxone is not immediately available, *do not delay starting* CPR while waiting.
4. Begin CPR and AED care (see chapters 3 & 4)
 - Combine chest compressions and rescue breaths (consider a barrier device)
 - If an AED is available, incorporate it into CPR care as soon as possible.
 - If naloxone becomes available while performing CPR, pause CPR and deliver a dose. Resume CPR and AED care following naloxone delivery.
5. Continue CPR and AED care until EMS arrives and takes over care.

Be prepared to protect yourself from the opioid overdose victim if your care efforts combined with naloxone are successful. The victim may not be fully aware of their actions and may be very aggressive. If they are suffering from an addiction, they may be very displeased that you have intervened.

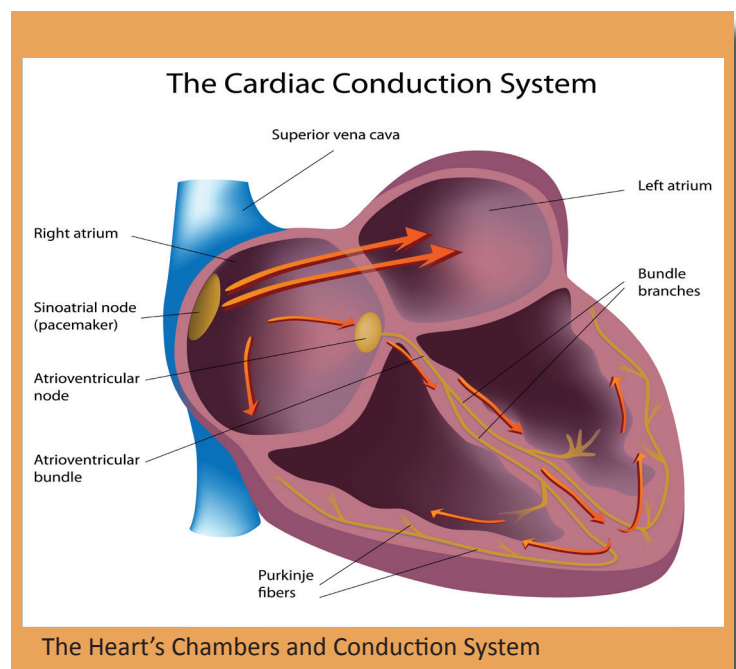
When EMS arrives, it is important to encourage the patient to be transported. Victims of opioid overdose may suddenly return to an intoxicated state with a depressed CNS and respiratory system and will need additional doses of naloxone and other care until the opioids finally leave the victim's system.

How the Heart Functions and Cardiovascular Disease

The circulatory system is made up of the heart and blood vessels. This system delivers oxygen and nutrients throughout the body, and removes waste products. The heart is an organ about the size of a person's fist, with four chambers through which blood moves in and out. The two upper chambers are the right and left atria. The two lower chambers are the right and left ventricles.

These chambers receive oxygen-poor venous blood from the body and pump it to the lungs, where the waste products are removed and oxygen is picked up and returned to the left side of the heart. The two chambers on the left side of the heart are the left atrium (upper chamber) and left ventricle (lower chamber). These chambers accept the oxygen-rich blood and pump it out to all parts of the body through the arteries.

The heart muscle is very unique in that it automatically creates its own electrical impulses. These impulses, normally originating in the upper right side of the heart, move along an electrical conduction system in a wavelike pattern throughout the heart. When these impulses reach specialized muscle tissue, the chambers of the heart contract and then relax (**Figure 2.5**). This action moves blood throughout the body, generating a heartbeat that can be felt as a pulse. The electrical impulses in the heart are able to be viewed and interpreted through an electrocardiogram.



Cardiovascular disease, also known as heart disease, involves diseases that affect the heart and blood vessels. More people die globally each year from cardiovascular disease than from any other cause. **Coronary heart disease (CHD)** involves the narrowing of the coronary arteries, the blood vessels that supply oxygen and blood to the heart. This is usually caused by **atherosclerosis**, which is the plaque (cholesterol substances) that accumulates on the inside walls of the arteries, causing them to narrow. This results in reduced blood flow to the heart. Diseases of the blood vessels can also affect other organs, such as the brain, resulting in a stroke.

Other types of cardiovascular disease include:

- Arrhythmias – electrical disturbance of the electrical conduction system in the heart.
- Heart valve problems – valves do not open or close properly; blood does not flow properly through the heart.
- Heart failure – when the heart fails to pump blood adequately.
- Stroke – a blockage or bursting of a blood vessel in the brain.

Many of the causes leading to heart disease can be prevented by adopting a heart healthy lifestyle that reduces the risk of heart disease. There are two types of risk factors; those that can be controlled, and those that cannot be controlled. There are 8 risk factors commonly associated with cardiovascular disease.

Five risk factors that can be controlled are:

1. **High cholesterol** - Total cholesterol level is a measure of all the cholesterol in the blood, including LDL (bad) cholesterol and HDL (good) cholesterol. The higher the LDL (bad) cholesterol number, the greater the risk of developing heart disease from cholesterol building up in the arteries.
2. **High blood pressure** - Blood pressure (BP) increases with each heartbeat and decreases when the heart relaxes. Blood pressure constantly changes as a result of exercise, stress, or sleep. For adults at rest, BP for adults should normally be less than 120/80 mm Hg (120 systolic and 80 diastolic).
3. **Overweight** - Body Mass Index (BMI) is a method used to determine if a person is overweight. It is calculated from a person's weight and height, and provides an indicator of body fatness, that can lead to health problems. Although BMI correlates with the amount of body fat, it does not directly measure body fat. So some people, such as athletes, may have a BMI that identifies them as being overweight even though they do not have excess body fat.
4. **Smoking** - Smoking is a major cause of heart disease. A person's risk of heart disease and heart attack greatly increases with the number of cigarettes smoked. People who smoke are 2-4 times more likely to suffer heart disease. Women who smoke are twice as likely to have a heart attack as male smokers.
5. **Diabetes** - Adults with diabetes are 2 - 4 times more likely to have cardiovascular disease than adults without diabetes. People with diabetes often have other risk factors that contribute to their risk for developing cardiovascular disease.

Risk factors that cannot be controlled are:

1. **Gender** - Coronary heart disease, the single biggest cause of death in the United States, claims men and women in nearly equal numbers each year.
2. **Heredity** - Certain inherited heart conditions can affect the physical structure of the heart and interfere with its ability to pump blood to the rest of the body. Hereditary electrical disturbances (dysrhythmia) can result in a heartbeat that is too fast, too slow or irregular. This can lead to dizziness, fainting, and sometimes death.
3. **Age** – As people age the risks of cardiovascular disease increase.

Reducing your odds of developing heart disease can begin with a personal pledge that involves five areas:

- **Achieve a healthy weight.** Being overweight or obese cause many preventable deaths.
- **Be active.** Commit to at least 30 minutes of moderate-intensity activity daily.
- **Eat smart.** Choose a diet that includes whole grains, vegetables and fruits, and one that is low in saturated fat, trans fat, and cholesterol.
- **Know your personal facts.** Have your physician check your blood pressure, cholesterol (total, HDL, LDL, triglycerides), and blood glucose, and establish a plan to improve these numbers.
- **Don't smoke, and if you already do, attempt to quit.** People who smoke are more likely to suffer a heart attack than non-smokers.

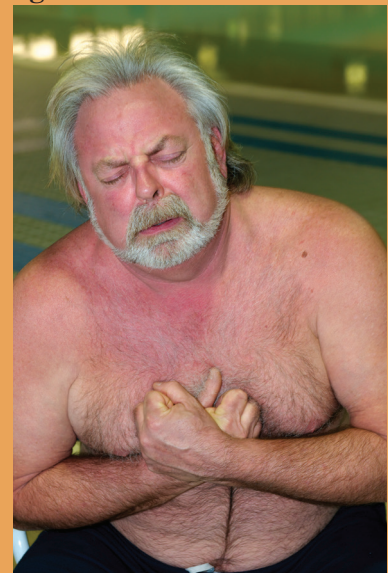
Heart Attack, Anaphylaxis, and Stroke

A **heart attack** occurs when blood flow to a part of the heart is blocked by a clot. This is often associated with atherosclerosis. If the damage to the heart muscle is too great, the heart can stop beating, a condition known as **cardiac arrest**.

The signs and symptoms of a heart attack can include:

- Chest pain or discomfort that lasts longer than 15 minutes, and can radiate to the arms, neck, jaw, or back (**Figure 2.6**)
- Difficulty breathing
- Profuse sweating
- Nausea and vomiting
- Cool, pale skin
- Unusual weakness / fatigue
- Dizziness / fainting
- Irregular heart beat

Figure 2.6



Chest pain is a primary symptom of a heart attack.

FYI: Chances of Heart Attack

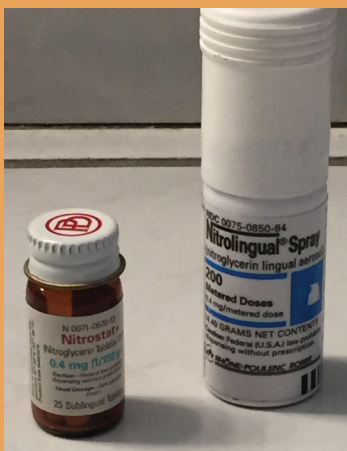
Studies show that heart attacks are more likely to occur in the morning hours than any other time of day. Mondays are the most likely day of the week for a heart attack to occur. People are far more likely to experience a heart attack in the winter months than at any other time. Why this happens is not exactly known. But it is believed that stress plays an important part. Cortisol is a hormone produced by the adrenal gland. It is often called the “stress hormone” because it is involved in response to stress. Elevated cortisol levels, and increased heart rates (also in response to stress) normally occurring during these times can lead to the rupture of plaque in coronary arteries.

Not everyone presents with all these signs and symptoms. Some people have little or no chest discomfort. This is often referred to as a “silent heart attack,” and occurs most frequently in women, elderly, or those with diabetes.

Follow these steps to care for a heart attack:

- Call 9-1-1.
- Have the victim stop all activity and rest in a comfortable position.
- Loosen any restrictive clothing.
- If the victim has a prescribed heart medication such as nitroglycerin, you can assist with its use. Because nitroglycerin lowers a person’s blood pressure, it should not be given if the person is dizzy or feels faint (**Figure 2.7**).
- Provide low dose aspirin if the person is not allergic, not on a blood thinner, and does not have stomach disease. Provide 1-2 chewable aspirin (81mg each) (**Figure 2.8**).
- Retrieve an AED (if available) and be prepared to provide CPR.

Figure 2.7



Nitroglycerin is a medication prescribed for select heart problems.

Figure 2.8



Low dose aspirin can help victims of heart attack.

Women and the Atypical Heart Attack

During a heart attack women can also experience the same heavy chest pressure that men feel, but many women don't. Unlike men, a large portion of women can experience a heart attack without chest pressure. Other atypical signs of a heart attack in women include pressure or pain in the lower chest or upper abdomen, upper back pressure, and unusual, extreme fatigue.

Severe Allergic Reactions

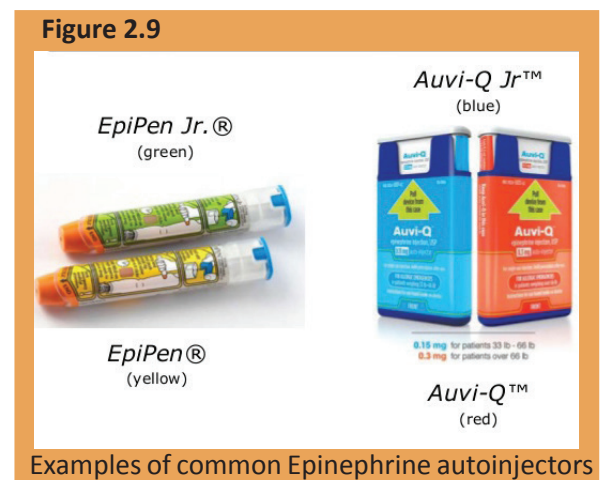
Severe allergic reactions are reported to affect as many as 1 in 50 Americans annually (with the trend on the rise). Severe allergic reactions are known as **anaphylaxis**. If not properly and quickly cared for, a sufferer of anaphylaxis may become a victim of cardiac arrest. As a layperson responding to an emergency, it is important that you know what to do when confronted with probable anaphylaxis.

Signs of Anaphylaxis include:

- Difficulty breathing or swallowing (sign that the airway may be compromised)
- Swelling of the face, throat, or tongue (sign that the airway may be compromised)
- Wheezing, persistent cough, difficulty speaking or a hoarse voice
- Skin irritation, hives
- Pale and “floppy” (young children)
- Rapid heart rate with low blood pressure (anaphylaxis is a type of shock)
- Dizziness, confusion, loss of consciousness

Helping someone suffering from a severe allergic reaction:

- Stop continued exposure to the allergin (if possible).
- Ask the victim (or someone who might know) if they have an epinephrine autoinjector (most commonly an EpiPen® or AuviQ® **Figure 2.9**). If available, quickly provide it to the victim so that they can self administer.
- If the victim is unresponsive or is otherwise unable to self-administer the injection, you or another available responder should administer the autoinjector to the victim as quickly as possible (see general instructions on the next page).
- Call 9-1-1 (even if symptoms improve following epinephrine administration). Report all of the victim’s symptoms, especially those involving the airway.



Closely monitor the victim’s breathing and be ready to begin CPR if needed (if one is accessible, have an AED ready). If a second epinephrine autoinjector is available, keep it on standby. If the victim does not improve or if initial improvement reverses between 5 - 15 minutes of first administering, consider giving the second dose.

If the victim is unresponsive when you arrive and it is reported that signs of anaphylaxis occurred prior to becoming unresponsive, make sure 9-1-1, an accessible AED retrieved and CPR started.

General procedure for epinephrine autoinjector administration:

1. Hold the device firmly so that your fingers are not near the needle end of the device and remove the safety cap (**Figure 2.10**).
2. Place the victim in a seated position and hold the knee firmly so that the leg does not move during injection (take additional precautions if performing on a child).
3. Place the needle end near the outer thigh. The device will work through clothing, but it is best to administer it into the bare skin whenever possible.
4. Press the device firmly in place (listening for a “click”) and hold for the number of seconds indicated for the device being used (EpiPen[®], 3 seconds; AuviQ[®], 2 seconds). (**Figure 2.11**)
5. Lightly massage the injection area for about 10 seconds.
6. Monitor the guest for improvement. If the patient does not improve in 5 minutes (with sustained improvement for at least 15 minutes) give a second dose if available.

Figure 2.10

Hold the autoinjector firmly and carefully remove the safety cap.

Figure 2.10

Hold the autoinjector firmly and carefully remove the safety cap.

Recognizing a Stroke

Stroke, also called brain attack, occurs when a blood vessel in the brain becomes blocked (ischemic) or ruptures (hemorrhagic) (**Figure 2.12**).

Most strokes are ischemic. Without adequate oxygen brain cells will die. Stroke and heart disease share many of the same risk factors. As brain cells die, a person may show some general signs to look for if a stroke is suspected.

Additional signs to look for, include:

- Numbness, weakness, or paralysis of the face (Figure 2.13), arm, or leg on one side
- Difficulty speaking
- Difficulty understanding
- Dizziness
- Blurred or decreased vision in one eye
- Sudden, severe headache
- Unequal pupils

Use the **F.A.S.T. Stroke Action Plan** as described in Table 2.1 below to quickly assess if the signs you are observing may be a stroke.

Figure 2.13



Facial droop or paralysis is a sign of possible stroke.

To care for stroke:

- Call 9-1-1. Getting the victim the necessary advanced medical care needed as soon as possible can save the victim’s life or reduce the amount of injury to the brain.
- Have the victim rest in the most comfortable position, which is often lying on the back with the head and shoulders elevated.
- Loosen any restrictive clothing.
- Do NOT give the victim any medication that he or she might have been using for heart conditions, such as nitroglycerin or aspirin.

Table 2.1 F.A.S.T. Stroke Action Plan

Stroke Sign / Symptom	Questions
F acial Droop	Is one side of the face numb or drooping? If the person can smile, is it uneven?
A rm Weakness	Is one arm numb or weak? Can the person raise both arms equally?
S peech Difficulty	Is the person unable to speak or hard to understand? Can the person repeat a simple sentence correctly?
T ime to Get Help	Note the time the signs and symptoms first appeared and call 9-1-1 or summon more advanced care.

Primary and Secondary Checks

After you have confirmed that the scene is safe, determined that the victim is unresponsive, have called for help (including calling 9-1-1), the **primary check** should be performed. As a responding layperson, your primary focus during this check should be to determine if the victim is breathing in a manner that can sustain life. Layperson responders do not perform a pulse check. Instead, if the victim is unresponsive and not breathing, cardiac arrest is assumed and CPR is started.

Checking Unresponsive Victims for Breathing

Before checking for breathing, the victim needs to be placed on their back, on a firm, flat surface. If you need to move the victim to achieve this, move slowly, paying particular attention to protecting the victim's head as you move. If a bystander is available, get assistance. With the victim in position, kneel close to the head. Place your head near the victim's mouth and look at the victim's chest. In less than 10 seconds, you need to determine if the victim is breathing. If you are unsure during the check, err on the side of *no breathing* and begin CPR (compressions will not harm the victim if you were incorrect).

In less than 10 seconds, check for breathing by:

Looking for:

- **Chest movement** - the regular rise and fall of the chest, consistent with breathing. This movement may be subtle, but detectable over the course of up to 10 seconds. If no movement is seen or if the movement is irregular, you should proceed as if no breathing is present and immediately begin CPR.

Listening for:

- **Breathing sounds** - the regular sounds expected of someone inhaling and exhaling normally. Normal breathing sounds may be quiet but should be detectable over the course of up to 10 seconds. Breathing sounds that include wheezing, gurgling, gasping or snoring noises should be considered unusual and interpreted as **agonal breathing**. If you suspect that agonal breathing, assume no breathing is present and immediately begin CPR.

A Closer Look: Agonal Breaths

An unresponsive victim may have occasional gasping breaths called agonal breaths, which occur in the first few minutes of cardiac arrest. Agonal breathing may also sound like wheezing, gurgling, or snoring. This breathing is not effective and should not be confused with adequate breathing because it cannot sustain life. Agonal breaths occur in **about half** of all victims of cardiac arrest outside of a hospital, so it should be anticipated. If agonal breaths are present, presume the victim is in cardiac arrest and start CPR.

Recovery Position

If you do detect breathing during the Primary check, place the victim in the recovery position. The recovery position is a lateral recumbent (side-lying) position that facilitates maintaining an open airway. Placing the victim in this position will allow you to perform a secondary check for signs of injury or illness. Similarly, if you briefly need to leave the scene either before or during care, the recovery position is the safest placement option for the unresponsive victim, reassessing once you return.

There are multiple methods recognized as acceptable when placing someone in a side-lying position, which results in the victim either facing you or facing away. The following steps may be among those followed to safely place the patient on their side to protect the airway while minimizing uneven movement of the spinal column (**Figure 2.13**).

Basic Recovery Position Steps:

1. With the victim lying flat on their back, position yourself at their side and bend the patient's leg nearest you at the knee.
2. Raise the victim's farthest arm to you above their head so that the victim's ear is against the raised arm at the shoulder.
3. Place the victim's nearest arm to you across the victim's chest.
4. Place your hands on the victim's nearest shoulder and hip and slowly roll the victim's body as a single unit away from you until they are lying on their side, while making certain that the victim's head remains in line with their hips, against their raised arm.
5. Adjust the victim's free arm and top leg to support their body and confirm that the area around the patient's mouth is clear and that the victim continues to breathe normally.
6. Confirm the victim is stable in this position before proceeding with the secondary check or another task.

Figure 2.13



Recovery position example.

If you suspect a possible head or spinal injury, it is advisable to leave the victim on their back unless the airway is at risk due to vomiting. Maintaining an airway and therefore the victim's ability to continue to breathe is your chief concern so close monitoring is important.

If the victim is found to not be breathing during the primary check or if they become unresponsive at any point, you may need to initiate care, including rescue breathing and CPR.

Secondary Check

A secondary check should only be done once the primary check is completed and any immediate life-threatening conditions are addressed. The **secondary check** includes:

- Gathering information about the victim's condition that could help you provide care, including deciding about the need to call 9-1-1. Pass on any information you gather to arriving EMS personnel.
- Quick physical exam of the body for conditions that could need care or become more serious if not addressed.

During the secondary check, you will search for signs and symptoms. A **sign** is a condition that you can see or feel, such as a deformed limb or bleeding wound. A **symptom** is what the victim is able to describe to you, such as chest tightness, pain, and dizziness. Some people wear medical identification in the form of a bracelet or necklace that notes the wearer's medical conditions. It may also provide a phone number that can be called to get more information, or to alert a person, such as a parent, if needed. You can gather information directly from a responsive victim, bystanders who may have witnessed the incident, or family or friends who are present and know the medical background of the victim.

The acronym **DOTS** can help you remember what signs and symptoms of injury or illness to look for as you check the victim. Start your physical exam at the head and quickly work downward along the victim's body (**Figures 2.11-2.15**). Use DOTS, and look, feel, and listen as you progress. Speak with the victim. Ask what happened so that you can determine the cause of the incident. Ask the victim to describe any pain and the location of the pain and what makes it feel better or worse.

DOTS stands for:

- Deformity
- Open wound
- Tenderness (or pain)
- Swelling

Figure 2.11



Conduct an exam of the head and neck.

Figure 2.12



Conduct a physical exam of the chest

The mnemonic **SAMPLE** (Table 2.1) can be used to help you remember what information to gather. A victim may have a condition that can be pointed out, so you can focus your attention on that area of the body. A victim may also have problems in multiple areas of the body, requiring a more thorough physical check of the entire body (Table 2.2).

Table 2.1 SAMPLE

Letter Descriptions	Questions
S igns and Symptoms	"What is wrong?"
A llergies	"Are you allergic to anything?"
M edication	"Are you taking any medications for this condition?"
P ast medical history	"Do you have any medical problems?"
L ast intake	"When did you last eat or drink?"
E vents leading up to the problem	"What were you doing before the problem started?" <i>or</i> "How did you get hurt?"

Figure 2.13



Conduct a physical exam of the abdomen

Figure 2.14



Conduct a physical check of the pelvis.

Figure 2.15



Conduct a physical exam of the legs.

Table 2.2 Physical Exam

Part of the Body to Check	What to Check For
Head	DOTS Skin temperature, color, moisture Pupils (should be the same size and both react to light) Clear or blood tinged fluid in the ears or nose Injury to the teeth or tongue
Neck	DOTS Bruising
Chest	DOTS (include checking for tenderness when inhaling/exhaling) Symmetry during breathing
Abdomen	DOTS (push gently to determine tenderness)
Pelvis	DOTS (push inward on the sides of the hips for tenderness)
Limbs	DOTS (Check arms/hands and legs/feet) Have victim wiggle fingers and toes (leave shoes on, unless pain is reported)
Back	DOTS If the victim is lying on the back and you do not suspect a spine injury, roll the victim onto the side. Do not move the victim if already complaining of back pain.

Skin Conditions

Skin should be normal in color, temperature and moisture. Flushed (red) skin can be an indication of conditions such as high blood pressure, excitement, or being overheated. Pale/blue/gray skin can result from blood loss, insufficient oxygen, and shock. If skin is hot and moist or dry, it could be a high fever or exposure to heat. Cool and moist skin often reflects poor blood circulation and shock. Cold skin, especially areas such as the abdomen under clothing, could indicate hypothermia.

Chapter 2 REVIEW

Key Terms

- Anaphylaxis
- Cardiopulmonary
- Carbon dioxide
- Circulatory system
- DOTS
- Epinephrine
- Heart attack
- Heart disease
- Physical exam
- Primary check
- Recovery position
- Respiratory system
- Naloxone
- Opioid
- Oxygen
- SAMPLE
- Stroke
- Secondary check
- Sign
- Symptom

Key Points

- ✓ Cardiopulmonary medical emergencies may result in cardiac arrest if not promptly addressed.
- ✓ Victims of opioid overdoses experience depressed breathing and a reduction in their central nervous system (CNS). Naloxone given promptly to opioid overdose victims may prevent cardiac arrest, but CPR may still be necessary.
- ✓ The signs of a heart attack or a stroke should not be dismissed. 9-1-1 should be called as soon as the signs are recognized and the responder should be prepared to begin CPR if the victim becomes unresponsive.
- ✓ A victim of a severe allergic reaction (anaphylaxis) needs epinephrine administered as early as possible to avoid cardiac arrest.
- ✓ Use the mnemonic F.A.S.T to help determine if someone is experiencing stroke.
- ✓ The primary check is designed to quickly determine if the victim is breathing adequately to sustain life.
- ✓ Look at the chest for normal regular movement associated with breathing. Listen for sounds of normal breathing. If unusual breathing sounds such as gasping, gurgling, wheezing, or others are heard, assume no breathing and begin CPR.
- ✓ If an unresponsive victim is breathing, they can be placed into the recovery position. The recovery position is also recommended if you need to temporarily leave the scene.
- ✓ A secondary check is done once the primary check is completed and any immediate life-threatening conditions are addressed.
- ✓ The secondary check involves gathering information and conducting a physical exam.
- ✓ Use the mnemonic S.A.M.P.L.E. to gather information during the secondary check
- ✓ Use the mnemonic D.O.T.S. to help identify key signs and symptoms.

Check Your Progress

Now that you have read this chapter and completed any accompanying class activities, answer the following questions:

- ✓ Where within the lungs does the transfer oxygen and carbon dioxide occur?
- ✓ How does blood flow through the heart as it pumps?
- ✓ What are common signs to look for if you suspect a breathing emergency?
- ✓ What emergency medicine is available without a prescription (in most cases) that will help a victim of an opioid overdose?
- ✓ What steps would you take to help a breathing victim of an opioid overdose?
- ✓ What five risk factors for heart disease are within our control?
- ✓ What are five things you can do to reduce your chances of developing heart disease?
- ✓ What common over the counter medicine is recommended to be given to an individual showing signs of a heart attack? When should it not be given?
- ✓ What steps would you take to help someone showing signs of a heart attack?
- ✓ What does a victim of anaphylaxis critically need to help avoid cardiac arrest?
- ✓ What does the mnemonic “*F.A.S.T.*” mean and how does this help you determine if someone is suffering a stroke?
- ✓ During the primary check, how do you determine if an unresponsive victim is breathing?
- ✓ What is the term used to describe inadequate, noisy breathing or gasping?
- ✓ As a layperson, what should you immediately perform once you determine the victim is not breathing?
- ✓ What position should you place the victim if you have to quickly leave the scene to make sure 9-1-1 was called?
- ✓ What is the secondary check and how is it performed?
- ✓ What does the mnemonic “*D.O.T.S.*” mean and how is it used during the secondary check?
- ✓ What does the mnemonic “*S.A.M.P.L.E.*” mean and what information does it help you to gather?
- ✓ Why should you look for medical alert tags on a victim during the secondary check?
- ✓ When performing the secondary check, you discover that the victim has pale, blue skin. What might this indicate?

Chapter 3

Cardiopulmonary Resuscitation & Related Care

Learning Outcomes

After reading this chapter and completing any related course work, you will be able to:

- Demonstrate high quality chest compressions for adults, children, and infants.
- Demonstrate how to open the airway and deliver proper rescue breaths.
- Demonstrate how to handle rescue breaths not going in during delivery.
- Demonstrate Full CPR, combining quality chest compressions with rescue breaths.
- Demonstrate Compression only CPR.
- Describe when it is appropriate to pause or stop CPR care.
- Demonstrate how to relieve an airway obstruction on a responsive adult or child
- Demonstrate how to relieve an airway obstruction on a responsive infant.
- Demonstrate how to handle an airway obstruction when the victim is unresponsive.

Chapter Quick Look

- Cardiac Arrest
- CPR Chest Compressions
- CPR Rescue Breathing
- Compression Only CPR
- When to pause or stop CPR
- CPR and Related Special Situations

Cardiac Arrest

If damaged, a person's heart may fail to perform adequately or properly, and may cease to function. This condition is known as **cardiac arrest**. The victim of cardiac arrest will become unresponsive and stop breathing (or with only occasional gasps). As a layperson responding during this emergency, you will presume cardiac arrest if you find someone to be unresponsive and not breathing. The immediate care for a person in cardiac arrest involves:

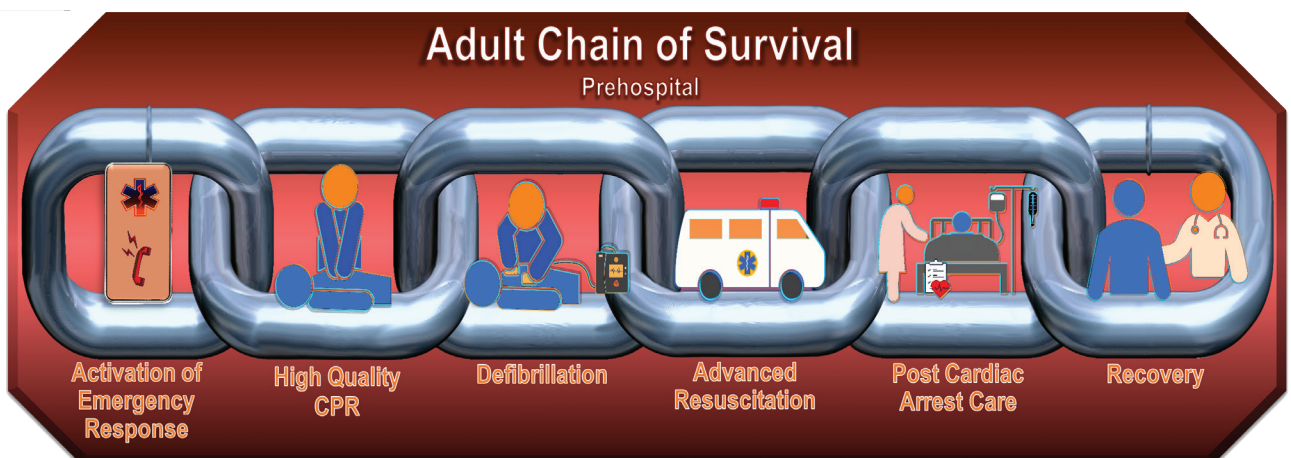
- **Making sure 9-1-1 is/has been called and an accessible AED retrieved.**
 - For adults, secure emergency services via 9-1-1 and any accessible AED before proceeding with care.
 - For children and infants, if a phone is not immediately available, proceed with approximately 2 minutes of care first, then pause care to secure emergency services via 9-1-1 and any accessible AED and resume care.
- **Cardiopulmonary Resuscitation (CPR).**
- **Attaching an accessible AED and incorporating into CPR care.**

The Chains of Survival - Adult and Pediatric Prehospital Care

The **Chains of Survival** refers to a series of actions that must be linked together to provide the best care and chance of survival for a person in cardiac arrest.

The **Adult Chain of Survival** includes:

- Rapid recognition and activation of the emergency response system
- Immediate high quality CPR
- Rapid defibrillation
- Advanced Cardiac Life Support
- Post Cardiac Arrest Care
- Recovery

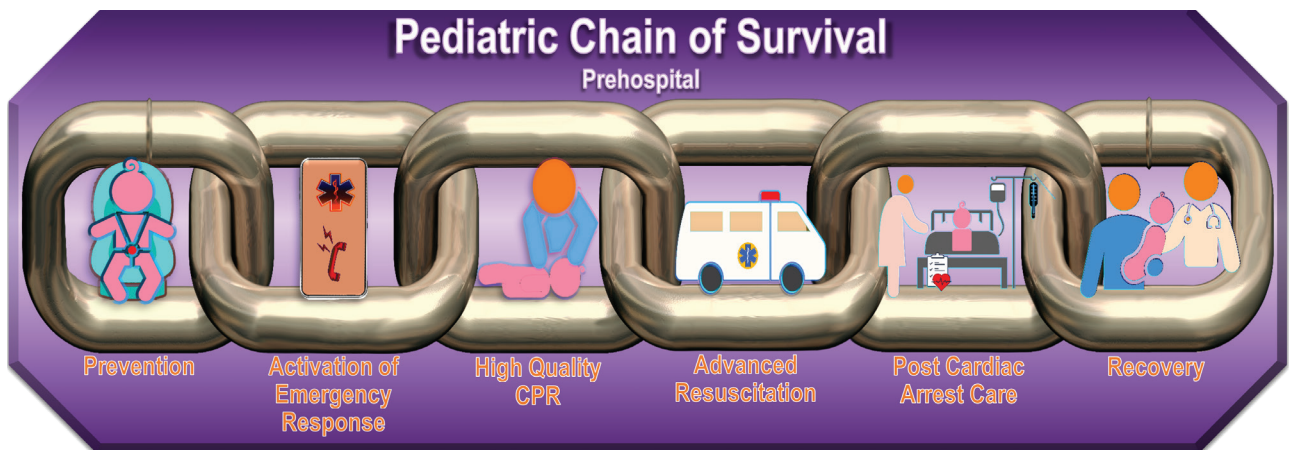


For children and infants, the **Pediatric Chain of Survival** is slightly different. Since the majority of cardiac arrests involving children are due to preventable causes, **Prevention** is the first and most vital link in the chain.

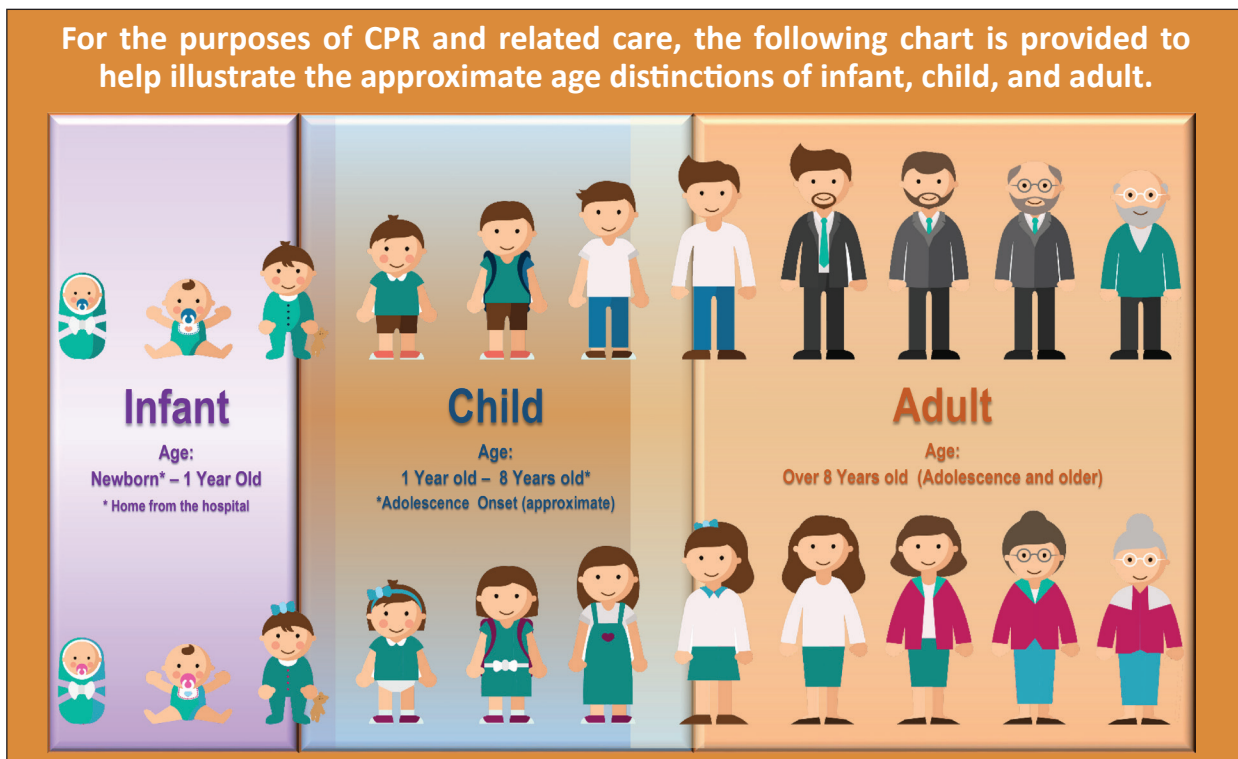
The **Pediatric Chain of Survival** includes:

- Prevention
- Rapid recognition and activation of the emergency response system
- Immediate high quality CPR
- Advanced Cardiac Life Support
- Post Cardiac Arrest Care
- Recovery

Your role in both chains is vital! Your actions as a bystander during an emergency will make a difference, but only if you act.



For the purposes of CPR and related care, the following chart is provided to help illustrate the approximate age distinctions of infant, child, and adult.



Cardiopulmonary Resuscitation - Chest Compressions

Cardiopulmonary resuscitation (CPR) involves providing regular chest compressions and ideally, rescue breaths. The chest compression component circulates blood and oxygen to vital organs throughout the body. Chest compression quality is critical to the overall effectiveness of CPR (**Figure 3.1**).

Providing Chest Compressions on Adults

For adults specifically, the components needed to accomplish high quality compressions include:

- The adult is positioned face up, on a flat, firm surface.
- The rescuer begins compressions immediately following the less than 10 second check for breathing (and finding no breathing).
- The rescuer positions themselves at the victim's side, facing the center of the chest.
- The knees of the rescuer should be against the victim's side, about a shoulder width apart.
- The rescuer locates the compression landmark at the center of the victim's chest (between the victim's nipples, on the sternum).
- The rescuer places the heel of one hand on the compression landmark, with the other hand on top, interlocking fingers.
- The rescuer brings their shoulders directly over the victim's chest and straightens both arms and back.
- The rescuer pivots at the hips to initiate each compression. While keeping both arms straight, the rescuer pushes the heel of the first hand, 2 - 2.4 inches deep and then releases to allow the chest to fully recoil.
- The rate of each compression and release is performed between 100 - 120 compressions per minute.
- Each compression and release is performed rhythmically, in a consistent manner.
- The rescuer avoids leaning or tilting, keeping arms straight. Primary contact with the chest during each compressions is the heel of the hand, allowing a very slight loss of contact during the upstroke to help ensure that the chest fully recoils before each subsequent compression.
- For all ages, perform 30 compressions and then provide 2 rescue breaths (when rescue breathing is incorporated into CPR).
- Interruptions to the consistent delivery of compressions must be avoided, once compressions have started. If an interruption is necessary, the rescuer should minimize it to less than 10 seconds in length. Examples of acceptable interruptions include: rescue breath delivery, AED attachment, analysis, and shock delivery.

Figure 3.1



Quality chest compressions are critical to the effectiveness of CPR.

Providing Chest Compressions on Children over One Year

Many of the same components needed to accomplish this high quality delivery for adults, remain important for children. Areas unique to children, include:

- The rescuer places the heel of one hand on the compression landmark (same as adult), but with the option to place the other hand on top, interlocking fingers, or proceeding with a single hand. Generally, one hand is adequate for younger children while two may be needed for older children or if the rescuer is fatigued. This remains the preference of the rescuer (**Figure 3.2**).
- The rescuer pivots at the hips to initiate each compression. While keeping the arm or arms involved in compressing straight, the rescuer pushes the heel of the compressing hand, about 2 inches deep (or about $\frac{1}{3}$ the depth of the diameter of the child's chest) and then releases to allow the chest to fully recoil.
- Just like CPR for adults, the rate of each compression and release is performed between 100 - 120 compressions per minute (performing 30 compressions, then 2 breaths).

Figure 3.13



Once the airway obstruction victim is safely on the ground, start CPR with chest compressions.

Providing Chest Compressions on Infants

Many of the same components needed to accomplish this high quality delivery for adults, remain important for infants. Areas unique to infants, include:

- An infant may be placed on a table or another safe elevated surface (as an alternative to placement on the ground), provided that the surface is flat and firm to facilitate chest compressions.
- The rescuer will perform compressions using two fingers (**Figure 3.3**). The rescuer will find the landmark by using a finger to trace between the infant's nipples to reach the center of the chest.
- The rescuer will place the two fingers being used to compress, about 1 finger's width below the nipple line on the sternum.
- The rescuer compresses the chest with two fingers about 1.5 inches deep (or about $\frac{1}{3}$ the depth of the diameter of the infant's chest) and then releases to allow the chest to fully recoil.
- Just like CPR for adults and children, the rate of each compression and release is performed between 100 - 120 compressions per minute, (performing 30 compressions then 2 breaths).

Figure 3.3



Use two fingers about 1 finger width below the nipple line to compress the chest of an infant.

Cardiopulmonary Resuscitation - Rescue Breaths

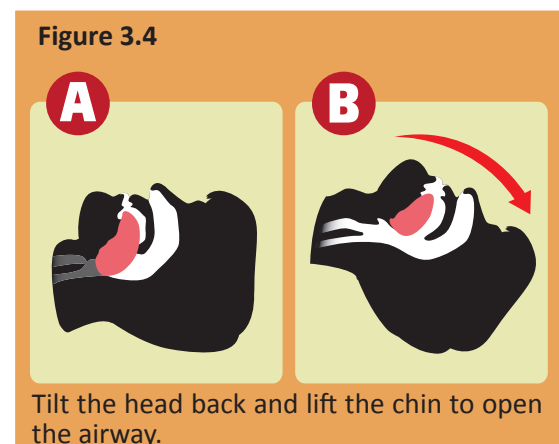
Combining **rescue breaths** with chest compressions will enhance the overall effectiveness of CPR and its inclusion is highly recommended. In situations where the cause of the emergency is most likely to be respiratory in nature, providing rescue breaths during CPR may have a significant positive impact. If cardiac arrest occurred because there was insufficient oxygen concentrations in the bloodstream, the inclusion of rescue breaths will elevate those concentrations. Rescue breathing combined with compressions moves the oxygen enriched blood (from rescue breaths) to all parts of the body, especially the brain. Similarly, if the victim is only in respiratory arrest (still has a pulse), your inclusion of rescue breaths combined with chest compressions may even result in return of spontaneous breathing.

Emergency situations where the victim is not breathing with the presumed cardiac arrest is likely due to a respiratory cause and/or situations where rescue breaths are critical, include incidents involving:

- Children and infants
- Pregnant women
- Drowning
- Opioid overdose
- Asthma attack
- Altitude sickness or oxygen deprivation
- Severe allergic reactions (anaphylaxis)
- Inhaled poisoning (smoke, carbon monoxide, etc.)

Opening the Airway

Before rescue breaths can be given, the victim's airway must be opened. To open the airway, place one hand on the victim's forehead and 2 fingers of the other hand under the chin. Tilt the head back while lifting the chin and opening the mouth. This action moves the tongue away from the back of the throat to open the airway (**Figure 3.4**). Opening the airway of an adult requires you to tilt the head back farther than you would for children, and especially infants. Do not over extend the neck of a child or infant, as this could cause narrowing of the trachea (windpipe). For infants specifically, you are looking to achieve or maintain the airway in a neutral position, where the tip of the chin is roughly a right angle to the infant's chest.



Providing Rescue Breaths after Compressions

With the airway open, give *two rescue breaths* after every 30 compressions, regardless of the age of the victim. Breaths must be provided in a cautious manner, specifically paying attention to not overinflate the lungs or have the air provided, end up in the

stomach. Breathing too rapidly or forcefully can damage lungs, adding a complication to an already dire situation. It can also cause distention (swelling) of the abdomen that can result in vomiting, inability of the lungs to fully inflate, and a decrease in the amount of blood that returns to the heart.

To help avoid these issues, rescuers should always make certain:

- The airway is correctly opened before delivering a breath.
- That the maximum duration of each breath is 1 second.
- The younger the victim, the less air volume needed.
- That as you are delivering each breath, you closely monitor the victim's chest. As soon as you see the chest start to rise, end your breath.

To Perform CPR with Rescue Breaths, follow these steps:

1. Complete 30 chest compressions (**Figure 3.5**), then reposition yourself at the victim's head.
2. Open the airway and mouth of the victim. *Maintain the open airway.*
2. Take a regular breath (not deep).
3. Pinch the victim's nose as you seal your mouth over the mouth of the victim. For infants, seal your mouth over their nose
4. Gently exhale your breath into the mouth of the victim for 1 second, as you look for the chest to start to rise (**Figure 3.6**).
5. Remove your mouth and take another regular breath (not deep)
6. Pinch the victim's nose as you seal your mouth over the mouth of the victim
7. Gently exhale your breath into the mouth of the victim for 1 second, as you look for the chest to start to rise. Remember to reduce your rescue breaths when providing care to a child and especially an infant (use "cheek puffs" for an infant).
8. Quickly return to the chest compression landmark and perform another 30 chest compressions.

A pause of about 5 seconds is taken between each set of 30 compressions, to deliver two rescue breaths.

Figure 3.5



Complete 30 chest compressions before attempting 2 rescue breaths.

Figure 3.6



After compressions, open the airway and deliver 2 rescue breaths.

You may feel more comfortable providing rescue breaths using a barrier device, such as a face shield or resuscitation mask. A face shield is tiny and easily portable, while a resuscitation mask may need to be retrieved, assuming you are at a location where you know one is located. If you have immediate access to a face shield, position on the victim's face as its instructions indicate. Keep the airway open, pinch the nose, and provide breaths through the one-way valve containing mouth piece (**Figure 3.7**). The one-way valve allows your breaths to go into the victim, but does not allow any exhaled air, mouth liquids, or vomit to pass the valve.

If Breaths Do Not Make the Chest Rise

Occasionally rescue breaths may not make the chest start to rise as expected. This is often because the airway was not adequately opened during the rescue breath attempt. If your breath fails to make the chest start to rise during CPR, follow these steps:

1. You observe that the chest does not start to rise with a breath as expected. **End the breath attempt** (do not "blow harder" or longer).
2. Gently return the airway to a neutral position and then **re-tilt** the head back while lifting the chin so that the head is slightly more tilted back than before.
3. Reattempt 1 rescue breath, looking for the chest to start to rise. Take extra care to maintain an airtight seal around the victim's mouth and ensure the victim's nose is adequately pinched to close off air from escaping. If you are using a barrier device, make sure it is sealing properly (**Figure 3.8**).

In most cases, this quick procedure will ensure that the airway is open enough to allow the breath to go in as expected, allowing you to continue CPR without further interruption.

Figure 3.7



Barrier device with one-way valve for rescue breathing.

Figure 3.8



If using a barrier device, make sure you are sealing it properly on the victim's face (follow device instructions).

However, if you still do not see the chest start to rise with the reattempted rescue breath, there may be an airway obstruction. If this occurs, continue CPR care in the following manner:

1. Resume CPR starting with 30 chest compressions as you would normally.
2. Before attempting 2 rescue breaths, open the victim's mouth and quickly look for an object.
3. If an object is visible, sweep it out with your finger. If you do not see anything in the mouth, proceed to rescue breaths.
4. Tilt the head back while lifting the chin as you would normally (making sure the head is adequately tilted back)
5. Attempt to deliver 2 rescue breaths, looking for the chest to start to rise with each breath. As before, take extra care to maintain an airtight seal around the victim's mouth and ensure the victim's nose is adequately pinched to close off air from escaping.

If the chest continues to not rise, repeat all steps, starting with re-tilting the head and re-attempting another rescue breath. Fortunately, if there is an airway obstruction, the chest compressions you are providing may help force the object high enough into the airway, allowing you to see it when checking mouth and sweep it out. If however the breaths do not go in for an extended period, the chest compressions you are providing continue to move blood containing a residual amount of oxygen throughout the victim's body. When EMS arrives, they will be able to use artificial airways to ensure proper ventilation.

Cardiopulmonary Resuscitation - Compression Only

It cannot be overstated that your prompt and decisive actions during an emergency are critical. As discussed in Chapter 1, you will likely use your skills on someone you know, probably a family member. However, cardiac arrest and related emergencies can happen anywhere, at any time, and to anyone.

Being able to act as quickly for a stranger as you would a friend or family member may make the difference in their ultimate survival. As a layperson and likely bystander in this scenario, you probably do not have immediate access to basic PPE or a barrier device to help facilitate the rescue breathing component of CPR. Even with the understanding that harmful disease transmission is unlikely, you may not be comfortable or willing to attempt direct mouth-to-mouth rescue breathing on a stranger. In these cases, **Compression only CPR** should be performed without further delay (**Figure 3.8**).

Figure 3.8



Perform *Compression only CPR* if you do not have access to a barrier device and you are unwilling to include rescue breathing by mouth-to-mouth contact.

To perform Compression only CPR, follow these steps:

1. Properly position your hands and make the appropriate adjustments to your body position.
2. Begin high quality chest compressions at the appropriate depth, allowing full recoil, performed at a rate between 100 - 120 compressions per minute.
3. Continue *Compression only CPR* until EMS arrives or it is otherwise appropriate to stop care.

When to Pause or Stop CPR

CPR is necessary for anyone who is unresponsive and not breathing (or only gasping) where you presume cardiac arrest (as a layperson responding). Interruptions or pauses in care need to be avoided most of the time. However, there are some instances where it is appropriate to pause CPR (typically for 10 seconds or less) or cease performing CPR all together. Always consider your specific circumstances when making these decisions, as you provide the best care you reasonably can, until others are available or EMS arrives and takes over care.

Layperson rescuer guidance examples for pausing or stopping CPR, including:

- Following the completion of 30 chest compressions, a pause of about 5 seconds is appropriate to deliver 2 rescue breaths.
- A pause is appropriate when an AED becomes available and ready to be attached to the victim. Attach it as quickly as you can reasonably and correctly do.
- A pause is appropriate when an attached AED prompts you to stand clear of the victim to allow analysis or to deliver a shock. Once analysis is complete and a shock is delivered (or not advised) resume CPR with chest compressions.
- A pause to allow the administration of naloxone for victims of opioid overdose.
- A pause long enough to check the victim is appropriate if the victim begins to show signs of life (e.g. coughing, moaning, normal breathing, or regains consciousness). If signs of life are confirmed, CPR care can cease and the victim placed in the recovery position.
- A pause in CPR care is appropriate if you are too exhausted to continue. If you are able to resume CPR after a short period of time, you are encouraged to do so. If you cannot, make sure help is on the way and monitor the situation.
- If you are relieved by another rescuer who is capable of performing CPR care, you may cease CPR. If appropriate, you may start to alternate care tasks with this second rescuer to minimize fatigue.
- You may cease CPR if the scene is no longer safe and you need to take steps to make it safe, including possibly moving the victim. If there is no way to make the scene safe, make sure help is on the way and monitor the situation.

- It is appropriate to cease CPR care if a medical professional, such as a responding emergency medical services personnel or physician advises you to stop resuscitative efforts.
- If you are in a remote area (unlikely for EMS response) or it is impossible to contact EMS, it is appropriate to cease CPR care if cardiac arrest lasts longer than 30 minutes. Where local standard of care differs, follow local standards.

CPR and Related Care in Special Situations

It is in the nature of emergencies that require CPR and related care to happen unexpectedly. You may encounter situations that do not “follow the script” and will need to quickly determine what you should do. An emergency might happen at the kitchen table, at your children’s school, or when driving down the road. This section will address the most common of these sudden or special situations.

Airway Obstruction - Adults and Children over 1 Year

The most common sudden emergency you may encounter is an **airway obstruction**. This is a special situation because it is one of the few times where you may need to begin care, just seconds after first recognizing that an emergency exists.

Commonly simply called **choking** it most often is caused by an object, such as food, becoming lodged in the throat (**Figure 3.9**). Young children and infants also choke on small objects such as coins or toy parts. Fortunately, most people can self-resolve this emergency through coughing and your role might be only to check on them to see if they are doing well afterward. However, if the choking victim seems to be struggling to cough or is clutching at their throat (known as the universal distress sign of choking), you may need to immediately act to save their life! (**Figure 3.10**).

If the airway obstruction victim is able to productively cough, the airway is only partially obstructed. However, if the victim is clutching at the throat, it often means that

Figure 3.9



Children often choke as a result of foods such as grapes, nuts, meat, and hard candy.

Figure 3.10



Grasping the throat is a common distress sign of choking. Gain consent and get ready to perform the Heimlich Maneuver.

the person is panicking and may either not coughing at all or not adequately coughing to get the object out. Verbally encourage the victim to start coughing or to continue coughing. This added “coaching” often aids the victim as they dislodge the obstruction. If the victim cannot cough, speak, cry, or breathe, or is coughing weakly (and getting weaker), or making high pitched “crowing” sounds, the airway is severely obstructed, and your immediate assistance is needed. The care you can provide an adult or child over the age of 1 year is the **Heimlich Maneuver**.

Follow these steps to relieve the obstruction (adults and children over the age of 1):

1. Confirm consent by saying “*I know the Heimlich Maneuver, may I help you?*” (or something to that effect). If the victim offers no response while clutching their throat, it is reasonable to assume that they consent to your offer to help. Even a slight head nod is enough to indicate consent.
2. Position yourself behind the victim, pushing any items (such as furniture) around you out of your way. Position your feet in a stance that will allow you to hold and carry the entire body weight of the victim if necessary. If performing on a smaller child, you may need to get on your knees.
3. Reach around the victim’s waist with one hand and locate the navel and note the location of the soft notch at the bottom of the sternum (the xiphoid process).
4. Make a fist with your other hand (thumb on the inside) and position it just above the navel but below the xiphoid process (**Figure 3.11**).
5. Grasp the outside of your fist with your other hand and give quick sharp, inward and upward thrusts to force the object out (**Figure 3.12**).

Figure 3.11



Locate the navel and position your fist just above it (but below the xiphoid process).

Figure 3.12



Grasp your fist and provide inward and upward abdominal thrusts.

Repeat these thrusts until the object is dislodged. If the victim becomes unresponsive while performing the Heimlich, you will need to be ready to accept all of the victim’s body weight. Make sure you are ready for this by having your feet roughly shoulder width apart, with one foot slightly forward (between the victim’s feet) to help stabilize yourself.

Cease performing the Heimlich and create “hooks” with your arms bent upwards at the elbows, catching under the victim’s armpits. Confirm that there is nothing behind you and slowly move backwards while at the same time lowering the victim to the ground. Gently allow the victim’s legs to remain straight as you pivot the victim’s hip, setting the victim down on their buttocks. Continue to slowly move backwards, unhooking your arms, positioning them on the victim’s back until the shoulders reach the ground. Lastly position your arms, then hands behind the victim’s head, gently placing it on the ground. These actions will help avoid causing the victim to have secondary falling injuries. Always protect the victim’s head.

Once the victim is safely on the ground, immediately begin CPR, starting with chest compressions (**Figure 3.13**), opening the airway and checking the mouth for the object before attempting 2 breaths (**Figure 3.14**).

Figure 3.13

Once the airway obstruction victim is safely on the ground, start CPR with chest compressions.

Figure 3.14

Before attempting 2 rescue breaths, open the airway and look into the mouth to see if an object can be reached with a finger sweep.

Since you witnessed the reason for the collapse, there is no need to check for responsiveness or breathing. As was covered earlier, chest compressions are an effective means of moving an obstruction higher into the airway. As you begin care, ask a bystander to call 9-1-1. If no bystanders are present, shout for help. If no help arrives, continue CPR for about 2 minutes, then place the victim in the recovery position and make the call. Follow the care described earlier in this chapter under ***“If Breaths do not Make the Chest Rise”***.

If a choking victim is too large and you are unable to reach around the victim to give effective abdominal thrusts, or if the victim is obviously pregnant, give chest thrusts. Reach under the victim’s armpits and place the thumb side of your fist against the center of the victim’s chest.

Grasp your fist with your other hand and give quick, inward thrusts (**Figure 3.15**). Continue until the object is dislodged or the victim becomes unresponsive. If the larger victim (or pregnant woman) becomes unresponsive, follow the same procedure to safely place them on the ground and then begin CPR.

Airway Obstruction - Infants under 1 Year

If an infant (home from the hospital to 1 year) is conscious and choking, use a series of back slaps and chest compressions to relieve the obstruction. Follow these steps to relieve a severe airway obstruction in an infant:

1. Gain consent from any parent or guardian present. If none are present, consent is assumed.
2. Grasp the infant's jaw, position the infant face down on your forearm, and lower your forearm to your leg.
3. Use the heel of your free hand to give 5 back slaps between the infant's shoulder blades. (**Figure 3.16**).
4. Grasp the back of the infant's head, roll the infant face up on your forearm, and lower your forearm to your leg.
5. With your free hand, place 2 fingers on the breastbone, about a finger width below the nipples, and give 5 chest compressions. Each compression should be one third the depth of the chest (about 1.5 inches), and allow the chest to fully recoil after each compression (exactly the same as infant CPR). (**Figure 3.17**).
6. Look in the mouth of the infant and attempt to sweep out any visible object.
7. Repeat these steps until the obstruction is dislodged or the infant becomes unresponsive.

If the infant becomes unresponsive, carefully place on a flat, firm surface and begin infant CPR, starting with chest compressions. As with adults and children, after 30 chest compressions, open the airway and look into the mouth to see if the obstruction is visible. If it is visible, perform a finger sweep to remove, then attempt 2 rescue breaths. If the object is not visible, do not finger sweep and attempt 2 rescue breaths. Continue in the same manner as children and adults.

Figure 3.15



Provide chest thrusts for a pregnant or large victim.

Figure 3.16



Provide 5 back slaps between the infant's shoulder blades.

Figure 3.17



Provide 5 chest thrusts to help relieve the obstruction.

Victim Vomit or Fluids in or Around the Mouth

Unfortunately, there is a fair chance that the victim may **vomit** at some point during your care. This can be minimized by making sure you are not over ventilating during rescue breathing and maintaining an open airway during ventilations. During compressions, the victim may vomit simply because of the relaxation of the lower esophageal sphincter.

If the victim vomits during care, quickly but carefully roll the victim to one side (similar to the recovery position). If you are wearing gloves, wipe away any vomit remnants from inside and around the mouth. If you are not wearing gloves, consider using the victim's clothing or any available loose article of clothing. Once the victim has finished vomiting and has had their mouth adequately cleaned, roll the victim back and resume CPR with compressions.

If you do not have a barrier device, you may consider performing Compression only CPR to avoid direct contact with the victim's vomit residue, or if other suspect fluids or blood is present in or around the mouth. Alternatively, research suggests that the nose can support rescue breaths (**mouth-to-nose**) and can be a reasonable alternative to direct mouth-to-mouth contact. To perform mouth-to-nose rescue breathing, perform the following:

1. Open the airway with the head tilt, chin lift, but keep the victim's mouth closed.
2. Take in a normal breath of air (not deep).
3. While keeping the victim's head tilted back and mouth closed, seal your mouth around the victim's nose and breathe into their nostrils. Monitor for the start of chest rise as you would normally.

In addition to avoiding contact with fluids, this method is also helpful if the mouth has been damaged, making mouth-to-mouth impractical even if you were willing to do so.

Victim with a Laryngectomy

If the victim has had a **laryngectomy**, they will have an opening in the front of their neck called a **stoma**. Rescue breaths will not work via the mouth or nose, so your options in this situation are to perform *Compression only CPR* or to attempt to delivery rescue breaths directly onto the stoma (**Figure 3.18**).

To perform, tilt back the victim's head so that you have maximum access to the neck and stoma and cover the mouth and nose. Seal your mouth against the stoma and deliver two regular breaths while monitoring for the start of chest rise after each. Other than this adjustment, proceed with care as you would normally.

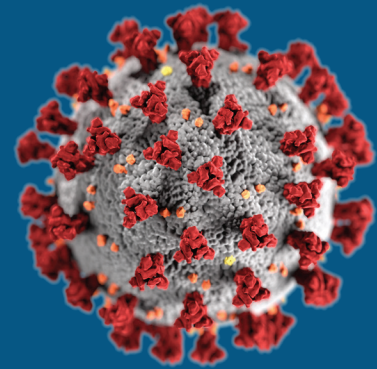
Figure 3.18



A victim with a laryngectomy breathes through a stoma.

Community CPR During a Pandemic

As discussed in chapter 1 of this textbook, harmful disease transmission is very unlikely, even when standard precautions are not taken - ***under normal circumstances***. Unfortunately, during a pandemic caused by an airborne pathogen, like SARS-CoV-2 (the virus that causes COVID-19) it is reasonable to wonder if “*the scene is safe*” if you do not know if the victim is infected. While only you can make that determination (based on the unique characteristics and situation at the scene) there are official ECC Guideline recommendations designed to address these valid concerns. This guidance is meant to strike a good balance between protecting yourself and helping someone, specifically a victim of presumed cardiac arrest, who will almost certainly die if nobody acts.



Consider these guidelines:

If no accessible AED is available perform *Compression only CPR*

- Keep your face mask on (or put it on) before entering the scene.
- If the victim is unresponsive, call 9-1-1 or have a bystander make the call.
- If you have immediate access to any PPE, such as gloves, use it.
- If the victim has a mask on, ensure that it is properly covering their face (put one on the victim if needed).
- Look at the chest closely for up to 10 seconds to determine if there are any signs of breathing. Avoid getting close to the victim's face.
- If you do not see any signs of breathing or if you are not sure, presume cardiac arrest and begin *Compression only CPR* as previously described.
- Continue *Compression only CPR* until EMS arrives and takes over.

If an accessible AED is available, attach first, then perform *Compression only CPR*:

- Proceed in the same manner as outlined above, except retrieve (or have someone retrieve) the accessible AED and bring it to the scene and make sure 9-1-1 is called.
- If the victim is unresponsive and not visibly showing signs of breathing, presume cardiac arrest. Attach the AED (as described in chapter 4) and follow the prompts.
- After the AED analyzes, it will advise a shock or no shock. If it advises a shock, deliver the shock and then initiate *Compression only CPR* (wearing a face mask). Likewise, if no shock is advised, begin *Compression only CPR* (wearing a face mask).
- Continue *Compression only CPR* until the AED prompts you to stand clear for the next analysis (about 2 minutes). Proceed in this manner until EMS arrives and takes over.

Once you have completed your role in helping the victim, properly clean (or sanitize) your hands and any other part of your body that may have come into contact with the victim. Avoid touching your face or uncontaminated objects, until you can properly wash your hands. EMS personnel may be able to assist with proper cleaning or advise you at the scene on how you should proceed. It is recommended that you change and launder your clothing and bathe yourself as soon as possible to help eliminate any potential contamination. Contact your physician for advice on self-care and to arrange a test as a precaution, if possible. The victim will likely be tested at the hospital. Consider giving EMS your information before leaving the scene so that you can be alerted if the victim was in fact infected through contact tracing.

Chapter 3 REVIEW

Key Terms

- Airway obstruction
- Automated External Defibrillator (AED)
- Cardiac arrest
- Cardiopulmonary resuscitation (CPR)
- Compression only CPR
- Chain of survival - Adult
- Chain of survival - Pediatric
- Chest rise
- Heimlich Maneuver
- Laryngectomy
- Mouth-to-mouth
- Mouth-to-nose
- Rescue breaths
- Re-tilt
- Stoma
- Vomit

Key Points

- ✓ Laypersons are often the first on the scene, and are capable of rendering appropriate initial care for a victim with presumed cardiac arrest.
- ✓ An unresponsive, non-breathing person needs CPR, an AED, and more advanced care.
- ✓ Regardless of whether the person is an adult, child, or infant, the general steps of CPR are the same.
- ✓ Begin CPR with chest compressions. Compressions should be deep, fast, and with minimal interruptions.
- ✓ When performing CPR, provide 30 compressions and 2 breaths.
- ✓ Repeat cycles of compressions and breaths until a defibrillator is available.
- ✓ Compression only CPR requires continuous compressions at a rate between 100 - 120 compressions per minute (pausing at appropriate times related to the AED).
- ✓ Continue CPR until you are too exhausted to continue, the victim shows signs of life, someone trained arrives to take over, or EMS personnel take over care.
- ✓ Perform the Heimlich Maneuver on responsive (adult and child) victims of an airway obstruction.
- ✓ Perform 5 back blows and 5 chest thrusts for responsive infant victims of an airway obstruction.
- ✓ Consider mouth-to-nose rescue breathing if the mouth is damaged or covered in body fluids.
- ✓ Consider rescue breathing into a stoma of victims who have had a laryngectomy.

Check Your Progress

Now that you have read this chapter and completed any accompanying class activities you should be able to answer the following questions:

- ✓ What is presumed cardiac arrest?
- ✓ What are the links in the Adult Chain of Survival?
- ✓ What are the links in the Pediatric Chain of Survival?
- ✓ How are “adult”, “child”, and “infant” defined for CPR and related care?
- ✓ How many compressions should you provide before rescue breaths?
- ✓ How should you provide chest compressions for an adult?
- ✓ How should you provide chest compressions for a child?
- ✓ How should you provide chest compressions for an infant?
- ✓ How do you perform mouth-to-mouth rescue breaths during CPR?
- ✓ How do you avoid over ventilation during rescue breathing?
- ✓ What do you do if your rescue breaths do not go in during CPR?
- ✓ What is Compression only CPR and when is it used?
- ✓ What are some examples of special situations that may arise during CPR and related care?
- ✓ What is the Heimlich Maneuver and when is it used?
- ✓ When would you use back blows and chest thrusts?
- ✓ What should you do if the victim of an airway obstruction becomes unresponsive during care?
- ✓ What are your options if the victim vomits during CPR care?
- ✓ How do you provide rescue breaths if the victim has had a Laryngectomy?

Chapter 4

Automated External Defibrillation

Learning Outcomes

After reading this chapter and completing any related course work, you will be able to:

- Explain the electrical conduction system of the heart.
- Explain the two abnormal heart rhythms that the AED can correct.
- Identify the elements common to all AEDs.
- Describe how an AED works to help a victim in cardiac arrest.
- Describe special considerations when using an AED.
- Describe how to maintain an AED in proper working condition.
- Demonstrate how to use an AED.

Chapter Quick Look

- The Heart's Electrical Conduction System
- About AEDs
- Using an AED
- Special Considerations
- Maintenance

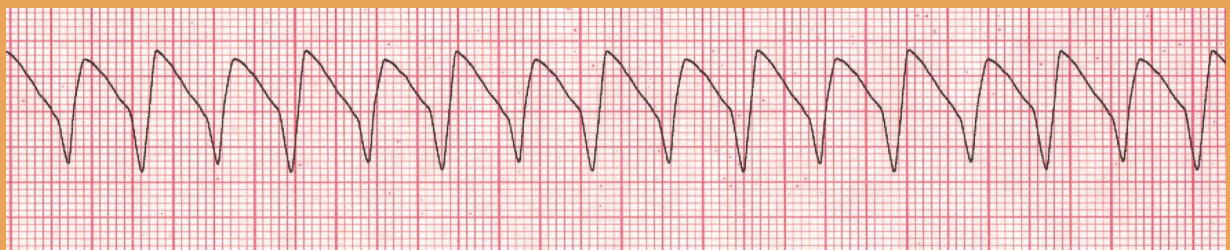
The Heart's Electrical Conduction System

The electrical conduction system of the heart sends the signal that results in the contraction of the chambers of the heart and the pulse that can be felt. The normal electrical impulse in the heart originates in the upper right side, occurs about once every second, and travels along pathways within the heart. When the electrical impulse causes the heart muscle to contract, it forces blood to move throughout the body.

When the normal electrical activity of the heart is interrupted, electrical disturbances known as **dysrhythmias** will occur. These dysrhythmias are able to be viewed as tracings on an **electrocardiogram (ECG)**. Two of the most common life-threatening dysrhythmias seen in the first few minutes of sudden cardiac arrest are ventricular tachycardia (V-tach) and ventricular fibrillation (V-fib).

Ventricular tachycardia causes the ventricles to beat far too fast. The chambers cannot fill properly or pump blood effectively (**Figure 4.1**). **Ventricular fibrillation** is disorganized, chaotic electrical activity that results in quivering of the ventricles. Blood cannot be pumped out of the heart resulting in no pulse (**Figure 4.2**).

Figure 4.1



Electrocardiogram (ECG) showing Ventricular Tachycardia.

Figure 4.2



Electrocardiogram (ECG) showing Ventricular Fibrillation.

FYI: “Rebooting” the Heart

It may help you to think of an AED restarting the heart in a manner similar to a computer being “rebooted,” when it becomes locked and must be shut down completely and then restarted.

About AEDs

An **automated external defibrillator (AED)** is a portable electronic device applied to a victim in cardiac arrest. It is capable of analyzing the heart rhythm and delivering an electric shock, known as **defibrillation**, to the heart of a victim to correct ventricular fibrillation or ventricular tachycardia. The goal of defibrillation is to reestablish a viable heart rhythm by shutting down the heart (asystole), enabling the heart to restart with normal electrical and mechanical function. Besides analyzing the heart rhythm and delivering a shock if needed, an AED also records data such as the number of shocks delivered, changes in the ECG, the date, and the time of use. (**Figure 4.3**).

Figure 4.3



AEDs can quickly analyze the heart rhythm and provide a shock if needed.

There are several different AED manufacturers. Beyond the minor differences in device appearance (color, size, buttons), all AEDs have the following commonalities (**Figure 4.4**):

- Battery operated
- Self – maintained internal diagnostics
- Power on/off
- Voice prompts to guide users
- Cable and electrode pads to attach to the chest
- ECG Analysis capability
- Defibrillation capability

Figure 4.4



Though there are different devices, all devices have common features.

The initial care for a victim in cardiac arrest involves giving CPR until a defibrillator is available. For every minute that defibrillation is delayed, the chance that a victim in cardiac arrest will survive decreases 7% - 10%.

Using an AED

Once an AED is available, turn the device on and follow the prompts. Remove any clothing. Dry and shave any excessive hair (where the electrodes will be placed) if needed. A “Ready Kit” is part of the AED, and normally includes scissors, razor, and a drying cloth (**Figure 4.5**).

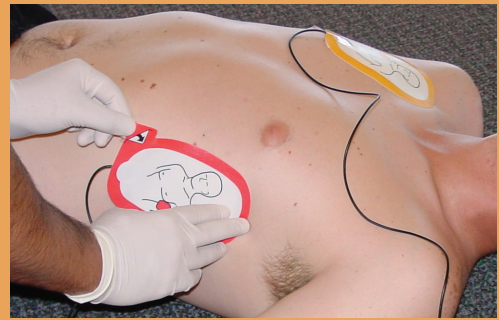
Figure 4.5



A “Ready Kit” has necessary AED supplies.

With the chest prepared, remove the two **electrode pads** from the package. Peel the protective backing off the pads, and place the pads on the chest according to the diagram on the packaging. For adults, one pad is placed just below the right collarbone. The other pad is placed on the lower left side of the chest (**Figure 4.6**). Pad placement varies for children and infants. Follow the manufacturer's instructions for use of pediatric pads if available.

Figure 4.6



Place electrode pads on the upper right side and lower left side of an adult (over the age of 8) victim's chest.

Figure 4.7



AEDs can deliver the shock automatically, or require the user to press a button to deliver the shock.

With the cable attached to the AED the device will immediately begin analysis of the heart's electrical activity once the second electrode pad is attached. Stand clear and allow the device to analyze the rhythm. The AED will advise of the need to administer a shock. Some AED's are fully automated and will administer the shock automatically. Most publicly accessible AEDs are require the operator to push a flashing "shock" button but you should be familiar with both types (**Figure 4.7**).

If no shock is advised, it means that the AED did not find a shockable rhythm (V-fib or v-tach). Regardless of whether a "shock" or a "no shock" advisory is given, CPR should resume as long as the victim appears to remain in cardiac arrest. It may take several shocks to correct to correct the dysrhythmia or the AED may never find a shockable rhythm. Your focus should remain on delivery of care, not with what the results of the AED analysis might mean.

Before delivering a shock, quickly confirm that nobody is touching the victim. This is not solely out of concern about possibly injuring yourself or a bystander. It is to ensure that 100% of the AED energy is directed where it is needed - the victim's heart (**Figure 4.8**).

Figure 4.8



Make sure everyone is standing clear before the shock is delivered.

As soon as the AED indicates that it is safe to touch the victim, resume CPR starting with chest compressions (**Figure 4.9**).

It is possible that the combination of several minutes of CPR and the AED delivering one or more shocks may result in cardiac function being restored. While this could mean that the victim will start breathing or even become responsive, do not get discouraged if the victim remains unresponsive without breathing. Your efforts are giving the victim the best chance of survival. You continuing high quality CPR and AED care undaunted until EMS personnel take over, may make it more likely that Advanced Cardiac Life Support will be more effective.

Special Considerations

There are several special considerations to be aware of when using an AED:

- Medication patches
- Implanted devices
- Children and infants
- Jewelry and body piercings
- Water
- Metal Surfaces

Medication Patches

Medication patches such as nitroglycerin, pain medication, or nicotine are worn on the skin and absorbed into the body. If a patch is worn on the chest and it is in the way of where an electrode pad will be placed, remove the patch, dry the chest, and apply the electrode pads (**Figure 4.10**).

Children and Infants

Cardiac arrest in children and infants is usually secondary to airway and breathing problems that ultimately lead to cardiac arrest. AEDs can be used on adults, children, or infants. Special pediatric electrodes pads or a pediatric “key,” reduce the energy for use on those less than 8 years of age (although it is completely safe and appropriate to use adult pads in lieu of pediatric measures). Pediatric pads are to be placed according to the manufacturer’s instructions. For infants this means placement of one pad on the chest and the other on the back.

Figure 4.9



Provide 2 minutes of CPR after delivering any shock.

Figure 4.10



Remove any medication patches in the way of the electrode pads.

A Survivor's Perspective

Dennis Burstein is an accomplished athlete, coach, educator, and administrator. He is a spouse, parent, and grandparent. But he is far more than this. He is a survivor of sudden cardiac arrest. Dennis is not unique because he survived cardiac arrest, but rather, the way in which he survived it.

Dennis suffered two heart attacks! The first heart attack happened when he was a young man, just 40 years of age. The second occurred 12 years later. Here is his remarkable story of survival.



It was early morning in mid-September. I had just completed a vigorous 2 hour swimming workout. When I arrived home just before 7:00 a.m., I told one of my children and my wife that I was not feeling well and just wanted to lie down for a few minutes. Minutes later I felt my chest suddenly compress three times, going “pa-thump, pa-thump, pa-thump.” I knew I was having a heart attack. Just as suddenly, my chest felt fine, there was no pain, only a sudden awareness that I had to get to the hospital right away. I knew if I asked my wife to take me that she would need a few minutes to get dressed, and if I called 9-1-1 I feared it would be a longer delay. Since I lived a half mile from the hospital, I grabbed the car keys, said I was going to the hospital, and drove away.

How fortunate that I made it to the hospital. It was even more fortunate that when I arrived at the hospital there were no other patients present! As I registered and sat down in the triage area my chest compressed again, four more times. Simultaneously, I felt like an entire swimming pool of water was flowing over my head and down my body, as I slid off the chair toward the floor.

The next thing I remembered was waking up and realizing I had been defibrillated. What I found out later is that it was the third shock that brought me back. When I opened my eyes my wife was at my side asking how I was feeling. Just then my heart stopped again, and I was defibrillated several more times. The next time I awoke was after the sixth defibrillation. I felt my body pop up off the table and I shouted out “that hurt.” Collapsing again, a seventh shock was provided. I again felt my body pop off the table and I shouted out again. Though things were hazy, I saw a group of people standing around me. A group of interns had just arrived, and my condition caused everyone to observe. Each time following defibrillation my heart would recover, but then I would go back into cardiac arrest. The 8th, 9th, and 10th shocks were administered when I arrested in the cardiac cath lab where I had emergency surgery.



After celebrating my 40th birthday in the hospital, things were fine for 12 more years until I had a second heart attack at age 52. This was the same age that my father died of a heart attack. After being successfully defibrillated (this time by an AED), and surviving that event, it was suggested that I put in an internal cardiac defibrillator (ICD). I was in no hurry to return to the hospital, and delayed having this procedure for several more years. Finally I was ready. Three stents were installed along with an ICD.

Although it was very noticeable to me when it was first implanted, after a while it seemed hardly noticeable. Even when I am swimming most people never even noticed. I know my ICD is there just in case I experience another event. It is like an insurance policy for my heart. My first ICD lasted more than the six years of its expected battery life.

I am now on my second ICD, which is expected to last more than 10 years. I am anxious to see what new technology will be out there when it needs to be replaced. At this point in my life, I continue to eat relatively well, take my medicine, and exercise on a regular basis. Exercising regularly helps me feel good, reduce stress, stay fit, look better, and live a longer, healthier life. And right now my blood lipids are the best they have ever been. The more I am with my family and friends the more fulfilling my life becomes.

If pediatric pads are not available, adult pads can be used. The pediatric “key” turns a specific AED into a pediatric AED, adjusting the voice instructions and decreasing the energy during defibrillation of children and infants using the same set of electrode pads for adults (**Figure 4.11**).

Water

Water is a conductor of electricity, which could provide a pathway for electricity between the AED and rescuers. Common practice is to remove the victim from any free-standing water. This might involve moving a victim from a pool to at least 6 feet away from the pool edge. It could also include placing the victim on a backboard to further ensure separation from the water. Dry the victim’s chest and then attach the electrode pads. Taking these precautions greatly reduces any risks to rescuers (**Figure 4.12**).

Implanted Devices

Surgically implanted devices include internal **pacemakers** and internally placed **cardioverter defibrillators (ICD)** (**Figure 4.13**). These devices are placed under the skin and attached to the heart in people with specific heart conditions. They can often be seen or felt once clothing is removed from the chest. They are often placed under the skin on the top left side of the chest, so AED electrode pads should not normally be in contact with these implanted devices. If the device has been placed in an area where the pad is normally positioned, avoid placing the AED electrode pad over top of the implanted device.

Figure 4.11



Use pediatric pads or “key” if available for those younger than 8 years old.

Figure 4.12



Move the victim from standing water and dry the chest before applying electrode pads.

Figure 4.13



Implanted Cardioverter Defibrillator (ICD).

Since an ICD shocks the heart directly, a shock from an ICD is less powerful than a shock given externally through an AED. Though the victim will feel a jolt, the energy that escapes to the surface, where a rescuer might be contact with the victim, is hard to detect and harmless.

Jewelry, Body Piercings and Metal Surfaces

In most cases there is no need to remove body piercings and jewelry when using an AED. Place the electrode pads so that are not directly over metallic jewelry or body piercings. This may require you to position the pads slightly different than normal. Remove jewelry or body piercings if there is no other way to safely place the electrode pads. It is safe to deliver a shock when a guest is on a metal surface, as long as the AED electrode pads do not contact the metal surface and no one is touching the guest during defibrillation.

Maintenance

AEDs require very little maintenance. Devices run their own internal checks to verify proper operation. AEDs have warning lights that signal users that the device is functioning properly or that it is malfunctioning. If a device has a problem, such as a low battery, it can inform users by changing to a red light instead of its normal light, and chirping the same way a smoke alarm does. This signals those responsible for the maintenance of the device that attention is needed immediately (**Figure 4.14**).

Periodic inspection of the AED will also ensure that the proper supplies, such as unexpired electrode pads are in place, as well as items such as a razor, scissors, and drying cloth (**Figure 4.15**).

Figure 4.14



AEDs run internal diagnostics to ensure proper working condition. Warning lights verify that the device is functioning properly or needs attention.

Figure 4.15



Periodic inspection of the AED will ensure it is proper function and that the necessary supplies are available and up-to-date.

Putting it All Together

The general BLS response procedure provided below includes the key components for a layperson's response, should an emergency occur. The matrix on the next page is also provided as a general reference for each skill.

General BLS Response Procedure (Layperson):

- **Recognize the emergency and act.**
- **Survey the scene.**
 - Confirm the scene is safe, then enter the scene.
 - If the scene is not safe, take reasonable steps to make it safe (if possible).
 - If the scene cannot be made safe, call 9-1-1; if something changes, act accordingly.
- **Enter the scene and check the victim for responsiveness (*Tap & Shout*).**
 - If responsive, place in the recovery position and do a secondary check.
- **If unresponsive, ask a bystander to call 9-1-1 and retrieve an accessible AED.**
 - If a bystander has a mobile phone, ask that it be put on speaker once connected.
 - If a bystander needs to leave the scene to call, confirm that they will return promptly once the call is made to report that EMS is on the way.
 - If you are completely alone, make the call yourself:
 - If you have a mobile phone, make the call and place on speaker.
 - If you do not have a mobile phone, and the victim is an adult, place in the recovery position and leave to make the call.
 - If you do not have a mobile phone and the victim is a child or infant, perform 2 minutes of care and then make the call, taking the victim with you if possible (and safe to do so).
 - If an accessible AED is at or near the scene, retrieve or have someone retrieve.
- **Place the victim face up on a flat, hard surface and check for breathing (10 sec.)**
 - If breathing is definitely found (not agonal breathing) place in the recovery position and perform a secondary check.
- **If no breathing is found or if breathing is agonal (or you are not sure), begin CPR.**
 - Start with 30 chest compressions at a rate of 100-120 compressions/min.
 - Adults: Use two hands, 2-2.4 inches deep, allow full recoil
 - Child: Use one or two hands, 2 inches deep, allow full recoil.
 - Infants: Use two fingers, 1.5 inches deep, allow full recoil.
 - Open the airway and deliver 2 rescue breaths (use a barrier device if available).
 - Take a normal breaths before delivering two, 1 second long breaths watching for the chest to start to rise with each breath delivered.
- **As soon as the AED is available, attach and incorporate it into your CPR efforts:**
 - Turn on the AED and remove the victim's shirt. Note evidence of internal devices.
 - Dry the chest if wet and safely remove medication patches, if present.
 - Shave chest locations of pad placement if needed.
 - Open the electrode pads and place each on the chest as indicated.
 - Follow the AED's prompts, including standing clear for rhythm analysis.
 - If the AED advises a shock, confirm all are clear and press the shock button.
- **Following each shock delivery or if no shock is advised, resume CPR.**
- **Continue CPR/AED care until EMS personnel arrive and take over.**

Community CPR & AED Layperson Care Summary Matrix

Key Areas of Care	Adults Older than 8 years of age* <small>*Approximately adolescence & older</small>	Children 1 year of age to 8 years of age* <small>*Preadolescence onset</small>	Infants Newborn* - 1 year of age <small>*Home from the hospital</small>
Scene safety & Responsiveness	Look for dangers, proceed with caution. Check for responsiveness: <i>“Tap and shout”</i>	Look for dangers, proceed with caution. Check for responsiveness: <i>“Tap and shout”</i>	Look for dangers, proceed with caution. Check for responsiveness: <i>“Tap and shout”</i>
Get help from others Call 911	If no response, ask for help from bystanders if available. Make sure 911 has been called & an AED retrieved if accessible before beginning care. <i>Place the 911 call on speaker as you proceed with care.</i>	If no response, ask for help from bystanders if available. Begin care, calling 911 ASAP or after 2 minutes of care. Retrieve an AED if accessible. <i>Place the 911 call on speaker as you proceed with care.</i>	If no response, ask for help from bystanders if available. Begin care, calling 911 ASAP or after 2 minutes of care. Retrieve an AED if accessible. <i>Place the 911 call on speaker as you proceed with care.</i>
Victim position for care	Carefully place adults on their backs, on a flat, hard surface.	Carefully place children on their backs, on a flat, hard surface.	Carefully place infants on their backs, on a flat, hard surface.
Check breathing	Look for chest rise and fall. Listen and feel for breathing for no more than 10 seconds.	Look for chest rise and fall. Listen and feel for breathing for no more than 10 seconds.	Look for chest rise and fall. Listen and feel for breathing for no more than 10 seconds.
Breathing absent <i>Compression only CPR</i>	Begin CPR: Use 2 hands, at the center of the chest. Provide continuous compressions with full recoil at a rate of 100 – 120 comp/min. Attach an AED if available.	Begin CPR: Use 1-2 hands, at the center of the chest. Provide continuous compressions with full recoil at a rate of 100 – 120 comp/min. Attach an AED if available.	Begin CPR: Use 2 fingers, at the center of the chest, just below the nipple line. Provide continuous compressions with full recoil at a rate of 100 – 120 comp/min. Attach an AED if available.
High Quality Chest Compressions	Depth: 2 – 2.4 inches (5 – 6 cm). Rate: 100-120 compressions/min (nearly 2 compressions per second). Allow full recoil. Limit interruptions to ≤10 sec.	Depth: 2 inches (about 5 cm). Rate: 100-120 compressions/min (nearly 2 compressions per second). Allow full recoil. Limit interruptions to ≤10 sec.	Depth: 1.5 inches (about 4 – 5 cm). Rate: 100-120 compressions/min (nearly 2 compressions per second). Allow full recoil. Limit interruptions to ≤10 sec.
Breathing absent <i>Willing to provide Rescue Breaths with CPR</i>	Begin CPR: Give 30 chest compressions, tilt back head, lift the chin & deliver 2 rescue breaths. Repeat this sequence until an AED is available.	Begin CPR: Give 30 chest compressions, tilt back head, lift the chin & deliver 2 rescue breaths. Repeat this sequence until an AED is available.	Begin CPR: Give 30 chest compressions, tilt head slightly into a neutral position & deliver 2 rescue breaths. Repeat this sequence until an AED is available.
High Quality Rescue Breaths	Duration: About 1 second. Volume: Achieve visible chest rise Airway: Head tilt, chin lift. Use barrier device if available; consider mouth to mouth if barrier device is unavailable.	Duration: About 1 second. Volume: Achieve visible chest rise Airway: Head tilt, chin lift. Use barrier device if available; consider mouth to mouth if barrier device is unavailable.	Duration: About 1 second. Volume: Achieve visible chest rise Airway: Slight head tilt, chin lift. Use barrier device if available; consider mouth to mouth if barrier device is unavailable.
Automated External Defibrillator (AED)	Retrieve first if accessible. Prepare the chest & attach pads. Follow prompts & provide CPR whenever the AED is not prompting to stand clear.	Retrieve ASAP, if accessible. Prepare the chest & attach pediatric pads (if available). Follow prompts & provide CPR whenever the AED is not prompting to stand clear.	Retrieve ASAP, if accessible. Prepare the chest & attach pediatric pads (if available). Follow prompts & provide CPR whenever the AED is not prompting to stand clear.

Chapter 5 REVIEW

Key Terms

- Automated External Defibrillator (AED)
- Defibrillation
- Dysrhythmia
- Electrocardiogram (ECG)
- Electrode pads
- Internal cardioverter defibrillator (ICD)
- Pacemaker
- Ventricular fibrillation
- Ventricular tachycardia

Key Points

- ✓ The electrical conduction system of the heart is responsible for coordinating the rhythmic pumping action of the heart.
- ✓ Ventricular fibrillation (V-fib) and ventricular tachycardia (V-tach) are two of the most common electrical disturbances present at the time of cardiac arrest. Both of these rhythms interrupt normal blood flow. Both respond to defibrillation.
- ✓ The earlier an AED can be used the greater the chance the victim will survive. Chances decrease 7% -10% for each minute that defibrillation is delayed.
- ✓ Provide high quality CPR until an AED is available. Once available, turn on the device and follow the prompts of the device.
- ✓ An AED will give one of two commands – “Shock” or “No shock advised.” Provide CPR for two minutes after receiving the command.
- ✓ After two minutes of CPR the AED will advise to stand clear so that it can reanalyze the heart and advise how to continue with care.
- ✓ There are a few special considerations when using an AED: water, medication patches, children and infants, implanted devices, metal surfaces, jewelry and body piercings.
- ✓ An AED requires little maintenance other than regular inspection to verify that the device is functioning properly and has the necessary supplies.
- ✓ When helping a victim of cardiac arrest, incorporate an accessible AED into your CPR efforts as soon as it is available at the scene.

Check Your Progress

Now that you have read this chapter and completed any accompanying class activities answer the following:

- ✓ Explain the electrical conduction system of the heart.
- ✓ What are the two abnormal heart rhythms that an AED can correct?
- ✓ What elements are common to all AEDs?
- ✓ What items are typically stored with the AED?
- ✓ How should an AED be maintained to insure proper working condition?
- ✓ What are several special considerations to be aware of when using an AED?
- ✓ How should you do if the victim has a wet, hairy chest, and medical patches?
- ✓ What are the AED considerations for an adult, child, and infant?
- ✓ Once the AED is attached, it prompts you to stand clear - what is it doing?
- ✓ Following delivery of a shock, what should you do?
- ✓ If the AED indicates that no shock is advised, what should you do?

APPENDICES

SKILL PERFORMANCE SHEET: ADULT CPR

Name:

Date:

Instructor:

Task	Practice Prompts	Satisfactory	Unsatisfactory
Check responsiveness.	<i>Adult is unresponsive.</i>		
Make sure 9-1-1 has been called.	<i>EMS system has been activated.</i>		
Check breathing.	<i>Breathing is absent or only gasping sounds are heard.</i>		
Use 2 hands to provide 30 chest compressions at a rate of about 110/min (range 100-120), at least 2 inches in depth and with proper recoil.			
Tilt the head and lift the chin to open the airway.	<i>Airway is open</i>		
Give 2 breaths (each 1 second in duration) to achieve chest rise.	<i>Chest rise is noted</i>		
Continue CPR cycles until an AED is available.	<i>It has been 2 minutes. An AED is available.</i>		

Notes: _____

SKILL PERFORMANCE SHEET: CHILD CPR

Name:

Date:

Instructor:

Task	Practice Prompts	Satisfactory	Unsatisfactory
Check responsiveness.	<i>Child is unresponsive.</i>		
Make sure 9-1-1 has been called.	<i>EMS system has been activated.</i>		
Check breathing.	<i>Breathing is absent or only gasping sounds are heard.</i>		
Use 1 or 2 hands to provide 30 chest compressions at a rate of about 110/min (range 100-120), about 2 inches in depth, and with proper recoil.			
Tilt the head and lift the chin to open the airway.	<i>Airway is open</i>		
Give 2 breaths (each 1 second in duration) to achieve chest rise.	<i>Chest rise is noted</i>		
Continue CPR cycles until an AED is available.	<i>It has been 2 minutes. An AED is available.</i>		

Notes: _____

SKILL PERFORMANCE SHEET: INFANT CPR

Name:

Date:

Instructor:

Task	Practice Prompts	Satisfactory	Unsatisfactory
Check responsiveness.	<i>Infant is unresponsive.</i>		
Make sure 9-1-1 has been called.	<i>EMS system has been activated.</i>		
Check breathing.	<i>Breathing is absent or only gasping sounds are heard.</i>		
Use 2 fingers to provide 30 chest compressions at a rate of about 110/min (range 100-120), about 1.5 inches in depth, and with proper recoil.			
Tilt the head slightly and lift the chin to open the airway.	<i>Airway is open</i>		
Give 2 breaths (each 1 second in duration) to achieve chest rise.	<i>Chest rise is noted</i>		
Continue CPR cycles until an AED is available.	<i>It has been 2 minutes. An AED is available.</i>		

Notes: _____

PERFORMANCE SKILL SHEET: AED

Name:

Date:

Instructor:

Task	Practice Prompts	Satisfactory	Unsatisfactory
Provide CPR until an AED is available.	<i>An AED is now available.</i>		
Turn on the Device.	<i>Device is on.</i>		
Ensure chest is bare and dry.			
Apply electrode pads to chest according to manufacturer design.	<i>Pads are applied.</i>		
Stand clear.			
Initiate analysis.	<i>Shock advised.</i>		
Deliver shock.	<i>Shock delivered.</i>		
Provide CPR, starting with chest compressions.			
Reanalyze rhythm after 2 minutes.	<i>No shock advised.</i>		
Resume CPR if still needed, and reanalyze every 2 minutes.	<i>Victim is unresponsive, but breathing normally.</i>		

Notes: _____

SKILL PERFORMANCE SHEET: ADULT / CHILD AIRWAY OBSTRUCTION

Name:

Date

Instructor:

Task	Practice Prompts	Satisfactory	Unsatisfactory
Responsive Adult / Child			
Determine that the adult/child is choking.	<i>Adult/child is unable to speak, cough, or cry.</i>		
Provide abdominal thrusts (Heimlich Maneuver) until the obstruction is relieved or the adult/child becomes unresponsive.	<i>Object is expelled.</i>		
Unresponsive Adult/Child			
Position the adult/child on the back on the ground.			
Make sure 9-1-1 has been called.	<i>EMS system has been activated.</i>		
Provide 30 chest compressions in the same manner as CPR.			
Open the airway and look in the mouth. Remove any object that is visible.	<i>No object is visible.</i>		
Attempt 2 breaths.	<i>First breath is unsuccessful.</i>		
If breath is unsuccessful, reposition the head and reattempt breath.	<i>Second breath is unsuccessful.</i>		
Repeat chest compressions, object check, and breaths until the obstruction is relieved or EMS personnel arrive.	<i>Obstruction is relieved and adult/child is breathing normally.</i>		

Notes: _____

SKILL PERFORMANCE SHEET: INFANT AIRWAY OBSTRUCTION

Name:

Date:

Instructor:

Task	Instructor Prompts	Satisfactory	Unsatisfactory
Responsive Infant			
Determine that the infant is choking.	<i>Infant is unable to speak, cough, or cry.</i>		
Provide 5 back slaps and 5 chest compressions. Check mouth for object and remove if visible.	<i>Obstruction is not relieved.</i>		
Repeat procedures until the obstruction is relieved or the infant becomes unresponsive.	<i>Object is expelled.</i>		
Unresponsive Infant			
Position the infant on the back on the ground.			
Make sure 9-1-1 has been called.	<i>EMS system has been activated.</i>		
Provide 30 chest compressions in the same manner as CPR.			
Open the airway and look in the mouth. Remove any object that is visible.	<i>No object is visible.</i>		
Attempt 2 breaths.	<i>First breath is unsuccessful.</i>		
If breath is unsuccessful, reposition the head and reattempt breath.	<i>Second breath is unsuccessful.</i>		
Repeat chest compressions, object check, and breaths until the obstruction is relieved or EMS personnel arrive.	<i>Obstruction is relieved and infant is breathing normally.</i>		

Notes: _____

GLOSSARY

Abandonment Abandoning a person after you started to give care without ensuring the person continues to receive care at an equal or higher level.

Advanced cardiac life support (ACLS) Specialized care procedures initiated by paramedics and EMTs in the prehospital setting, and physicians and nurses in the hospital setting.

Airway Obstruction Choking

Atherosclerosis Plaque accumulates on the walls of the arteries of the heart, narrowing the arteries and restricting blood flow.

Atria The two upper chambers of the heart.

Automated External Defibrillator (AED) Battery powered device used to correct certain types of electrical disturbances within the heart.

Basic Life Support (BLS) The initial care provided for those experiencing respiratory and cardiac emergencies.

Bronchi Two main branches off the trachea which allow air to enter into each of the two lungs.

Bronchioles The division of the bronchi into smaller branches.

Capillaries Tiny blood vessels involved in the exchange of oxygen and carbon dioxide.

Carbon dioxide Waste product produced by the body and exhaled.

Cardiac arrest Absence of responsiveness, breathing, and pulse.

Cardiopulmonary resuscitation (CPR) Providing chest compressions and breaths to a person in cardiac arrest (unresponsive and not breathing).

Chain of Survival A series of actions that must be linked together to provide the best care and chance of survival for a person in cardiac arrest.

Choking blockage of the airway

Cardiovascular Disease (CVD) Also known as heart disease, CVD involves diseases that affect the heart and blood vessels.

Coronary heart disease (CHD) Involves the narrowing of the coronary arteries; the blood vessels that supply oxygen and blood to the heart.

Consent Approval given by an ill or injured person, either verbally or as a gesture. If a person is unable to grant consent due to mental impairment, confusion, or loss of consciousness, then consent is implied.

Defibrillation A process in which an electronic device sends an electric shock to the heart to stop an extremely rapid/ irregular heartbeat and restore normal heart rhythm.

Duty to Act Legal duty to respond to emergency situations and provide care.

Dysrhythmia Disturbance of the electrical conduction system in the heart.

Electrocardiogram (ECG) An assessment of the function of the heart's electrical activity.

Electrode pads Pads placed on the chest of a person in cardiac arrest to determine the ECG and administer a shock if needed.

Emergency Medical Services Community resources including EMTs and paramedics

First Aid The immediate care provided to an ill or injured victim.

Good Samaritan Laws State laws enacted to protect responders from legal actions that might arise from emergency care provided while not in the line of duty. These laws vary from state to state.

Head Tilt – Chin Lift Technique used to open a person's airway so that the tongue does not restrict the back of the throat.

Heart Attack Resulting damage that occurs when blood flow to a part of the heart is blocked.

Heimlich Maneuver Care procedure for a conscious choking adult or child.

Hepatitis A bloodborne virus causing serious disease of the liver.

Human Immunodeficiency Syndrome A bloodborne virus that attacks white blood cells, destroying the body's ability to fight infection, and leading to AIDS in most cases.

Implanted Cardioverter defibrillator (ICD) a device placed within the body, designed to recognize and correct certain types of abnormal heart rhythms, such as ventricular fibrillation and ventricular tachycardia.

Laryngectomy A person who has had his or her larynx surgically removed.

Negligence Failure to follow a reasonable standard of care, which causes or contributes to injury or damage.

Oxygen Chemical in the air breathed; essential for life.

Pacemaker A device placed within the body, designed to recognize and correct certain types of abnormal heart rhythms, such as very slow rhythms.

Personal Protective Equipment (PPE) Standard precautions used to ensure that health care providers have an effective barrier between themselves and an ill or injured person.

Primary Check The initial process of checking for immediate threats to life.

Rescue breathing The process of manually providing oxygen to the lungs of a non-breathing person during CPR.

Respiratory arrest Stoppage of breathing.

Respiratory distress Difficulty breathing.

Standard Precautions Measures used to reduce the risk of disease transmission.

Stoma A small opening in the front of the neck through which a person who has had a laryngectomy breathes.

Stroke A blockage of blood flow or rupture of an artery to the brain resulting in death of brain cells.

Trachea The windpipe.

Tuberculosis (TB) A communicable airborne disease.

Ventricles The two lower chambers of the heart.

Ventricular fibrillation Condition of disorganized, chaotic electrical activity in the heart.

Ventricular tachycardia Electrical disturbance that causes the ventricles of the heart to beat far too fast.