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Health Care Provider Basic Life Support

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MEETS CURRENT ILCOR CPR & ECC GUIDELINES

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Welcome

Ellis & Associates (E&A) revolutionized the lifeguard training industry with its National Pool and Waterpark training program in 1983. Since then E&A has become the second largest provider of lifeguard training worldwide, and the premier aquatic risk management organization. For nearly 40 years, E&A training programs including those involving lifeguard water skills, as well as first aid, CPR, AED, and oxygen administration, have been recognized by regulatory authorities worldwide and used by more than 1 million professionals responding to thousands of emergencies every year.

E&A is pleased to bring you its curriculum and philosophy for *Health Care Provider Basic Life Support* that stresses the importance of preventing emergencies, understanding what to do in an emergency, and adequately practicing critical skills so that they become second – nature when needed in an emergency.

Continuing Education

The International Association for Continuing Education and Training (IACET) is a non-profit association dedicated to quality continuing education and training programs. IACET is the only standard-setting organization approved by the American National Standards Institute (ANSI) for continuing education and training. The ANSI/IACET Standard is the core of thousands of educational programs worldwide.

Ellis & Associates is pleased to be an Authorized Provider of IACET. This prestigious accreditation demonstrates our commitment to high-quality lifelong learning and high standards for all of our programs. We are proud of our education programs which reach thousands of safety, supervisory, and health care professionals each year, helping to broaden their skills so that they remain on the cutting edge of education.

Acknowledgements

The development and production of high quality training materials takes time and effort from many people. E&A is proud to be associated with so many dedicated health care professionals. To name them all would be a difficult task. There are, however, several individuals and entities whose contributions to the development of our program require mention.

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1 You,The Health Care Provider

OBJECTIVES

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

1. Provide examples of professions that include health care providers.
2. Describe legal and ethical concerns that apply to health care providers rendering care.
3. Identify pathogens that pose a risk of transmission to health care providers and precautions to minimize disease transmission.
4. Describe how health care providers determine and maintain the safety of the scene.
5. Identify and describe the links in the (Adult and Pediatric) Chain of Survival, and the actions of trained responders within each link.

CHAPTER QUICK LOOK

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5. Standard Precautions and PPE
6. Handling an Exposure
7. Determining and Maintaining the Safety of the Scene
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Critical Skills of Basic Life Support

The initial care that health care professionals provide for those experiencing respiratory and cardiac emergencies is referred to as **basic life support (BLS).** BLS is provided for adults, children, and infants, and includes these four critical skill sets:

- **Perform Cardiopulmonary Resuscitation (CPR) –** CPR is the care provided to a person who is unresponsive, not breathing, and without a detectable pulse.
- **Use an Automated External Defibrillator (AED) –** An AED is used to correct certain types of electrical disturbances within the heart. If CPR is being performed an AED should be used as soon as it is available (**Figure 1.1).**
- **Managing and maintaining an open Airway** - This includes providing direct care to a person who is choking and is a critical concern when delivering any BLS care.
- **Deliver Rescue Breathing** - This is provided to a person who is unresponsive, has a detectable pulse, but is not breathing normally (or only gasping).

This course covers how to deploy these skill sets in an effective manner while maintaining safety. Additionally, this course will cover special situations that health care providers may encounter when giving care.

Figure 1.1

Applying an AED to a person who is in cardiac arrest.

Health Care Providers

Health care providers are traditionally thought of as physicians, physician assistants, and nurses. But others that are trained to provide pre-hospital, basic life support care are also considered to be "health care providers" both due to the level of expertise and a duty to act. Examples include: lifeguards, athletic trainers, ski patrollers, and occupational therapists. Key among these are EMS personnel, such as EMTs and Paramedics as well as firefighters and law enforcement officers. All of these groups have roles to play as they utilize basic life support training in pre-hospital emergencies.

Together these professionals make up more than 10% of the workforce in America, and are employed in areas such as hospitals, clinics, practitioners' offices, nursing homes, public safety departments, schools, park and recreation, insurance companies, and government (**Figure 1.2).**

Figure 1.2

Health care providers with basic life support training are actively involved in many fields.

Emergency Medical Services System

Some form of emergency medical services has always existed in the populated areas of the United States, with horse drawn ambulance services appearing in the decades following the Civil War. The modern Emergency Medical Services (EMS) System (as we know it today in the United States) was developed in the decades leading up to and following passage of the ***EMS Systems Act of 1973***. This act helped formalize the role of pre-hospital care and provided funding for over 300 EMS systems across the nation. Since this modern rebirth, the EMS system has grown further to help ensure that the vast majority of Americans have the ability to call 911 and expect help. The CDC estimates 240,800 paid EMS workers in the United States (as of 2018) with an unknown number of active EMS volunteers. With similar systems set up around the world, there has never been any other time in history where so many humans have access to emergency medical assistance.

Over the past decade, a push to aid non-trained bystanders who contact 911 during an emergency is beginning to yield positive results in lives saved. 911 operators now frequently receive training in Dispatcher-assisted CPR (DA-CPR), allowing a critical link in the Chain of Survival to be performed by a bystander. As the caller describes what is happening, the dispatcher gives easy to follow instructions. This information is also relayed to responding EMS so they know exactly what may be needed upon arrival.

Despite the successes discussed only briefly here, many challenges remain. As with all areas of health care, consistent funding (public and private) and the universal accessibility of promptly arriving EMS responders remains a challenge that has only been exacerbated by the recent COVID-19 pandemic. As such, it has become even more critical to have as many people as possible trained in performing CPR, First Aid, and other life saving skills. Non-EMS, pre-hospital first responders with the ability to perform health care provider level basic life support has also become increasingly essential, as these providers may be the primary means of survival for a person suffering from a medical emergency.

A Health Care Provider's Duty

What makes this group of professionals unique is that during their careers they will respond, on and off duty, to millions of people suffering from cardiac and respiratory emergencies. The interventions they provide will save many lives, regardless of whether the event was the result of a medical condition or trauma. Health care providers typically have a job-related duty to respond to emergencies and provide care to those in need. The actions of health care providers, like you, play a critical role in whether a person survives the event. Though laws vary somewhat from state to state, there are several basic legal considerations that you must be aware of as a health care provider, regardless of where you live and work:

- ✓ **Duty to act:** Health care providers have a duty to respond emergency situations and provide care. Failure to fulfill this duty could result in legal action (**Figure 1.3).**
- ✓ **Scope of practice.** Health care providers have certain responsibilities and skills that have been acquired through training and licensure / certification. These skills make up a scope of practice or training.
- ✓ **Standard of care.** The expectation that health care providers responding to an emergency will provide care with a certain level of knowledge and skill equal to that of similar health care providers.
- ✓ **Negligence.** The failure to follow a reasonable standard of care, which causes or contributes to injury or damage.

Figure 1.3

Health care providers have a duty to act.

- ✓ **Consent.** A rescuer can provide care if he or she first obtains consent from 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. In this case, the law assumes that the person would grant consent if he or she were able to do so.
- ✓ **Confidentiality.** Information provided to health care providers is private and should only be shared with other health care providers directly responsible for the care of the person.
- ✓ **Advance Directives.** These are written instructions that describe a person's desires regarding his or her health care decisions. Living Wills and Do Not Resuscitate (DNR) orders are examples of Advance Directives.
- ✓ **Documentation.** Health care providers are responsible for accurate written records of the events surrounding a person's illness or injury.
- ✓ **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.
- ✓ **Abandonment.** Abandoning a person after you started to give care without ensuring the person continues to receive care at an equal or higher level.

Health Care Provider Protection From Pathogens

Health care providers are at risk of becoming infected with pathogens which may lead to disease. Learning about these pathogens and how to best protect yourself is critical to your health and safety. There are several ***bloodborne pathogens*** of concern, such as Hepatitis A, B and C viruses and human immunodeficiency virus (HIV). These pathogens are transmitted between people when exposed to blood and/or other body substances of the infected person. Bacterial infections can also be transmitted in this manner. Some pathogens such as Tetanus are typically only transmitted into the blood via contact with contaminated surfaces. Several harmful pathogens can be transmitted from animal and insect bites or body substance exposure, which can be a concern if you are working in certain locations and/or certain times of the year. Pathogens such as E. coli can be transmitted by ingesting contaminated food, water, or other substances. Protozoa pathogens, including giardia and cryptosporidium also may also enter the body through ingestion, resulting in illness. Ebola is another possible disease transmitted via blood and other body substances. Those infected will have likely recently travelled to areas where the disease is epidemic and may exhibit a fever, vomiting, diarrhea, headache, joint or muscle aches, stomach pain, and abnormal bleeding.

Airborne pathogens are transmitted when respiratory droplets or aerosols from an infected person are inhaled or come into contact with mucous membranes associated with the upper respiratory system and the eyes of another person. Some especially infectious airborne viruses, such as SARS-CoV-2 (the pathogen which causes COVID-19) may remain infectious for many days on a contaminated surface. Other diseases caused by airborne pathogens include: tuberculosis, chickenpox, measles, mumps, rubella, meningitis, and the annual strain of influenza. Fungal infection risks typically occurs in wet or humid environments and may also be airborne.

Disease Transmission

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

Health care providers risk disease transmission from bloodborne pathogens when blood or other body substances are present at the scene. Transmission can occur if infected blood or body substances splashes in your eyes or mouth, or if you touch the infected person's blood without gloves when your hand has an open sore (even just a scratch). Disease transmission can 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.

FYI: Risk of Infection After An Occupational Exposure

According to the Centers for Disease Control (CDC), health care providers who have received the hepatitis B vaccine and have developed immunity to the virus are at virtually no risk for infection. For an unvaccinated health care provider, the risk from a single exposure (cut or needlestick) to HBV-infected blood is 6 –30%. The estimated risk for infection after a single exposure (cut or needlestick) to HCV-infected blood is approximately 1.8%.

The risk for HIV infection after a single exposure (cut or needlestick) to HIV-infected blood is very low (0.3%). The risk after exposure of the eye, nose, or mouth to HIV-infected blood is estimated to be, on average, 0.1%. A small amount of blood on intact skin probably poses no risk at all. There have been no documented cases of HIV transmission due to an exposure involving a small amount of blood on intact skin (a few drops of blood on skin for a short period of time).

Source: Centers for Disease Control and Prevention, 2014

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 rescue supplies when not wearing appropriate personal protection equipment (see below). You risk transmission of airborne pathogens if an infected person in your immediate vacinity 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 surfaces . You may also inhale the airborne pathogen if you are performing an ***aerosol generating procedure***, such as when performing CPR or rescue breathing to someone who is infected with an airborne pathogen (without additional precautions). 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.

Health care providers should check with their employer to determine which vaccinations are available to them and get vaccinated. Specifically, health care providers in the United States and many other countries are to be given the opportunity to receive vaccinations against specific diseases as described in Title 29 of the Code of Federal Regulations (29 CFR 1910) of the Occupational Safety and Health Administration (OSHA). Sections 1030, 132, 134, and the TB Directive (CPL 02-00-106) address all aspects of the diseases, precautions, treatment, and protection afforded health care providers. Personal Protection Equipment needed for protection is also required to be provided by employers.

Standard Precautions and PPE

Standard Precautions are measures put in place to reduce the risk of disease transmission. Such measures include hygiene practices, such as proper hand washing. Other measures include the use of engineering controls in the workplace that isolate or remove a particular danger, reducing the risk of disease transmission. Additional measures include work practice controls that involve proper storage, use, and cleaning of equipment, as well as clean up procedures in the event that a surface becomes contaminated.

The last of these measures involves the use of **personal protective equipment (PPE)** to ensure that health care providers have an effective barrier between themselves and an ill or injured person. **Figure. 1.4**

Figure 1.4

Health care providers should use PPE when providing care.

The specific PPE you put on before providing care depends on the circumstances of the scene. This includes: the presence of blood or other body substances, your knowledge of any confirmed or possible infections your patient may have, and the specific care you are providing. Health care providers will typically have a specific PPE protocol that conforms with the prevailing standard of care, local regulation, or other requirements or considerations. Pre-service training on these protocols should occur as should training on each item of equipment.

Examples of PPE include:

- Medical exam gloves to avoid contact with bodily fluids (non-latex, nitrile gloves are recommended).
- Devices designed to create a barrier eliminate or otherwise minimize contact with bodily fluids and airborne disease when providing rescue breathing care.
- Goggles or eye glasses with side shields to protect against fluid splatter.
- Face masks to provide protection against airborne pathogens at the scene.
- Gowns that can cover the entire body.
- Alcohol based sanitizer access (60% ethyl alcohol or more) if soap and running water are not immediately available after providing care.

Safely Using Medical Exam Gloves

The typical basic PPE used by health care providers when they encounter an individual who may require care are medical exam gloves. Non-latex, nitrile gloves that are appropriately sized for the hands of the rescuer are recommended. Always confirm that you have access to properly fitting gloves (and other needed PPE) well in advance of any potential response. Medical exam gloves may or may not be sterile, but should always be stored in a clean location that will not be directly exposed to contamination.

Before putting on medical exam gloves, it is recommended that any rings worn by the responder be removed and stored. Next, thoroughly wash your hands with soap and running water for at least 20 seconds. If soap and/or running water is not available, use a hand sanitizer containing 60% ethyl alcohol (or greater), applying an adequate amount to completely cover your hands, fingers, and wrists, rubbing these areas until dry. Finally, with clean hands, carefully put on your exam gloves. Once the gloves are on, quickly confirm that they are secure to your wrists or beyond and have no damage. If wearing gloves with a gown, each glove cuff must be secured over the gown's arms.

Following care, your gloves should be considered potentially contaminated, even if not visibly soiled. With this in mind, never touch anything with your gloved hands, including yourself. If equipment was handled by potentially contaminated gloved hands, identify these for proper cleaning. The graphic below provides the basic recommended procedure for safely removing potentially contaminated gloves.

Table 1.1 Safely Remove Your Gloves

1. Pinch the outside of the glove near the wrist.

2. Peel downward and the glove will turn inside out. Secure this glove in your gloved hand.

3. Slide your finger(s) under the wrist of the remaining glove.

4. Peel downward and the glove will turn inside out over top the first glove. Dispose properly.

Thoroughly wash your hands after removing and properly disposing your gloves*

→ Wet hands and rinse away any loose dirt or other substances
→ Apply enough soap to produce a lather on your hands, covering your fingers, fingernails, palms, and wrists
→ Thoroughly scrub your hands for at least 20 seconds, being sure to cover all surfaces
→ Rinse hands thoroughly under clean running water, removing all soap and residual substances
→ Dry your hands thoroughly with a single use, clean towel and properly discard

**Use an alcohol based hand sanitizer (60% or more ethyl alcohol) if you are unable to wash your hands with soap and water.*

Guidelines for using PPE to prevent infection include:

- Follow standard precautions when using PPE - assume all body fluids are potentially infectious
- If wearing soiled gloves, avoid handling items or equipment such as radios and never eat or drink
- Never touch unprotected body parts, especially your mouth, nose, or eyes while performing your tasks
- Thoroughly wash or sanitize your hands both before putting on exam gloves and following their removal
- Change gloves before providing care to additional individuals or performing the next task
- Wear appropriate protective coverings to protect from infectious droplets or blood splatter from serious bleeding
- If your PPE becomes excessively soiled or damaged, safely remove and put on fresh PPE as soon as possible

Handling an Exposure

If you suffer a possible exposure to blood or bodily fluid follow these guidelines:

- Clean any exposed skin area thoroughly with soap and water. If an injury was sustained, proper first aid care should be administered followed by medical assistance.
- If the exposure involves a splash to areas such as the eyes, flush the area with water or saline. Seek medical assistance.
- Report the event to your supervisor immediately (or ask someone to do so for you) and make sure it is properly documented. **Figure 1.5**. Follow your employer's written exposure control plan.

Figure 1.5

Report the incident to your supervisor and follow your employer's written exposure control plan.

Determining and Maintaining the Safety of the Scene

Health care providers may encounter an individual in need of care in an unknown environment. Similar to taking precautions against possible pathogen exposure, health care providers should always first ***survey the scene*** to determine dangers to yourself, the individual (or individuals) needing care, or anyone else nearby, before attempting any assistance. It is also an opportunity to quickly determine what has occurred and how you may render aid.

When making your assessment, approach the scene but maintain a safe distance until you can complete your survey. Use all of your senses as well as information being provided to you from others. In just a few seconds, your survey of the scene can reveal valuable information by answering certain questions, including:

→ What dangers exist to you and others who may be in the area?

→ What may have happened here or what may have been the cause? What is the general nature of the problem or medical emergency and how many people are involved?

→ What is needed? Do I need PPE (or additional PPE), resuscitation equipment, first aid supplies, additional responders, police, fire protection, etc.?

→ Is the area safe to approach and provide care? Is the area currently safe but is not likely to remain safe? Is the area currently unsafe and if so, is there any action that can be safely taken to make the scene safe?

→ Can I do this on my own or do I need help?

Table 1.2 Survey the Scene

Dangers can be many situations or conditions, such as live electric wires, fire, smoke, toxic chemical exposure, active roadways, confined or uncertain spaces, areas with active assailants (shooters), or other imminent hazards or potential risks. Always call for additional emergency services, including EMS, Police, or Fire Protection Services when dangers are present or if care cannot begin without additional support. If the scene is unsafe, try to make it safe without endangering your life or the lives of others. If the safety of bystanders is potentially affected, take steps to secure their safety. If other emergency responders are available, one should focus on securing the safety of bystanders while the remainder attempts to determine how to make the scene safe to enter and render aid if possible.

Never enter dangerous areas without the proper professional training and equipment. If the scene is safe for you to enter but it is not safe or conducive to provide care or may become unsafe, consider moving the patient to a location that would be safe. If it is not possible to make the scene safe or move the patient to a safer location, *then your remaining recourse is to wait for additional emergency services to arrive* and keep others from entering dangerous areas. Your safety and the safety of bystanders must come first. Remember, you cannot help the patient if you also become injured or worse. Once you determine that it is safe for you to enter the scene, you must remain vigilant to emerging dangers by being aware of your surroundings, maintaining communication with any other responders at the scene, and avoiding unnecessary risks.

In cases where the scene is safe, it is generally not advised to move the patient. Providing what care you can for the patient at the location and position found will most likely present the fewest risks to the patient. Unnecessary movement may worsen primary or secondary conditions or cause the patient undue pain. However, if the situation or conditions of the scene impact your ability to provide the specific care needed or if it is not possible to begin needed care at the found location or position, it will be necessary to move the patient.

Specific examples of when it may be appropriate to move the patient, include:

- The scene is unsafe or you anticipate that it may become unsafe while performing care.
- The terrain the patient is found in requires evacuation due to safety or to facilitate the start of care.
- Weather conditions are unsafe, or conditions are complicating or limiting care efforts.
- The patient is in a confined space making care, such as CPR impossible until moved.

- The location where the patient is found may allow for initial care but does not allow for additional care that may be needed.
- Movement of the patient is part of the delivery of care, such as manually opening the airway, performing CPR, placement in the recovery position, or to control bleeding.

If moving the patient to a different location is necessary, you should attempt to handle the patient as gently as possible, taking reasonable steps to not cause further harm. Consider the following points when preparing to move a patient:

- Protect the patient's head from impacts with objects or the ground.
- Avoid turning or twisting the patient's back or neck.
- If alone, consider using a shoulder or ankle drag to minimize potential injury to yourself or the patient.
- If bystanders are available to help you move the patient, use them while providing clear directions.
- If a spinal injury is suspected, having others aid in supporting the head, neck, shoulders, pelvis and limbs during the move may help minimize further injury (keeping in mind that these concerns are secondary to any life saving care which should not be delayed for any reason).

If you lack the proper training for the situation or if you are uncertain if everyone's safety can be maintained if attempted, wait for additional help to arrive. *Always act within the scope of your training.*

The Chain of Survival: Taking Action

The ***Adult Chain of Survival*** and the ***Pediatric Chain of Survival*** refers to a series of actions which have been determined to provide the best care and chance of survival for a person in cardiac arrest (**Figure 1.7 a and b).** For these chains, it is assumed that the patient suffering from cardiac arrest is found outside of a hospital environment. Ideally, someone with health care provider level basic life support training with access to basic response equipment is available at the scene. However, the chain link actions can be initiated by anyone willing to respond, regardless of training.

The Adult Chain of Survival links are:

1. Activation of Emergency Response
2. High Quality CPR
3. Defibrillation
4. Advanced Resuscitation
5. Post Cardiac Care
6. Recovery

The Pediatric Chain of Survival links are:

1. Prevention
2. Activation of Emergency Response
3. High Quality CPR
4. Advanced Resuscitation
5. Post Cardiac Care
6. Recovery

Figure 1.7a

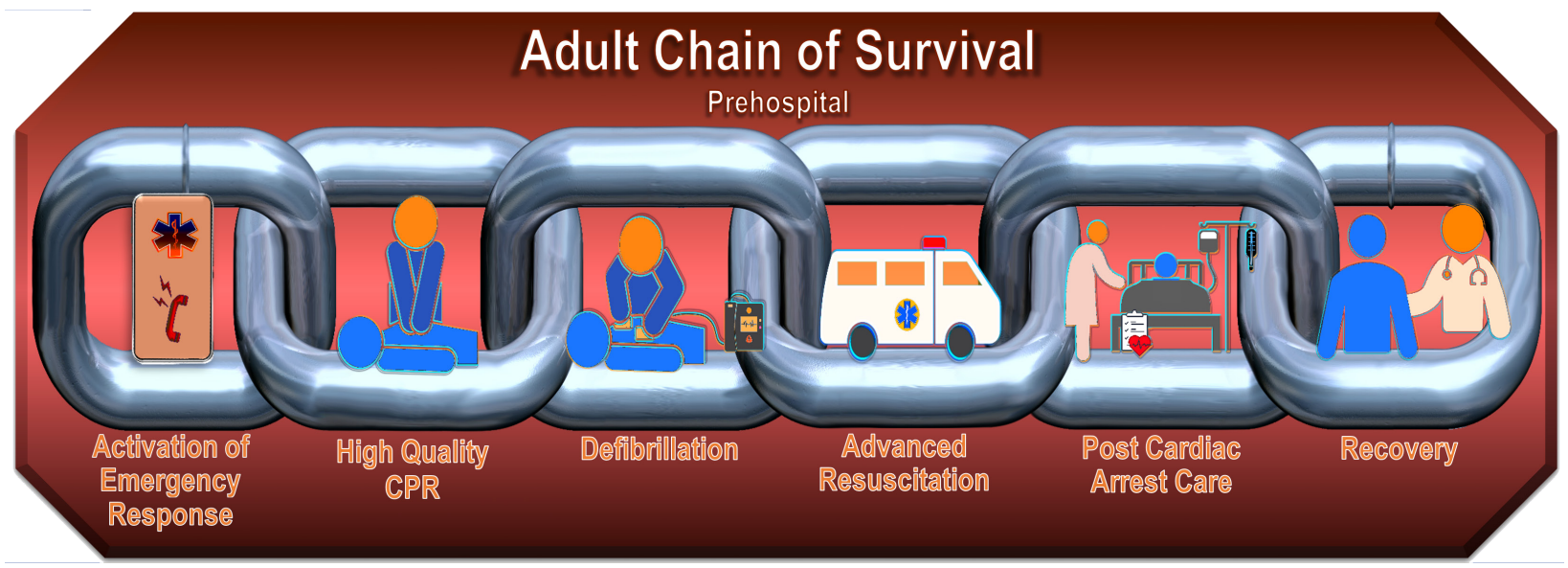
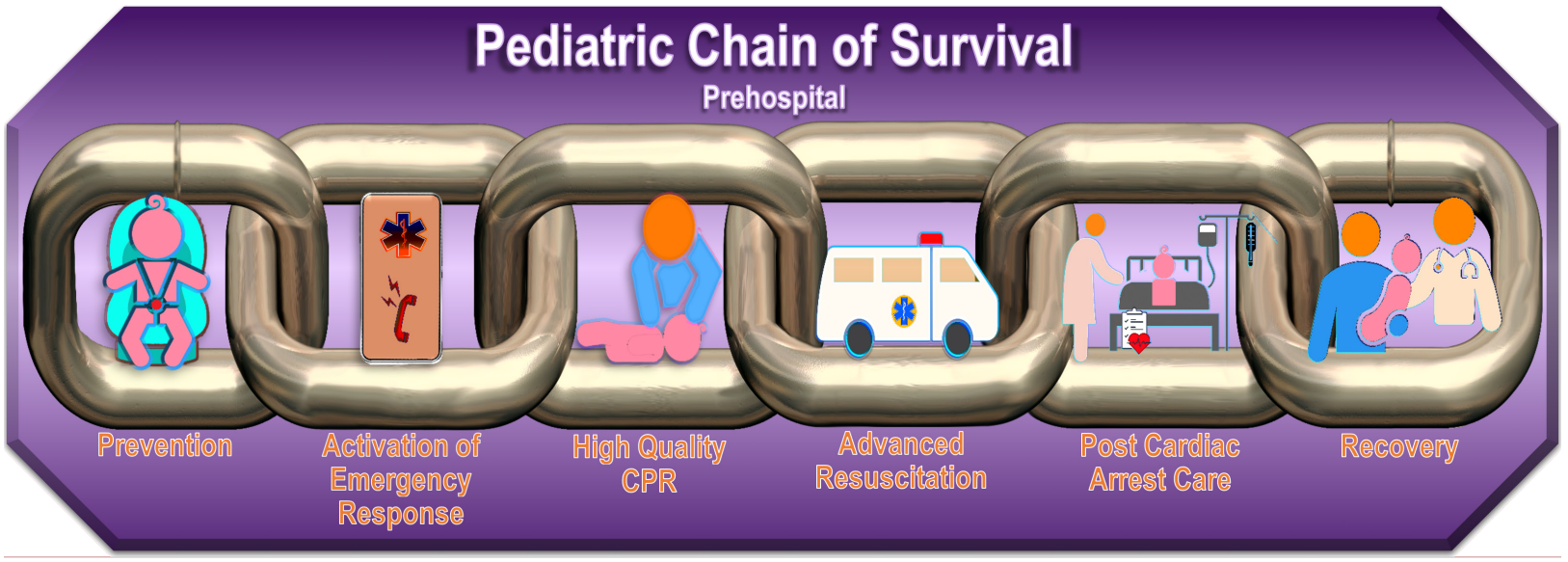


Figure 1.7b



Prevention

Prevention is identified as the first action link in the chain of survival for children to reflect the typically preventable causes of cardiac arrest for this age group. Progressive respiratory related emergencies, forms of shock, and trauma are the most likely causes of cardiac arrest for children and infants. Everyone can play a part in prevention!

Examples of actions that may prevent pediatric cardiac arrest include:

→ **Support and encourage child safety initiatives.** Always follow proper use of child safety seats, safety restraints, and seat belt wearing whenever in a moving vehicle. Require children to wear helmets (and other safety gear) when bike riding, skate boarding, and similar "fall prone" activities.

→ **Learn CPR and First Aid.** Everyone should, but this is especially important for parents and others who are frequently around or supervise children. Similarly, it is important that first aid and CPR related equipment (including an AED) is accessible in all public areas.

→ **Commit to understanding preventable dangers and remain vigilant when children are present.** Some examples may include: Expectant parents of infants should learn of the dangers of Sudden Infant Death Syndrome (SIDS) and ways to prevent it. Understanding that parents should remain alert and physically close to infants and children whenever they are eating, bathing, near water of any depth, or actively swimming (regardless of ability). Ensuring that dangerous items, such as firearms, household chemicals, allergens, drugs (prescribed or otherwise) are always kept secure and inaccessible to children in the home. Teaching children healthy habits related to eating, exercise, and taking care of their emotional and mental health. Finally, enrolling children into swimming lessons, wearing life jackets, and only swimming in designated locations with trained lifeguards on duty.

Recognition and Activation of Emergency Response

When you encounter an emergency situation, how quickly you and others recognize that reality may be critical to the outcome. As a health care provider trained in basic life support, recognition that an emergency is taking place is likely where you begin your role in the chain of survival for children and adults. Recognition of an emergency should initiate two sets of actions by you and others with training. These are:

1. **Surveying the scene** for safety, accounting for your safety and the safety of others, determining the circumstances of the emergency, and if safe, quickly assessing the condition of the patient or patients at the scene (as detailed earlier in this chapter).

2. **Activating Emergency Response** - If the patient or patients are unresponsive or suffering from a significant injury or illness, (or if the scene was unsafe) emergency medical services (EMS) must be contacted.

If you are alone, start by calling 911 on your mobile phone as you initiate care. 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, use your phone to call 911 and request EMS. Inform the dispatcher that someone trained in CPR is at the scene providing care." (Or something similar to this). If this person needs to leave the scene to make the call, direct that they need to immediately return to you to report that EMS is on their 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, such as an AED.

If you are alone and you do not have a mobile phone available, and the patient is an adult, activate emergency response before beginning care. If this means you need to leave the scene, place the patient in the recovery position (discussed in the next chapter) and quickly make the call. However, if the patient is a child or infant 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 infant or child with you to make the call.

You "phone first" for adults 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 patient 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* BLS care may prevent cardiac arrest.

While finding an unresponsive person always requires activation of emergency response, there may be other situations where activation is also warranted. While local protocols may differ, the following examples are offered (note, not an exhaustive list):

- Animal or human bite
- Any significant injury
- Drug overdose (known or suspected)
- Diabetic emergencies
- Electrocution (regardless of severity)
- Fracture or dislocation
- Heat stroke
- Persistent abdominal pain or swelling
- Poisoning (ingested or inhaled)
- Possible spinal or a blow to the head
- Respiratory distress
- Severe burns (any extent) or extensive minor burns
- Sudden significant illness
- Suspected heart attack or stroke
- Severe allergic reaction, including after EpiPen use
- Suspected secondary drowning
- Vomiting blood or persistent vomiting
- Uncontrolled bleeding or unknown blood loss

Any uncertainty by you when assessing if the situation warrants activation of emergency response should result in you erring on the side of activation - call 911. Medical incidents where BLS care is not immediately necessary may escalate. If this occurs, having already called EMS may save valuable time.

High Quality CPR

Cardiopulmonary resuscitation, commonly called CPR, is needed when a person's heart stops beating, or is beating inadequately to sustain life. CPR is important because it helps to circulate oxygenated blood throughout the body to vital organs such as the brain.

Health care providers will assess both breathing and the presence of a pulse at the same time, for up to 10 seconds. If no pulse is found CPR beginning with chest compressions followed by ventilations should begin. If a pulse if definitely found, but no breathing, the health care provider should perform rescue breathing, without chest compressions. "High Quality" CPR comes from your attention (and that of the team, if working with others) to the accuracy and effectiveness of each component of care being performed. The metrics of High Quality CPR will be discussed throughout this course.

Defibrillation

Two electrical disturbances, ventricular fibrillation and ventricular tachycardia, are frequently associated with persons who suffer sudden cardiac death. These electrical disturbances can be corrected through a specialized shock known as **defibrillation**, often provided through an automated external defibrillator (AED). The success of defibrillation is linked to the amount of time from collapse to defibrillation. Each minute that passes without defibrillation results in a 7-10% decrease in the chance of the survival.

High Quality CPR may be interrupted to apply an AED to a patient in cardiac arrest. Compressions should be withheld while the AED is analyzing the heart rhythm. If a shockable rhythm is detected, a shock should be delivered and compressions immediately resumed. If a shock is not advised by the AED, compressions should be immediately resumed. AEDs are designed to alert for reanalysis about every two minutes allowing for CPR to continue during that time. If multiple rescuers are present, they should alternate who is performing chest compressions, switching at every AED analysis to help ensure compression quality.

Advanced Resuscitation

Advanced cardiac life support, commonly referred to as ACLS, involves specialized care procedures initiated by paramedics and EMTs in the prehospital setting (at the scene and during transport), and physicians and nurses in the hospital setting. ACLS includes use of mechanical CPR devices, intravenous (IV) therapy, medication administration, advanced airway management, 12-lead ECG and protocols for transport to a hospital with coronary catheterization capabilities. The use of extracorporeal CPR (cardiopulmonary bypass) using venoarterial extracorporeal circulation and membrane oxygenation (ECMO) may also be performed.

Post Cardiac Arrest Care

This link refers to specialized measures provided to patients in the hospital following return of spontaneous circulation (ROSC). This link in the Chain of Survival is critical because many survivors of an initial cardiac arrest will still succumb to complications associated with the damage caused by the arrest or the underlying cause. Post Cardiac Care may include treating for reperfusion injuries, organ or tissue damage, and determining and treating potential neurological injury. Critically ill patients may require hemodynamic support, temperature management, and mechanical ventilation once they are stabilized. Treatment for multiple organ failure, shock, and seizures may also be required. Physicians will want to diagnose the underlying cause of the arrest and determine a treatment plan. Additional therapies may be needed, depending on the specific issues identified.

Recovery

This link refers to the total care required of survivors of cardiac arrest, along with their caregivers and loved ones. For all involved, an assessment to identify posttraumatic stress, anxiety, and depression, followed by a treatment plan. Short term and long term physical rehabilitation needs should be assessed and addressed quickly following release from the hospital. Also, following release from the hospital, initial appointments should be made or confirmed with the various specialists needed for both short and long term treatment of injuries and damage sustained during the arrest.

If you are involved in a resuscitation effort, your recovery following the care you provided is equally important. Seek mental and physical health assistance and take care of yourself. The self care you take may directly impact your ability to optimally perform, if and when it may occur again.

Chapter 1 RECAP

Key Terms

Abandonment
Advance directive
Advanced cardiac life support (ACLS)
Basic life support (BLS)
Cardiopulmonary resuscitation (CPR)
Chain of survival
Confidentiality
Consent
DA-CPR
Defibrillation
Documentation
Duty to act
Dysrhythmias
Exam gloves
Emergency Response
Good Samaritan laws
High Quality CPR
Negligence
Pathogen
Personal protective equipment (PPE)
Prevention
Post Cardiac Arrest Care
Recovery
Scene Safety
Standard of care
Scope of Practice
Standard precautions

Key Points

- Health care providers, such as you, are often the first professionals on the scene capable of rendering high quality care for a person with a breathing or cardiac problem.
- All care begins by providing Basic Life Support (BLS)
- Health care providers must understand the risks of disease transmission when providing emergency care, and take proper precautions at all times. Using personal protective equipment (PPE) ensures that health care providers have an effective barrier between themselves and an ill or injured person.
- Health care providers always determine if the scene is safe for themselves and others before attempting to provide care to a patient.
- The Chain of Survival refers to a series of actions represented by 6 links in a chain that must work together to provide the best care and chance of survival for an Adult or Child in cardiac arrest.

For Discussion

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

- ✓ Can you provide examples of professions that include health care providers?
- ✓ What are the basic legal considerations that apply to health care providers rendering care?
- ✓ Can you name 4 diseases that may pose a risk of transmission to health care providers?
- ✓ What precautions should be followed to minimize the transmission of the diseases in the previous question?
- ✓ When you Survey the Scene, what are you looking to find?
- ✓ Can you name and describe each of the 6 links in the Chain of Survival for both Adults and Children?

2 RESPIRATORY EMERGENCIES

OBJECTIVES

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

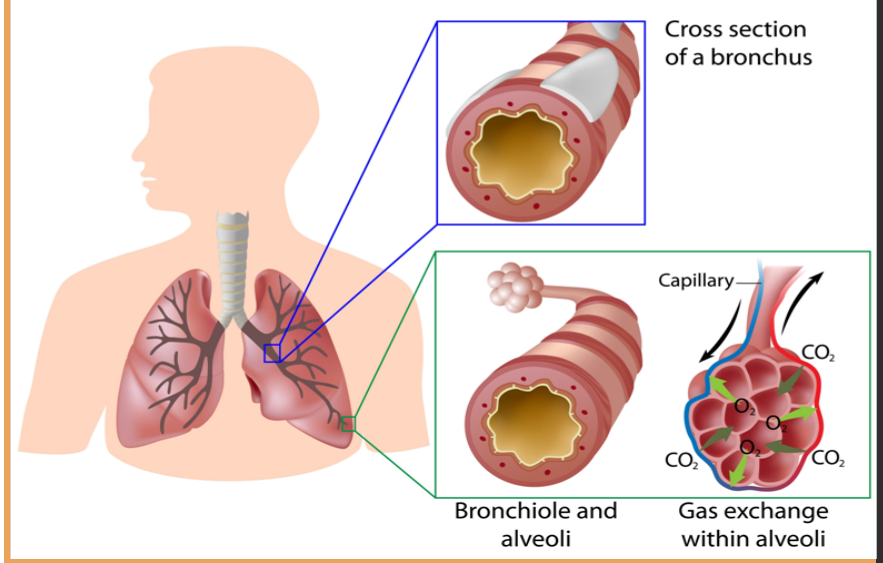
1. Describe the components and function of the respiratory system.
2. Identify causes of respiratory emergencies.
3. Describe how to assess a person experiencing respiratory distress.
4. Describe how to care for a person experiencing respiratory distress.
5. Demonstrate how to provide rescue breathing for an adult, child, and infant in respiratory arrest.
6. Demonstrate how to care for an airway obstruction in a conscious or unconscious adult, child, and infant.

CHAPTER QUICK LOOK

The Respiratory System

The respiratory system is responsible for delivering oxygen to the lungs during **inhalation** and removing waste products, such as carbon dioxide,during **exhalation**. This continuous process is necessary to sustain life. Any interruption in this process from conditions such as choking, suffocation, or drowning, can result in death within minutes.

Figure 2.1



Oxygen and carbon dioxide exchange in the alveoli.

During inhalation air is drawn into the body as the muscles in the chest wall and the **diaphragm** contract. Air enters the mouth and nose, where it is filtered, warmed, and humidified. The air passes down the **pharynx** (throat), and past the epiglottis. The **epiglottis** is a thin flap of tissue that allows air to enter the lungs, while diverting food and fluid down the esophagus to the stomach. Once past the epiglottis air enters the **trachea** (windpipe). The trachea divides into two main branches known as **bronchi**, which allow air to enter into each of the two lungs. The bronchi divide into smaller tubes known as **bronchioles**. At the end of the bronchioles the air enters small air sacs known as the **alveoli** located within tiny blood vessels known as **capillaries**. It is here that oxygen and carbon dioxide are exchanged. When the muscles of the chest and the diaphragm relax, air is exhaled. **Figure 2.1.**

Causes of Respiratory Emergencies

There are numerous causes of respiratory emergencies, which can result in respiratory distress or respiratory arrest. Examples include:

- Airway obstruction
- Anaphylactic shock (severe allergic reaction)
- Inhaling smoke or other poisonous chemicals
- Aspiration (inhaling stomach contents)
- Lung conditions, such as asthma and COPD
- Lung infections such as pneumonia
- Narcotic overdose
- Altitude sickness
- Near drowning
- Suffocation
- Chest trauma
- Laryngospasm
- Electrocution
- Heart attack or Cardiac arrest

Respiratory Distress

Breathing problems are easy to identify. Watch and listen to how a person breathes, and ask a conscious person how he or she feels when breathing. Signs and symptoms of ***respiratory distress*** can include:

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

While specific care may be needed for certain causes of respiratory distress, the following general guidelines can be referenced to care for a patient experiencing respiratory distress (**Figure 2.2**):

- Help the patient rest in a position that makes breathing easier. This is often a seated position.
- Comfort and reassure the patient.
- Assist the person with their prescribed medications, such as an inhaler for asthma. If the patient is suffering from anaphylactic shock assist with their epinephrine auto injector.
- Call EMS
- Consider administering supplemental oxygen if available and you are properly trained. It may be appropriate if signs of hypoxia are present, and reflected by pulse oximetry. (Follow local protocols).
- Keep the patient's airway clear.

Figure 2.2

A person in respiratory distress needs immediate help.

Respiratory Arrest

When a person is no longer breathing due to the failure of the lungs to function effectively, it is a condition known as **respiratory arrest**. Respiratory arrest can result from prolonged respiratory distress, or as a result of cardiac arrest. Respiratory arrest prevents the delivery of oxygen to the body, most importantly to the brain, causing loss of consciousness. Death is certain if left untreated, and is potentially reversible if treated early. The treatment for respiratory arrest is to provide rescue breathing.

Primary Check

A person found motionless must be assessed using a systematic approach. After making sure the scene is safe, approach the motionless person. The **primary check** involves checking for responsiveness (consciousness), breathing, and pulse. The appropriate care is provided based on what is found during this assessment.

Checking Responsiveness, Breathing, and Pulse

Begin the primary assessment by tapping the shoulder of the motionless person, and shouting, "Are you OK?" If the person does not respond, he or she is said to be unresponsive. If the patient is responsive, begin a secondary check (see Chapter 5, *Care Following Successful Resuscitation and Secondary Check*). If unresponsive, activate emergency response, if this has not already been done (**Figure 2.3).** Try to determine the approximate age range of the patient by asking bystanders or by using your best judgement as you continue your assessment (see **Table 2.1**).

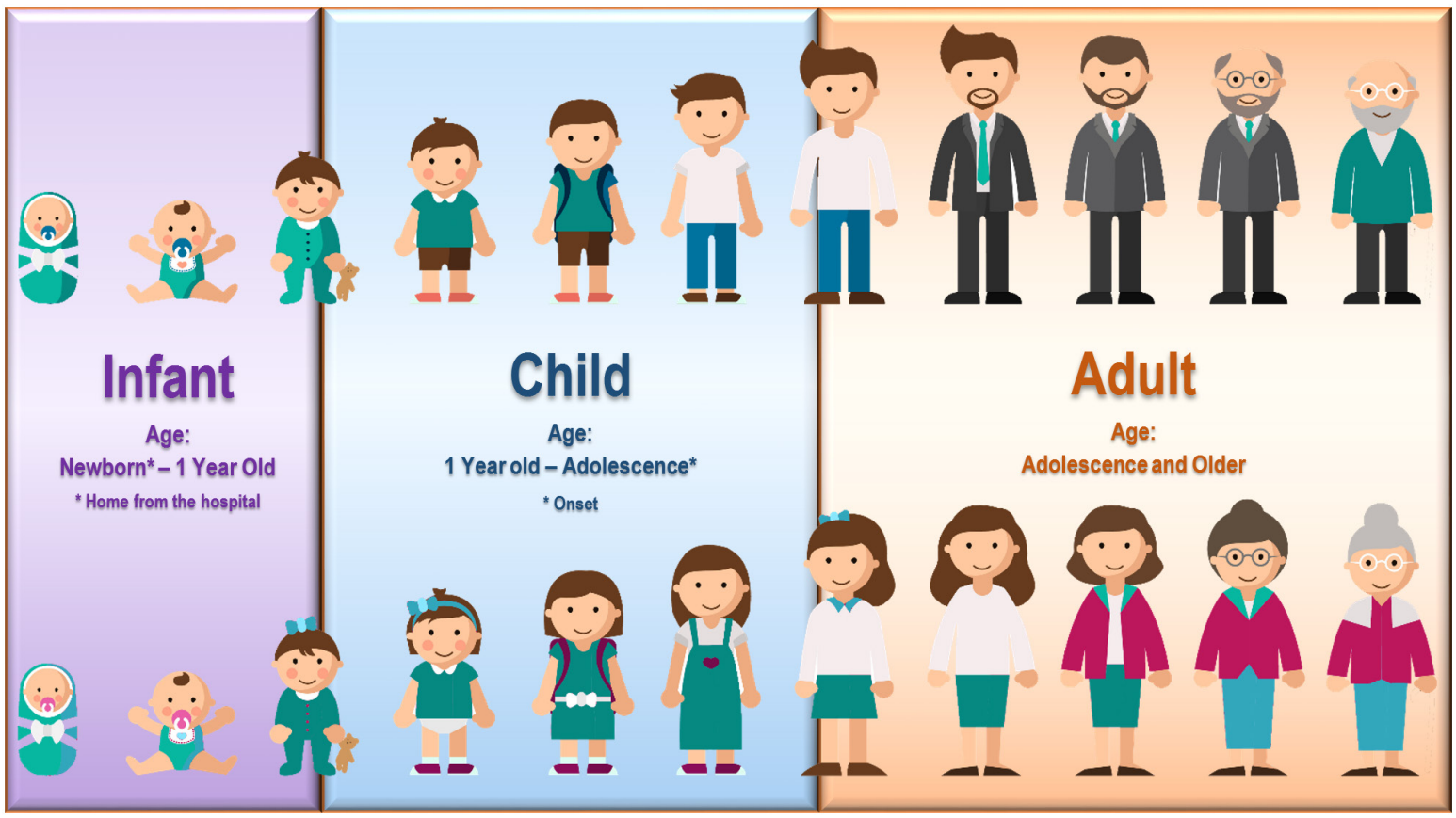
Depending on how an unresponsive patient is positioned when found, you may need to carefully place the patient onto their back to assess and provide any needed care. Continue your assessment by simultaneously checking for breathing and pulse for up to 10 seconds.

With the patient's head in a neutral position, place your head above their mouth and look at the chest to see if it is moving. Listen and feel for breathing and breathing sounds that would indicate either normal breathing or abnormal breathing, such as agonal respirations.

Figure 2.3

Check responsiveness.

Table 2.1 BLS Care Approximate Age Visual Reference



While checking for breathing, locate the carotid artery in the neck for a child and adult to determine if a pulse is present. To find the carotid artery, use your index and middle fingers to locate the Adam's apple. Slide your fingers toward you, into the groove at the side of the neck. Press down and feel for a pulse (**Figure 2.4).** For infants, check the brachial pulse in the inside of the upper arm instead of the carotid (**Figure 2.5).** Check for pulse and breathing at the same time for up to 10 seconds.

If the person is unresponsive, not breathing (or gasping) and does not have a pulse, he or she needs cardiopulmonary resuscitation (CPR). If the person has a pulse, but is unresponsive and not breathing, he or she is respiratory arrest and needs rescue breathing.

Figure 2.4

Check for a carotid pulse for an adult or child

Figure 2.5

Check for a brachial pulse for an infant.

FYI: Agonal Respirations

Agonal respirations have been described as deep, gasping breaths in which a person in cardiac arrest is in agony. They appear in more than 1/3 of persons suffering out-of-hospital cardiac arrest. The duration of the gasping respirations varies, and may be as brief as one or two breaths over several minutes. Agonal respirations originate from the lower brainstem as the brain becomes increasingly hypoxic. They should not be confused with adequate breathing, and resuscitation should begin and continue.

Rescue Breathing

Rescue breathing is the process of manually providing oxygen to the lungs of a person in respiratory arrest, by giving ventilations using your own breath, or by an artificial means, such as the use of a **bag-valve-mask (BVM).** When using your own breath, be sure to use a barrier device, such as a face shield or resuscitation mask. These methods can provide adequate ventilations while also minimizing the likelihood of disease transmission. **Figures 2.6 & 2.7**

Figure 2.6

Rescuers can provide rescue breathing by breathing into a resuscitation mask.

Figure 2.7

Rescuers can provide rescue breathing by using a bag-valve-mask.

Figure 2.8

Opening the airway using the Head tilt – Chin Lift.

Opening the Airway

To provide rescue breathing, you must first open the person's airway so that the tongue does not restrict the back of the throat. There are two common maneuvers used to open the airway:

- **Head tilt – chin lift**
- **Jaw thrust**, with or without head tilt

The **head tilt-chin lift** is done when no spinal injury is suspected. Position yourself at the side of the person's head. Place one hand on the person's forehead and two fingers of the other hand on the bony part of the person's chin. Tilt the head back while lifting the chin (**Figure 2.8)**. Adults require more head tilt than children of infants. Do not hyperextend the neck of a child or infant, as this could cause narrowing of the trachea.

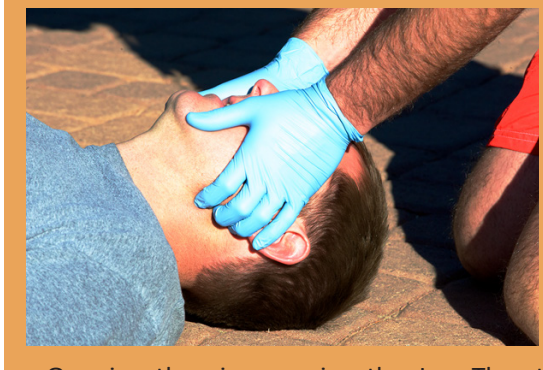
The **jaw thrust** with head-tilt is commonly used by health care professionals to open the airway when spinal injury is not suspected. Position yourself at the top of the person's head. Place your index and middle fingers of both hands behind the angle of person's jaw, and your thumbs on the cheekbones. Lift the jaw with your fingers and tilt the head back (**Figure 2.9).**

The jaw thrust without head-tilt is the preferred method used by health care professionals to open the airway when a spinal injury is suspected. In this case it would be unwise to tilt the head back, as this might cause further damage to the spine. Position yourself at the top of the person's head. Place your index and middle fingers of both hands behind the angle of person's jaw, and your thumbs on the cheekbones. Lift the jaw with your fingers. This will displace the tongue enough so that rescue breathing will be successful (**Figure 2.10).**

Figure 2.9

Opening the airway using the Jaw Thrust with head tilt

Figure 2.10



Opening the airway using the Jaw Thrust without head tilt

Providing Ventilations

With the airway open, provide rescue breathing in a manner that minimizes the risk of disease transmission. A barrier device such as a face shield can be used with the head tilt-chin lift technique. This device is tiny and easily portable, and may be the only thing available for health care providers who respond to an emergency when not part of their job. Position the face shield on the person's face, keep the airway open, pinch the nose, and provide ventilations through the one-way port in the mask (**Figure 2.11)**.

Figure 2.11

Use a face shield to provide rescue breathing

Health care providers more commonly use devices such as resuscitation masks when responding to emergencies as a part of their job. These devices are larger and involve a face mask and a one –way valve that attaches to the mask. The mask must be seated properly on the person's face, while maintaining an open airway. Using one of the jaw-thrust techniques, hold the mask securely to the face with your thumbs. Provide ventilations through the one –way valve (**Figure 2.12 & 2.13).**

Figure 2.12

Use a resuscitation mask and jaw thrust with head tilt to provide rescue breathing

When ventilations are provided, they should be given gently, over a period of one second. **Provide one ventilation about every 6 seconds for an adult, or about every 2 - 3 seconds for a child or infant.** Children and infants do not need the same volume as adults. Each ventilation should be enough to make the chest rise.

If the chest does not rise, reposition the head and mask and reattempt ventilation. If your attempts at delivering ventilations are unsuccessful, suspect that the person has an airway obstruction that needs to be cleared. This is discussed later in this chapter.

A resuscitation mask can also be attached to a bag, creating a bag-valve-mask (BVM). Using a BVM is a two person skill that even experienced healthcare providers need to frequently practice to maintain proficiency.

One rescuer holds the mask securely to the face and maintains an open airway. A second rescuer squeezes the bag to provide ventilations. The BVM provides a higher concentration of oxygen than a resuscitation mask alone. When connected to an oxygen cylinder, the BVM provides the highest concentration of oxygen possible during rescue breathing. **Figure 2.14.**

Figure 2.13

Use a resuscitation mask and jaw thrust without head tilt to provide rescue breathing

Figure 2.14

Providing ventilations with a bag-valve-mask is best accomplished by two rescuers

Rescue Breathing: Think about your Volume!

Ventilations must be provided in a manner that does not overinflate the lungs or force air into the stomach. Breathing too rapidly (hyperventilation) or forcefully can damage the lungs (especially of a young child or infant). It can also cause distention 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.

The approximate tidal volume ranges for each age grouping:

→ For adults, the volume of air needed for discernible chest rise is between 500-600 milliliters.

→ For a child, the volume of air needed for discernible chest rise occurs (depending on size) between 90-500 milliliters.

→ For an infant, the volume needed is small compared to an adult. Depending on size the range is 25-90 milliliters.

For an idea of these volumes, consider the basic sizes of each of the bags used as a part of standard bag valve masks (Adult, Child, and Infant BVMs). Depending on the manufacturer, most BVM bag capacities are about double the volume needed (or more) to make the chest rise (assuming all of the air was squeezed out of the bag). You only need to squeeze about half of that 1300 milliliter adult BVM bag to provide what is needed. Too much more may result in the issues described above.

With these points in mind, remember to think about the volume of air you are delivering when squeezing the BVM or when providing a rescue breath into a resuscitation mask. Provide what is needed to see the chest begin to rise, nothing more.

Managing The Airway During Care

While providing care to the patient, maintaining an open airway is critical. The airway may become compromised due to obstructions or more likely, due to poor positioning of the head and/or resuscitation mask. The following areas will address the most common challenges rescuers will face, when providing BLS care and how to properly manage to maintain or recover a patent airway.

Maintaining the Airway with the Recovery Position

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

There are multiple methods recognized as acceptable when placing someone in a side-lying position, which results in the patient either facing you or facing away. The exact procedure you follow will depend on several factors, such as if you are alone or with other trained responders, if the patient is actively vomiting, if an AED is attached, how much space you have around the patient at the scene, among other possibilities.

Figure 2.15

Gently place the breathing but unresponsive guest into the recovery position.

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 (sometimes referred to as the “HAINES” recovery position) (**Figure 2.15**).

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

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

Vomiting

It is estimated that as many as 1/3 of the individuals receiving several minutes of BLS care will vomit. Vomiting during rescue breathing or CPR care is almost always associated with overventilation combined with the relaxation of the esophageal sphincter when the body is hypoxic or in cardiac arrest. It is also more likely if the patient has recently eaten or is being resuscitated following a drowning incident. Any regurgitation event during BLS care is associated with reduced survival odds and longer hospital stays for the patient if resuscitation was successful.

Figure 2.16

Gently place the breathing but unresponsive guest into the recovery position.

Detecting that the patient has vomited when providing care is essential. *Always monitor the airway for fluids collecting under the resuscitation mask***.** If a patient begins to vomit while providing care, quickly roll the patient onto their side, similar to the recovery position previously described. With your gloved hand, quickly finger sweep the patient's mouth clean. Carefully roll the patient back and continue the care that was interrupted (quickly clean or replace soiled resuscitation masks before proceeding).

If you have immediate access to a manual suction device, this may also be used to clear the airway **(Figure 2.16**). To use a manual suction device, follow the specific directions that apply to your device.

The following recommendations may be generally applied when these are used:

- Do not use on small children or infants unless the device is specifically designed for that age group.
- Before using: make sure the patient's body and head are turned to the side and if the patient is actively vomiting,allow the reflex to complete (removing anything solid with your gloved hand).
- Place the suction opening no farther than the base of the tongue or interior cheek and engage the device.
- Use the device quickly so that the care interrupted can be resumed.
- Once vomit is removed with the device, secure the container, including replacing any protective cap and store in a position that will reduce the likelihood of leakage or accidental contact. If feasible (and it does not delay resumption of care) consider replacing the container in anticipation of additional vomiting.
- Properly dispose of fluid filled containers following your exposure control plan.

Possible Airway Obstruction In an Unresponsive Person

If at any time your ventilations do not make the chest rise, it is most likely due to not maintaining an open airway while delivering the ventilation, but it could also be caused by an airway obstruction.

To determine the reason for no chest rise when delivering ventilations, perform the following:
→ Remove the mask, look for signs of vomit within the mask and confirm its functionality
→ Reseal the mask and re-establish an open airway – confirming adequate head tilt and/or jaw thrust
→ Reattempt a one second ventilation, looking for a detectable chest rise

If no detectable chest rise occurs, begin 30 chest compressions, and check the mouth for material to remove before attempting two ventilations, repeating each of these steps until chest rise can be detected. Once chest rise is seen, resume care.

Airway Obstruction (Choking) In a Responsive Adult or Child

Airway obstruction (choking) in a Responsive adult most often results from an object, such as food, becoming lodged in the throat. Children and infants also choke on small objects such as coins or toys. A choking person may clutch the throat in what is commonly referred to as the universal distress sign of choking (**Figure 2.17).**

If the person is able to cough, the airway is only partially obstructed. Encourage the person to continue coughing. This often aids in dislodging the obstruction. If the person cannot cough, speak, cry, or breathe, or is coughing weakly or making high pitched "crowing" sounds, the airway is severely obstructed, and immediate care is needed.

Figure 2.17

Distress sign of choking.

If the choking person is an adult or child, use the **Heimlich Maneuver** to dislodge the obstruction. Stand behind the person. Reach around the person's waist with one hand and locate the navel. Make a fist with your other hand and place the fist just above the navel. Grasp your fist and give inward and upward thrusts to force the object out. Repeat these thrusts until the object is dislodged or the person becomes unresponsive (**Figure 2.18).** If the person becomes unresponsive, begin CPR. This is covered in the next section "Airway Obstruction in an Unresponsive Person". If a choking person is too large and you are unable to reach around the person to give effective abdominal thrusts, or if the person is obviously pregnant, give chest thrusts. Reach under the person's armpits and place the thumb side of your fist against the center of the person's chest. Grasp your fist with your other hand and give quick, inward thrusts (**Figure 2.19)**.

Figure 2.18

Provide inward and upward abdominal thrusts to relieve the obstruction.

Figure 2.19

Provide chest thrusts for a pregnant or large person.

Airway Obstruction (Choking) In a Responsive Infant

If an infant (birth to one year) is responsive 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. Grasp the infant's jaw, position the infant face down on your forearm, and lower your forearm to your leg.
2. Use the heel of your free hand to give 5 back slaps between the infant's shoulder blades. **Figure 2.20.**
3. Grasp the back of the infant's head, roll the infant face up on your forearm, and lower your forearm to your leg.
4. 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 about at least one third the depth of the chest (about 1 1/2 inches), and allow the chest to fully recoil after each compression. **Figure 2.21.**

figure 2.20

Provide 5 back slaps between the infant's shoulder

figure 2.21

Provide 5 chest thrusts.

5. Look in the mouth for any object, and sweep the object out with your finger if you see it.
6. Repeat these steps until the obstruction is dislodged or the infant becomes unresponsive. If the infant becomes unresponsive, begin CPR.

FYI: How the Heimlich Maneuver Works

Choking is a major cause of death, especially for children. The Heimlich maneuver is a BLS technique used to relieve it. In fact, one study reported a success rate as high as 86% when performed promptly. But how does it work?

The diaphragm is the largest muscle aiding breathing. When your hands are positioned just above the navel, they lie just below the diaphragm. When you pull inward and upward, the diaphragm is moved upward and intrathoracic pressure is generated. This action forces air out of the lungs, which is often adequate to dislodge an object in a conscious choking adult or child.

Back blows and chest thrust similarly create intrathoracic pressures which act to displace air from the lungs. All of these methods can be safely used to save a life but are most effective when performed at the first signs of a complete airway obstruction, following the procedures outlined.

Chapter 2 RECAP

Key Terms

Airway Obstruction
Alveoli
Bag-valve-mask (BVM)
Bronchi
Bronchioles
Capillaries
Carbon Dioxide
Diaphragm
Epiglottis
Exhalation
Heimlich Maneuver
Inhalation
Laryngectomy
Oxygen
Pharynx
Primary Assessment
Rescue Breathing
Respiratory Distress
Respiratory Arrest
Respiratory System
Stoma
Trachea

Key Points

- Care begins by checking responsiveness, breathing, and circulation.
- If a person is unresponsive and not breathing, but has a pulse, the person needs rescue breathing. Personal protective equipment (PPE), such as a resuscitation mask, can be used to effectively provide ventilations.
- Ventilations should be given at a rate of one every 6 seconds for adults, and one every 2-3 seconds for children and infants.
- Do not breathe too fast or forcefully, as this can result in complications.
- If the airway is obstructed in a responsive adult or child provide the Heimlich Maneuver. For responsive choking infants provide back slaps and chest compressions.
- If ventilations are unsuccessful, determine if there is an airway obstruction. Reposition the head and repeat ventilations. If still unsuccessful, provide 30 chest compressions, check the airway, and reattempt ventilations.

For Discussion

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

- ✓ Can you describe the various components that comprise the respiratory system and how the respiratory system functions?
- ✓ What are the causes of respiratory emergencies?
- ✓ What are the signs and symptoms of respiratory distress?
- ✓ Can you describe how to care for a person experiencing respiratory distress?
- ✓ How should you provide rescue breathing for an adult, child, and infant in respiratory arrest?
- ✓ How should you provide care for an airway obstruction in a conscious or unconscious adult, child, and infant?

3 CARDIOVASCULAR EMERGENCIES

OBJECTIVES

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

1. Describe the components and function of the circulatory system.
2. Identify the risk factors of cardiovascular disease.
3. Describe how to assess a person experiencing a heart attack.
4. Describe how to care for a person experiencing a heart attack.
5. Describe how to assess a person experiencing a stroke.
6. Describe how to care for a person experiencing a stroke.
7. Demonstrate how to provide cardiopulmonary resuscitation (CPR) for an adult, child, and infant in cardiac arrest.

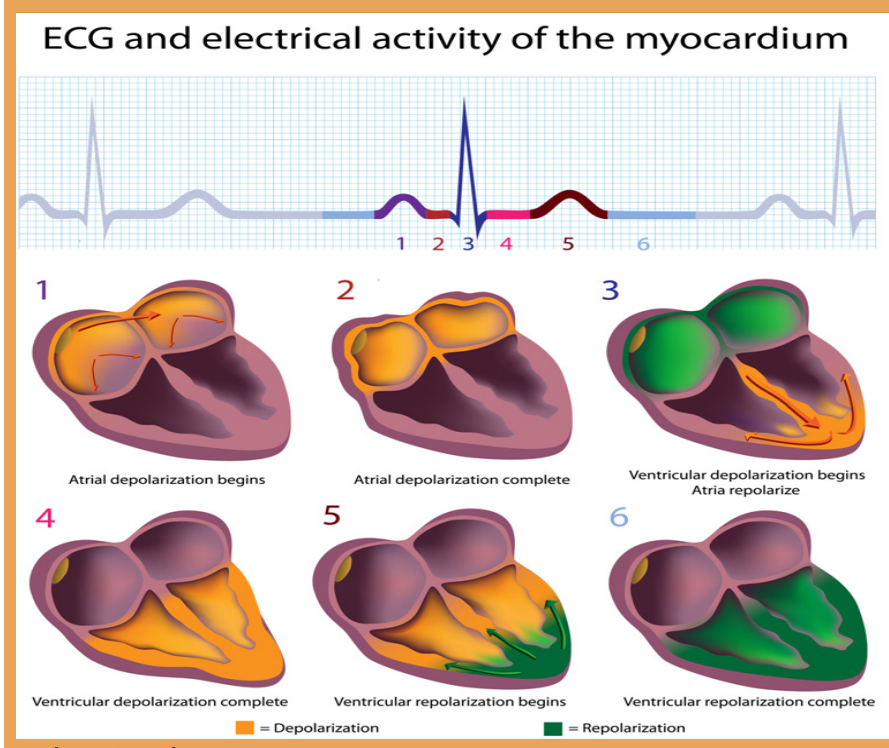
CHAPTER QUICK LOOK

The Circulatory System

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 such as carbon dioxide. 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 **atria**. The two lower chambers are the **ventricles**.

The two chambers on the right side of the heart are the right atrium (upper chamber) and right ventricle (lower chamber). 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.

Figure 3.1



The circulatory system.

The heart muscle is very unique in that it creates its own electrical impulses automatically. 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. This action moves blood throughout the body, and generates a pulse. The electrical impulses in the heart are able to be viewed and interpreted through an electrocardiogram (ECG) (**Figure 3.1).**

Cardiovascular Disease

Cardiovascular disease includes conditions that involve the heart and the blood vessels (arteries, veins, and capillaries). **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. CHD commonly causes chest discomfort, shortness of breath, heart attack, or sudden cardiac death, known as cardiac arrest. Diseases of the blood vessels can also affect other organs, such as the brain, resulting in a stroke.

Cardiovascular disease, also known as heart disease, involves diseases that affect the heart and blood vessels. Cardiovascular disease accounts for more than 800,000 deaths each year, and is the number one killer in America.

A **heart attack** occurs when blood flow to a part of the heart is blocked by a blood clot. This is often associated with **atherosclerosis**, a condition where plaque accumulates on the walls of the arteries of the heart, narrowing the arteries and restricting blood flow. If a clot cuts off the blood flow completely, part of the heart muscle supplied by that artery begins to die.

Other types of cardiovascular disease include:

- Dysrhythmias – electrical disturbance of the electrical conduction system in the heart
- Heart valve problems – where the valves do not open or close properly, in which blood does not flow properly through the heart
- Heart failure – when the heart is failing to pump blood adequately
- Stroke – a blockage or bursting of a blood vessel in the brain

Risking Your Life

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 two to four 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 (dysrhythmias) can result in a heartbeat that is too fast, too slow or irregular. They can lead to rapid heartbeat, light-headed, dizziness, fainting and sometimes sudden death.
3. Age – As people age the risks of cardiovascular disease increase.

Take the Pledge

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 personal 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.

FYI: Just the Facts

One out of every three people in the United States dies as a result of cardiovascular disease every year.

Heart disease is the leading cause of death for both men and women, affecting both equally.

Coronary heart (artery) disease is the most common type of heart disease, killing over 300,000 people annually. More than 900,000 Americans are hospitalized each year for heart attacks. Nearly 800,000 Americans suffer a new or a recurrent stroke each year. Coronary heart disease costs the United States nearly $109 billion each year.

Source: American Heart Association and Centers for Disease Control and Prevention / 2014.

Heart Attack

A **heart attack**, also known as a **myocardial infarction**, occurs when portions of heart muscle tissue die as a result of lack of oxygen. This occurs because the blood supply to that part of the heart is severely reduced or stopped, often as a result of atherosclerosis.

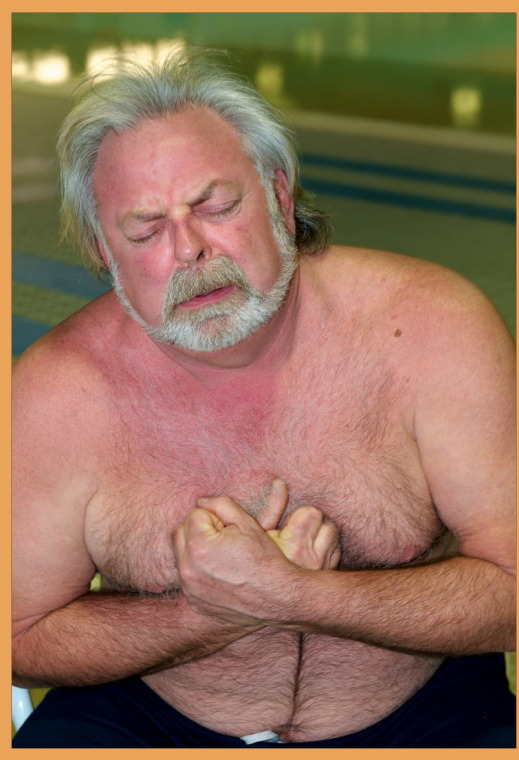
Recognizing a Heart Attack

The signs and symptoms of a heart attack include:

- Chest pain or discomfort that lasts longer than 15 minutes, and can radiate to the arms, neck, jaw, or back. **Figure 3.2**
- Difficulty breathing
- Profuse sweating
- Nausea and vomiting
- Cool, pale skin
- Unusual weakness / fatigue
- Dizziness / fainting
- Irregular heart beat (pulse)

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 MI”, and occurs most frequently in women, elderly, or those with diabetes.

figure 3.2



Chest pain is a frequent symptom of heart attack.

If you suspect a heart attack, perform the following actions:

- Call EMS
- If the person has prescribed heart medication such 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, unless an accurate blood pressure can be assessed. **Figure 3.3**
- Provide aspirin if the person is not allergic, not on a blood thinner, and does not have stomach disease. Provide 1 regular aspirin or 2 low dose (81 mg) aspirin.
- Administer supplemental oxygen if signs of hypoxia are present, supported by pulse oximetry, and in accordance with your local protocols.
- Get the AED if available, and be prepared to begin BLS care.

Figure 3.3

Nitroglycerin is a frequently prescribed heart medication.

Women and the Atypical Heart Attack

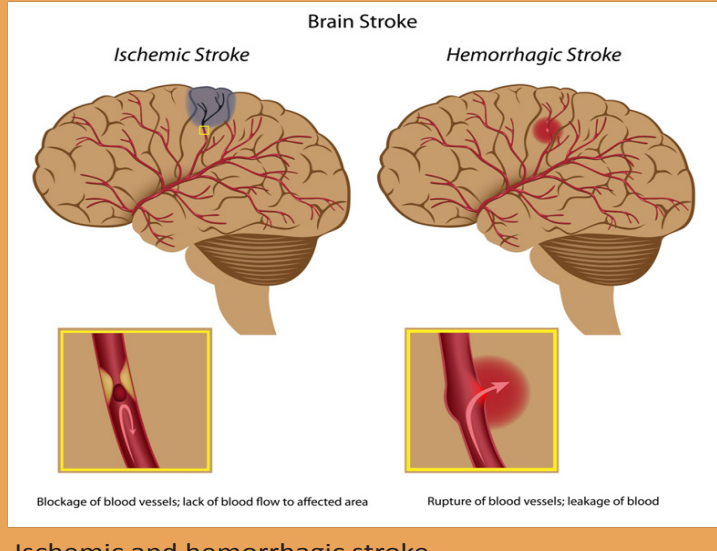
During a heart attack women can also experience the same heavy chest pressure that men feel, but many women don't. Unlike men, a large portion of women can experience a heart attack without chest pressure. Other atypical signs of a heart attack in women include pressure or pain in the lower chest or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

Stroke

A **stroke**, also called brain attack, occurs when a blood vessel in the brain becomes blocked (ischemic) or ruptures (hemorrhagic). Most strokes are ischemic. Without adequate oxygen brain cells will die. Stroke and heart disease share many of the same risk factors. **Figure 3.4**. As brain cells die, a person can show signs and symptoms of a stroke, including:

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

figure 3.4



Ischemic and hemorrhagic stroke

Refer to Table 1.3 below for "F.A.S.T." Stroke Action Plan

Follow these steps to care for a stroke:

- Call EMS or summon more advanced medical care.
- Have the person stop all activity and rest in a comfortable position.
- Loosen any restrictive clothing

Caring for stroke involves getting the person the necessary advanced medical care needed as soon as possible. Activate your emergency response system if this has not already been done. Have the person rest in the most comfortable position, which is often lying on the back with the head and shoulders elevated.

Table 3.1 F.A.S.T. Stroke Action Plan

Stroke Sign / Symptom	Questions
Facial Droop	Is one side of the face numb or drooping? If the person can smile, is it uneven?
Arm Weakness	Is one arm numb or weak? Can the person raise both arms equally?
Speech Difficulty	Is the person unable to speak or hard to understand? Can the person repeat a simple sentence correctly?
Time to Get Help	Note the time the signs and symptoms first appeared and call EMS or summon more advanced care.

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. And 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.

Cardiac Arrest

If the heart muscle is damaged severely, a person's heart can cease to function. The person will become unresponsive, non-breathing, and without a pulse. This is known as **cardiac arrest**. The immediate care for a person in cardiac arrest is to provide cardiopulmonary resuscitation (CPR) until a defibrillator is available.

Cardiopulmonary Resuscitation (CPR)

Cardiopulmonary resuscitation (CPR) involves providing chest compressions and ventilations that help circulate blood and oxygen to vital organs throughout the body. Once you have completed the primary assessment and confirmed that the person is unresponsive, not breathing (or only gasping), and without a detectable pulse, begin CPR starting with chest compressions.

Chest compressions are an important part of high quality CPR, and require rescuers to:

- Position the person on the back, on a hard surface.
- Compress on the center of chest.
- Push fast (at a target rate of 110 compressions per minute; range of 100 - 120, nearly two per second).
- Push deep (Compress at least 2 inches, but not more than 2.4 inches for an adult.
- Push rhythmically.
- Allow for complete recoil of the chest (do not lean on the chest).
- Minimize interruptions (target is 10 seconds or less)

Ventilations are the second part of CPR. Ventilations should be given over 1 second duration, and be enough to make the chest rise. Avoid excessive ventilation.

Continue CPR until a defibrillator is available or the person shows signs of life, in which case you can stop CPR. Other situations in which you can interrupt CPR include:

- You are too exhausted to continue.
- You are replaced by another rescuer able to perform CPR.
- The scene is no longer safe.
- A physician advises to stop resuscitative efforts.
- Cardiac arrest is prolonged and your protocols allow for discontinuation of care.

One Rescuer Adult CPR

If you are the only rescuer, give CPR to an adult by following these steps:

1. Position the adult on their back on a hard surface.
2. Determine that the adult is unresponsive, not breathing (or only gasping), and without a pulse.
3. Kneel alongside the adult's chest.
4. Place the heel of one hand on the center of the chest between the nipples. Place your other hand on top of the first hand. Straighten your arms and lock your elbows.
5. With your shoulders over your hands compress the chest at least 2 inches and allow the chest to return to its normal position. Give 30 chest compressions at a rate of approximately 110 compressions per minute (range of 100 - 120 per minute). **Figure 3.5**
6. Open the adult's airway and give 2 ventilations. Each ventilation should last about 1 second and make the chest rise. **Figure 3.6.** Do not over-ventilate (target tidal volume range of 500 - 600 ml)
7. Repeat cycles of 30 compressions and 2 ventilations until a defibrillator is available or the person becomes responsive.

figure 3.6

Ventilations provided to an adult during CPR

figure 3.5

Chest compressions provided to an adult during CPR

Improving Bystander CPR

Fewer than 40% of victims of out of hospital sudden cardiac arrest (over 350,000 every year) will receive help from a bystander. This reality no doubt contributes to the fact that nearly 90% of all out of hospital sudden cardiac arrest victims will not survive. The willingness to help someone is often stifled, not only by lack of training, but also by concerns over potential disease transmission, especially in the aftermath of the COVID-19 pandemic. Beyond concerns over contracting a disease, recent studies have shown that women are even less likely than men to receive bystander CPR. They also found that if bystander CPR is initiated, women are less likely then men to have an AED used, even if one is available.

Most experts agree that lack of education and understanding of this issue, combined with societal and cultural pressures are the primary causes of this inaction. Health care providers working in the community are in a unique position to help correct this. What can you do?

Consider setting up demonstrations of CPR and AED care (performed on manikins) and invite neighbors to give it a try. You could work with your kid's school or church to set something up. If you work in a building that has accessible BLS, AED, and First Aid equipment, how many people are trained in their use? How many people even know where this equipment is located? If the answers to these questions are not ideal, speak with your employer or building managers about correcting the situation and offer to help. Closer to home, how many of your family and friends know CPR? If you were the one who needed CPR, is there anyone among them who could save your life? Spread your knowledge and increase awareness of this issue. The lives saved may be those closest to you or even your own!

One Rescuer Child CPR

If you are the only rescuer, give CPR to a child by following these steps:

1. Position the child on the back on a hard surface.
2. Determine that the child is unresponsive, not breathing (or only gasping), and without a pulse.
3. Kneel alongside the child's chest.
4. Place the heel of one hand on the center of the chest between the nipples. Straighten your arm and lock your elbow. For large children use 2 hands as you would for an adult.
5. Compress the chest at least one third the depth of the chest (about 2 inches) and allow the chest to return to its normal position. Give 30 chest compressions at a rate of 110 compressions per minute (range of 100 - 120 per min.). **Figure 3.7**
6. Open the child's airway and give 2 ventilations. Each ventilation should last about 1 second and make the chest rise. **Figure 3.8**
7. Repeat cycles of 30 compressions and 2 ventilations until a defibrillator is available or the person shows signs of life.

figure 3.7

Use one or two hands to compress the chest of a child during CPR

figure 3.8

Ventilations provided to a child during CPR

figure 3.9

Use two fingers to provide chest compressions to an infant.

figure 3.10

Ventilations provided to an infant during CPR

One Rescuer Infant CPR

If you are the only rescuer, give CPR to an infant by following these steps:

1. Position the infant on the back on a hard surface.
2. Determine that the infant is unresponsive, not breathing, and without a pulse.
3. Kneel alongside the infant's chest.
4. Place 2 fingers on the center of the chest slightly below the nipples.
5. Use your fingers to compress the chest at least one third the depth of the chest (about 1 1/2 inches) and allow the chest to return to its normal position. Give 30 chest compressions at a rate of at least 110 compressions per minute (range of 110 - 120 per min.). **Figure 3.9**
6. Open the infant's airway and give 2 ventilations. Each ventilation should last about 1 second and make the chest rise. **Figure 3.10.** Repeat cycles of 30 compressions and 2 ventilations until a defibrillator is available or the infant shows signs of life.

Two – Rescuer CPR

Health care providers such as nurses, physicians, EMS providers, and lifeguards often respond to cardiac arrest as part of a team. Two or more rescuers can work more efficiently than a single rescuer. Performing CPR as part of a team enables rescuers to change positions when one tires during chest compressions. This should be done about every two minutes to ensure that compression depth and rate are maintained at an optimal level.

In two-rescuer CPR, one rescuer provides chest compressions and the second rescuer provides ventilations. When performing two-rescuer CPR on an adult, the compression to ventilation ratio remains the same as one-rescuer CPR (30:2). **Figure 3.11.** When performing two-rescuer CPR on a child or infant, the compression to ventilation ratio changes to 15:2. When two-rescuers perform CPR on an infant, the rescuer providing compressions should use two thumbs to compress the chest, while encircling the infant's chest with both hands. **Figure 3.12**.

figure 3.11

Two-rescuer CPR for an adult

figure 3.12

Two-rescuer CPR for an infant

Circulatory Assist Devices

Circulatory assist devices can provide an alternative to conventional manual cardiopulmonary resuscitation (CPR). The purpose of these devices is to enhance perfusion during cardiac arrest resuscitation, and improve the chance of long-term survival with normal brain function. While studies have not demonstrated a clear improvement in outcome, the devices may be in use in your area. Follow your local protocols for use of these devices if available.

There are two types of circulatory assist devices:

- Mechanical CPR devices
- Impedance threshold devices

Mechanical CPR devices promote active compression / decompression (ACD). One such device has a circumferential vest and automatic mechanical piston. Another device has a handle that attaches to the patient's chest with a suction cup and has pressure gauge to assess compression depth and timing. These devices allow for maximum compression and maximum recoil helping improve blood return to the heart. **Figure 3.13 a & b.**

Figure 3.13a

Mechanical CPR Device

figure 3.13b

Mechanical CPR Device

An impedance threshold device (ITD) is a small device attached to a face mask or endotracheal tube. Pressure-sensitive valves within the ITD impede the entry of air during chest wall decompression. This increases the amplitude and duration of the vacuum within the chest cavity, drawing more venous blood back into the heart (preload), and increasing the amount of blood ejected by the heart every minute (cardiac output). This combination improves blood pressure and organ perfusion. **Figure 3.14.**

The routine use of the ITD during CPR is not recommended. The use of the ITD along with ACD may provide an alternative to conventional CPR when properly trained rescuers are available. Follow your local protocols for use of these, or other circulatory assist devices.

figure 3..14

Impedance Threshold device (ITD)

BLS Care Options When PPE Is Not Immediately Available

As a health care provider who is required to provide life saving assistance to someone in need, as a part of your duties or functions, it is required that your employer or affiliated organization provide you with appropriate and adequate PPE, along with training on how to use it properly, as discussed in Chapter 1. However, what happens if a medical emergency occurs when you are not working or acting as a health care provider and you do not have immediate access to standard precautions PPE and other equipment?

Fortunately, serious disease transmission during BLS care in normal circumstances (non-pandemic circumstances) is very rare and no more likely to occur than engaging in close contact activities with the person. This is especially true if the patient is someone you have regular contact with anyway, like a family member. Given that nearly 70% of all out of hospital cardiac arrests occur in the victim's home, it is a strong possibility that your patient will be related to you. The risk for disease transmission increases slightly when dealing with strangers, while still low. However, the risk is at its highest if body fluids, such as blood, are present or if the patient is known or suspected of having a harmful airborne transmitted disease (such as COVID-19).

Here are some options to consider:

→ **Use what's available** - Lots of items around you may be crafted into decent DIY PPE. Items like clothing, rags, plastic, paper, etc. can be used to form a basic barrier between yourself and nearby body fluids. If you go with this approach, make mental notes of what may have become contaminated. Also, take extra care to avoid any direct skin contact, especially if you have a cut or scratch. If there are no body fluids present on the patient, it is probably safe to touch them, especially when doing things like the primary check and CPR compressions.

→ **Compression only CPR -** If you are concerned about airborne disease transmission or you do not feel comfortable providing ventilations without a mask,perform compression only CPR at a rate of 100-120 compressions per minute and attach an AED as soon as it is available (for anyone who is found to be unresponsive and not breathing). If you are wearing a mask (COVID-19 precautions, etc.) keep it on and put another mask on the patient (or keep their's on if wearing) to reduce the number of aerosols generated during chest compressions. AEDs will often have a limited supply of PPE kept with them, including medical exam gloves and a barrier device. If an AED is accessible, look for these items and use them to enhance your care.

→ **Consider mouth-to-mouth -** If you are not concerned about airborne disease transmission or if you are comfortable providing mouth-to-mouth because of your relationship with the patient (e.g. a family member), you may want to consider incorporating mouth-to-mouth ventilations into the care you are providing. Especially for children, infants, and victims of asphyxial cardiac arrest, the addition of the breathing element will enhance the effectiveness of the care you are providing. *To provide mouth-to-mouth ventilations* - open the patient's airway using the head tilt, chin lift, and pinch the patient's nose (maintain the open airway and closed off nose as you proceed). Open your mouth wide enough to create an airtight mouth-to-mouth seal with the patient. If working on an infant, it may be necessary to include the infant's nose in your seal. Once sealed, deliver a breath. Continue with this method in a manner appropriate for the BLS care being provided.

→ **Wash up / sanitize after care -** Regardless of how you choose to provide direct care, it is extra important to thoroughly clean your hands and any other part of your body that may have come into contact with the patient or the patient's body substances. It is also advisable to change your clothing and perhaps bathe before proceeding with any other activity.

→***Do something* that will improve the situation -** Depending on the situation, you may not able to provide care. The circumstances of the situation may simply mean that the scene is not safe without PPE or specific PPE. You may have other considerations to factor in as well. Regardless, you can, at a minimum activate the emergency response system by calling 911 and get EMS to the scene as quickly as possible. You can also remain to monitor the situation in case something changes that would make it possible for you to help.

As a footnote to help avoid this situation, you might consider obtaining and carrying your own barrier device (such as shown on page 19) and/or a small kit with basic standard precaution PPE available. Preparation for this possibility may make the difference.

Table 3.2 Standard Health Care Provider Basic Life Support Matrix

Care Steps	Adults (Adolescence* and older) *Onset	Children (1 year of age to Adolescence*) *Onset	Infants (Newborn* - 1 year of age) *Home from the Hospital
Scene safety and recognition	Determine scene safety, PPE. Check for responsiveness: "*Tap and shout*"	Determine scene safety, PPE. Check for responsiveness: "*Tap and shout*"	Determine scene safety, PPE. Check for responsiveness: "*Tap and shout*"
Patient position and airway	Place patient on back (hard surface). Tilt head backward, lift chin/jaw to open the airway.	Place patient on back (hard surface). Tilt head backward, lift chin/jaw to open the airway.	Place patient on back (hard surface). Tilt head *slightly* backward, lift chin to open the airway (achieve neutral position).
Simultaneously Assess pulse/breathing	Look for chest rise and fall. Listen and feel for breathing. Attempt to find the *carotid pulse* in the neck for no more than 10 seconds.	Look for chest rise and fall. Listen and feel for breathing. Attempt to find the *carotid pulse* in the neck for no more than 10 seconds.	Look for chest rise and fall. Listen and feel for breathing. Attempt to find the *brachial pulse* in the arm for no more than 10 seconds.
Pulse present, Normal Breathing absent	Provide rescue breathing: 1 breath every 6 seconds with a resuscitation mask or BVM. Attach oxygen when/if available.	Provide rescue breathing: 1 breath every 2-3 seconds (training target: 1:3) with a resuscitation mask or BVM. Attach oxygen when/if available.	Provide rescue breathing: 1 breath every 2-3 seconds (training target: 1:3) with a resuscitation mask or BVM. Attach oxygen when/if available.
Pulse & Breathing absent or uncertain	Provide High Quality CPR: 30 Chest compressions. (two hands), center of chest and 2 breaths using a mask with O2 when/if available. Use AED when available.	Provide High Quality CPR: 30 Chest compressions. (1 or 2 hands), center of chest and 2 breaths using a mask with O2 when/if available. Use AED when available.	Provide High Quality CPR 30 Chest compressions. (two fingers), just below the nipple line and 2 breaths using a mask w/O2 when/if available. Use AED when available.
Multiple rescuers	CPR Ratio: 30:2 Alternate compressors every 2 min. Ventilate with Adult BVM and oxygen when/if available.	CPR Ratio: 15:2 Alternate compressors every 2 min. Ventilate with Pediatric BVM and oxygen when/if available.	CPR Ratio: 15:2 Using the two-thumb method, alternate compressors every 2 min. Ventilate with Infant BVM and oxygen when/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: 1.5 – 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.
High Quality Ventilations	Duration: About 1 second. Volume: Achieve visible chest rise (Approximate range 500-600 ml)	Duration: About 1 second Volume: Achieve visible chest rise (Approximate range 90-500 ml)	Duration: About 1 second Volume: Achieve visible chest rise (Approximate range 25-90 ml)

CPR and Advanced Airways

If rescuers utilize an advanced airway, such as an endotracheal tube, during two-rescuer CPR, they no longer need to deliver cycles of CPR.

With two rescuers: One rescuer performs chest compressions continuously (100-120 compressions per minute rate), as the other rescuer provides one ventilation every 6 seconds (rate of 10 ventilations per minute).

There is no need to attempt to synchronize compressions and ventilations once an advanced airway has been inserted. Care should only be interrupted by the AED analysis and shock delivery.

Chapter 3 RECAP

Key Terms

Atria
Cardiac Arrest
Cardiopulmonary Resuscitation (CPR)
Coronary Heart Disease (CHD)
Heart Attack
Myocardial Infarction
Stroke
Ventricles

Key Points

- Care begins by checking responsiveness, breathing, and circulation.
- If a person is unresponsive, not breathing, and without a pulse, the person needs CPR.
- 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.
- In one-rescuer CPR provide 30 compressions and 2 ventilations.
- In two-rescuer CPR provide 15 compressions and 2 ventilations for children and infants.
- Repeat cycles of compressions and ventilations until a defibrillator is available, you are too exhausted to continue, or the person shows signs of life.

For Discussion

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

- ✓ Can you describe the various components that comprise the circulatory system and how the circulatory system functions?
- ✓ What are the risk factors of cardiovascular disease?
- ✓ What are the signs and symptoms of a heart attack?
- ✓ Can you describe how to care for a person experiencing a heart attack?
- ✓ How should you provide care for a person experiencing a stroke?
- ✓ Can you identify the signs and symptoms of a person experiencing a stroke?
- ✓ How should you provide CPR for an adult, child, and infant in cardiac arrest?

4 AUTOMATED EXTERNAL DEFIBRILLATION (AED)

OBJECTIVES

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

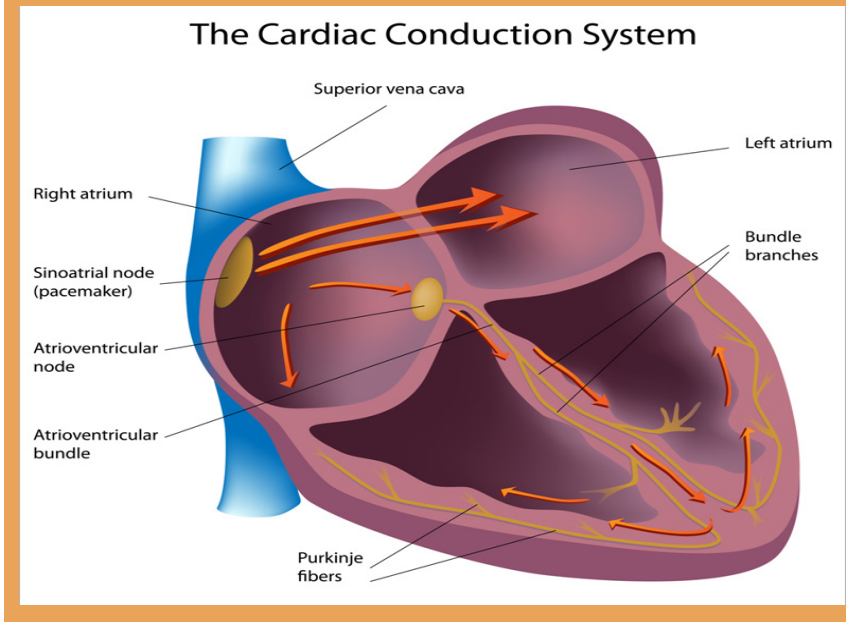
1. Explain the electrical conduction system of the heart.
2. Explain the two abnormal heart rhythms that the AED can correct.
3. Identify the elements common to all AEDs.
4. Describe how an AED works to help a person in cardiac arrest.
5. Describe special considerations when using an AED.
6. Describe how to maintain an AED in proper working condition.
7. Demonstrate how to use an AED for an adult, child, and infant in cardiac arrest.

CHAPTER QUICK LOOK

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 is felt. The normal electrical impulse in the heart originates in the **sinoatrial (SA) node**, found in the upper part of the right atria. This impulse occurs about once every second and travels along pathways within both **atria**. The impulse moves downward, passing through the **atrioventricular (AV) node** located between the atria and ventricles. Beneath the AV node the electrical pathway divides into the right and left bundle branches, extending into the corresponding two **ventricles**. When the electrical impulse reaches the **purkinje fibers** in the ventricles, the heart muscle contracts, forcing blood to move throughout the body. **Figure 4.1**

figure 4.1



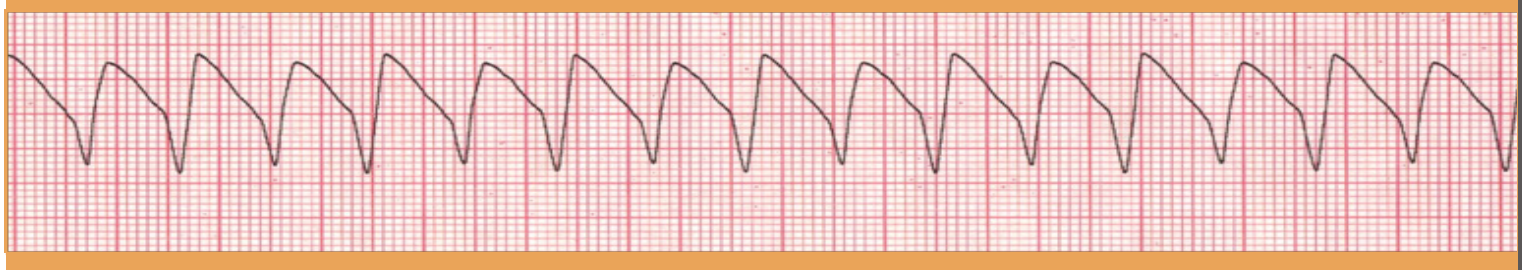
The heart's electrical conduction system

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 4.2**

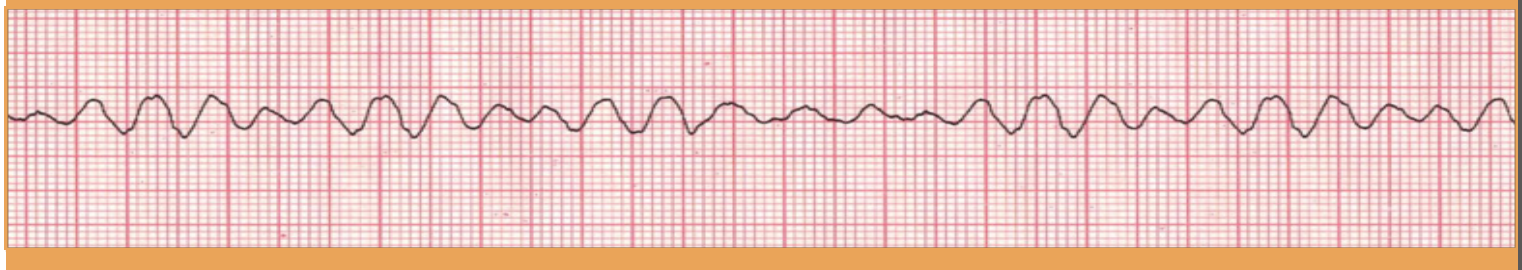
Ventricular fibrillation is disorganized, chaotic electrical activity that results in quivering of the ventricles. Blood cannot be pumped out of the heart so the person will be without a pulse. **Figure 4.3**

figure 4.2



Ventricular tachycardia (V-tach).

figure 4.3



Ventricular fibrillation (V-fib)

About AEDs

An **automated external defibrillator (AED)** is a portable electronic device applied to a person in cardiac arrest. It is capable of analyzing the heart rhythm and delivering an electric shock, known as **defibrillation**, to the heart of a person 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, and AED also records data such as the number of shocks delivered, changes in the ECG, the date, and the time of use. **Figure 4.4**

There are several different AED manufacturers. Beyond the minor differences in device appearance (color, size, buttons), all AEDs have the following commonalities (**Figure 4.5**).

- 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

AEDs are capable of analyzing the heart rhythm, delivering a shock (defibrillation), and storing data.

figure 4.5

While AEDs from different manufacturers look different, they all do the same thing.

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.

Using an AED

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

Once an AED is available, turn the device on and follow the prompts. Expose and prepare the person's chest. This involves removing any clothing, as well as drying the chest and shaving 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 4.6

Electrodes are placed on a dry chest.

figure 4.7

Automatic AEDs deliver the shock without user aid. Semi-automatic devices require the user to press the shock button.

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. Pad placement varies for children and infants. Follow the manufacturer's instructions for use of pediatric pads if available. **Figure 4.6**

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. Others are semi-automatic requiring the operator to push a flashing "shock" button. **Figure 4.7**

If advised to shock, make sure no one is in contact with the person before the shock is administered. If no shock is advised, it means that the AED did not find a shockable rhythm (V-fib or v-tach). **Figure 4.8**

Regardless of whether a "shock" or a "no shock" advisory is given, follow with 2 minutes of CPR as long as the person is in cardiac arrest. In some cases more than one shock will be needed to correct the dysrhythmia. Two minutes of CPR should be given following every analysis or shock. If the shock is successful the person may begin to show signs of life. **Figure 4.9**

Figure 4.8

Make sure no one is in contact with the person before administering a shock.

Figure 4.9

Provide 2 minutes of CPR between shocks, or whenever a shock is not advised.

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.

Special Considerations

There are several special considerations to be aware of :

- Medication patches
- Children and infants
- Water
- Implanted devices
- Jewelry and Body Piercing

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 and dry off the chest. Then apply the electrode pad. **Figure 4.10**.

figure 4.10

Remove any medication patches from the chest and wipe the area dry.

Children and Infants

Primary cardiac arrest in children and infants is rare. 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 electrode pads with reduced energy capability are available for use on those 8 years of age or younger. Pediatric pads are placed in accordance with manufacturer's instructions. For infants this means placement of one pad on the chest and the other on the back. If pediatric pads are not available, adult pads can be used. Figure 4.11.

figure 4.11

Use pediatric pads for those 8 years of age or younger, if they are available.

figure 4.12

Remove the person from any free standing water before use.

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 person from any free-standing water. This might involve moving a person from a pool to at least 6 feet away from the pool edge. It could also include placing the person on a backboard to further ensure separation from the water. Dry the person's chest and then attach the electrode pads. Taking these precautions greatly reduces any risks to rescuers. **Figure 4.12.**

Implanted Devices

Implanted devices include internal **pacemakers** and **cardioverter defibrillators (ICD**). 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 elsewhere, such as the lower left side of the chest, avoid placing the AED electrode pad over top of the implanted device. **Figure 4.13.**

figure 4.13

An 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 person will feel a jolt, the energy that escapes to the surface, where a rescuer might be contact with the person, is hard to detect and harmless.

Jewelry and Body Piercings

There is no need to remove body piercings and jewelry as long as the electrode pads are not placed directly over metallic items. This may require you to position the pads slightly different than normal. Remove these items if there is no other way to safely place the electrode pads.

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, or 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 for users that the device is ready.

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.

Chapter 4 RECAP

Key Terms

Asystole
Atrioventricular (AV) node
Automated External Defibrillator (AED)
Defibrillation
Dysrhythmia
Electrocardiogram (ECG)
Electrode pads
Pacemaker
Purkinje fibers
Sinoatrial (SA) node
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 person 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 the AED will advise to stand clear so that it can reanalyze the heart and advise you as to how to continue with care.
- There are only a few special considerations when using an AED: water, medication patches, children and infants, jewelry and body piercings, and implanted devices.
- AEDs require little maintenance other than to inspect it regularly to verify that the device is functioning properly and has the necessary supplies to respond to a cardiac emergency.

For Discussion

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

- ✓ Can you 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?
- ✓ Can you describe how an AED works?
- ✓ What are four special considerations to be aware of when using an AED?
- ✓ Can you explain how to use an AED for an adult, child, and infant in cardiac arrest?
- ✓ How should an AED be maintained to insure proper working condition?

5 SPECIAL SITUATIONS

OBJECTIVES

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

1. Describe the process of drowning and how to provide resuscitative care for someone who was rescued from the water and is unresponsive.
2. Describe the process of hypothermia and how to provide resuscitative care for victims of hypothermia.
3. Describe how to provide resuscitative care for victims of trauma and electrocution.
4. Describe how to provide resuscitative care for victims with anaphylaxis, a laryngectomy, or with dentures.
5. Describe how to provide resuscitative care for a pregnant woman.
6. Describe how to provide resuscitative care for victims of opioid overdose.
7. Describe how to perform a secondary check following a successful resuscitation.

CHAPTER QUICK LOOK

1. Drowning
2. Hypothermia
3. Trauma
4. Electrocution
5. Pregnancy
6. Anaphylaxis
7. Laryngectomy
8. Dentures
9. Opioid overdose
10. Secondary check

Drowning

Figure 5.1

A responsive drowning victim struggling on the surface of the water.

Death by **drowning** is caused by suffocation by immersion (the face/airway) or submersion (the entire body) in a liquid, most frequently, water. Prior to suffocation, a drowning individual may be responsive, but is unable to make it to safety on their own. If this person is not assisted quickly, they will eventually become unresponsive.

A responsive drowning person is in distress, struggling to access air. During this struggle, they may frequently immerse their face or submerge their body, necessitating the need to hold their breath. This often results in panic and further struggling in the water, which uses up oxygen and energy (**Figure 5.1**). Eventually, the drowning person will remain submerged and will be unable to breath. When a person is not breathing, oxygen is used up, and carbon dioxide builds up. The reflex to breathe is linked to the amount of carbon dioxide in the blood. This will increase until the desire to attempt to breath, even when submerged may occur. This results in water entering the lungs, washing away the **surfactant**, damaging the alveoli in the lungs. At this point, the drowning person is now unresponsive, unconscious, in respiratory arrest, and will eventually be in cardiac arrest due to **hypoxemia.** If the person can be rescued quickly following the onset of unresponsiveness, chances are good that prompt resuscitation efforts will yield positive results.

As soon as a person is recognized in the water and in distress, steps should be taken to safely initiate a rescue. If the person is actively struggling on or below the surface, an in-water rescue by someone trained, such as a lifeguard is advised. The rescue should be performed safely, using equipment such as a **rescue tube**. Alternatively, providing the responsive drowning person a floatation device or the use of a reaching pole may be adequate to resolve this emergency.

However, if the individual is unresponsive (motionless, face immersed or body submerged) when recognized, prompt basic life support is needed. Someone should perform an in-water rescue with equipment, while someone else is calling EMS. If you are completely alone and without access to a mobile phone, perform the rescue - *if you are able* - and following removal, perform BLS care for two minutes, then contact EMS.

If you have not received lifeguard training, you may need to get assistance before a rescue can be safely made. Once contact is made with the drowning victim, their face should be removed from the water and their airway opened and maintained. Ideally, rescue breathing is initiated in the water, as soon as it is safe to do so and if it does not delay out of water care. If started, rescue breathing is continued until the drowning victim can be safely removed from the water. Once removed from the water the patient should be quickly assessed. If the rescue occurred quickly following the patient becoming unresponsive, it is likely that the patient will have a detectable pulse. In this case, rescue breathing should be started (ideally with a BVM and supplemental oxygen attached).

Figure 5.2

Quickly clear the airway of debris and continue care without delay.

If the airway has debris present, such as vomit or surfactant in the mouth, it should be removed. If a suction device is available, the person's mouth should be cleared quickly and other care continued without delay (**Figure 5.2)**. Rescuers should anticipate the higher potential for vomiting during BLS care whenever working on a patient who has drown. If the assessment determines that the patient is in cardiac arrest, CPR should be started, combined with supplemental oxygen (if available). An AED should be attached as soon as possible. When EMS arrives, care is transferred to the responders. Even if successfully resuscitated at the scene, it is always recommended that someone who has drown to be transported to a hospital. There, the drowning victim can be evaluated for conditions, such as secondary drowning, lung damage, and hypoxic complications.

Hypothermia

Figure 5.3

Rewarming a hypothermic person.

Hypothermia is often caused by exposure to cold weather or immersion in cold water. It is a condition that occurs when the body loses heat faster than it can produce heat, resulting in a dangerously low body temperature. Normal body temperature is around 98.6 F (37 C). Hypothermia occurs when body temperature drops below 95 F (35 C). When body temperature drops, the heart, nervous system and other organs cannot function normally. Left untreated, hypothermia can lead to heart and respiratory system failure and death.

Hypothermia should be suspected if any of the following signs or symptoms exist:

- Altered levels of consciousness, from confusion and drowsiness to unresponsiveness (severe hypothermia)
- Shivering that worsens, until shivering stops (severe hypothermia).
- Core body temperature that falls below 95 degrees F, and continues to drop to below 90 degrees F (severe hypothermia).
- Abdomen that is cold to the touch even under clothing.
- Muscle rigidity

To care for a person experiencing hypothermia, get the person out of the cold. Handle the person carefully to avoid the chance of heart arrhythmias. Remove any cold or wet clothing and place the person in warm, dry items such as clothing and blankets. If the person is alert and able to swallow, provide warm fluids. Assess the person frequently. **Figure 5.3**

Because the metabolic rate of a hypothermic person falls sharply, medications and defibrillation have little effect if the person is in cardiac arrest, until the person can be rewarmed. If an AED advises the need for a shock, deliver the initial shock and resume CPR and continue efforts to rewarm the person. Severely hypothermic persons may benefit from extracorporeal rewarming methods, such as blood or inhalation warming, provided in hospitals.

Trauma

Figure 5.4

Trauma is major cause of death each year

Trauma is the 4th leading cause of death each year among Americans of all ages. It is the leading cause of death among those under 45 years of age. There are approximately 30 million injuries in the United States each year that are serious enough to require hospital care. Each year, traumatic brain injuries contribute to a substantial number of deaths and permanent disability. More than 2 million traumatic brain injuries occur annually as a result of isolated injury or along with other injuries. **Figure 5.4**

A person experiencing mild or moderate injury can benefit from the care provided by thousands of emergency departments. But, for severe trauma, a person needs the specialized care that can be provided by a trauma center. Trauma centers are classified from Level I to Level IV. A Level I trauma center provides the highest level of trauma care while Level IV trauma centers provide initial trauma care and transfers the person to a higher level of trauma care if necessary. Research has shown a 25% reduction in deaths for severely injured persons who receive care at a Level I trauma center rather than at a non-trauma center. For more detailed information regarding triage and care of for trauma, refer to the Centers for Disease Control and Prevention “Guidelines for Field Triage of Injured Patients.”

Head, Neck, Back - Suspected Spinal Injuries and Chest Injuries

If you suspect a person has a head, neck, or back injury, take precautions to keep the head in line with the body and minimize movements. Evidence from the past decade suggests that the application of cervical collars may cause more harm than help and are not recommended. Examples of modifications pre-hospital BLS care that may be appropriate in cases of head, neck, or back injury include:

- Jaw thrust without head tilt
- HAINES modified Recovery Position only if airway is compromised (as described in Chapter 1)

It is important to remember that the secondary injuries seen, even potentially severe injuries like a suspected spinal injury, cannot delay the initiation of any needed basic life support care. If the patient's airway cannot be maintained without a head tilt or if the patient vomits and head/body movement occurs to facilitate clearing of the airway, it is necessary to sustain the patient's life.

Chest injuries can be open or closed. Common closed chest injuries involve bruising, caused by blunt force trauma. More serious closed chest injuries can involve rib fractures. Open chest injury occurs when the chest wall is penetrated by an object such as a fractured rib, knife, or bullet. The object could also be impaled in the chest. Rib fractures can involve an individual rib or multiple ribs. If multiple ribs in the same area are each broken in multiple places, the condition is known as a flail chest.

The signs of rib fractures include:

- Pain, especially when breathing or coughing
- Difficulty breathing, including the inability to take a deep breath
- Tenderness

To care for closed chest injuries, such as rib fractures:

- Call EMS - Place the patient in the most comfortable position for breathing and pain relief
- To help stabilize the ribs, place a folded towel, blanket, or pillow against the injured side and have the guest hold it in place with their arm

Open chest injuries are those that penetrate the chest wall. An object causing the damage, such as a knife, can be withdrawn or remain embedded. A chest injury that allows air to pass into and out of the chest cavity is a sucking chest wound. This is recognized by the sound of air being sucked into and out of the chest wound, as well as bubbling blood at the site of the wound.

To care for open chest injuries:

- Call EMS - Control any significant bleeding present
- If a sucking chest wound is present and a dressing and direct pressure are required to stop bleeding, care must be taken to ensure that a blood saturated dressing does not inadvertently occlude the wound. If there is little bleeding with a sucking chest wound, leave the wound exposed.

Electrocution

Electrocution is a related set of injuries caused by direct contact with live electrical connections. The effects can vary from minor injuries to cardiac arrest. The injuries that may be visible include characteristic entry and exit burn wounds. Electricity passes through the body along the path of least resistance, normally the blood vessels and nerves.

Before attempting to care for a person who has suffered an electric shock, make sure the person is not still in contact with live electricity. Unplug, or otherwise disconnect the power before approaching the person. If this is not possible, use a non-conducting object such a wooden stick to attempt to remove the person from contact with the electricity. If the person received a serious electric shock, it may result in the person being unresponsive. Complete your primary assessment by checking breathing and pulse. If the person is unresponsive, non-breathing, and without a pulse, begin CPR. If the person is not breathing but has a pulse, provide rescue breathing.

Shocking News: Lightning

Did you know that there are about 50,000 thunderstorms each day worldwide? Seems like a lot, right? But this number is small compared to the amount of lightning generated from these storms. Here are some lightning facts:

- Worldwide, lightning strikes the earth more than 100 times each second, or about 8 million times per day.
- In the U.S. alone, lightning strikes the ground approximately 25 million times each year. The chance of an individual in the U.S. being killed or injured by a lightning strike in his or her lifetime (based on 80 years) is one in 12,000.
- The heat of a lightning strike can be 60,000 degrees F in only a few millionths of a second.
- Lightning creates ozone-producing chemicals. Without thunderstorms and lightning, the earth-atmosphere electrical balance would disappear in several minutes.

Source: NOAA National Severe Storms Laboratory, 2014

Conduct a secondary check (see page 53) whenever possible, searching for electrical burns that may include both an entrance wound and an exit wound. Cover these wounds with sterile dressings **Figure 5.5**. A responsive patient may complain of numbness, tingling, or "pins & needles" in the area where the electricity has passed through body. Anyone suffering from serious electrocution, whether responsive or unresponsive, needs to be evaluated at a hospital.

Figure 5.5

Cover any electrical exit wounds.

Pregnancy

Pregnant women are susceptible to several conditions that may result in needing BLS care. These conditions include (but are not limited to):

- Hemorrhage
- Heart failure
- Amniotic fluid embolism
- Sepsis
- Aspiration pneumonitis
- Venous thromboembolism
- Preeclampsia

Pregnancy and CPR

A pregnant woman who experiences cardiac arrest needs high quality CPR just like anyone else. But for those in late pregnancy, positioning the woman on her back comes with a complication. The size and weight of the fetus can compromise blood flow by completely blocking the inferior vena cava and displacing the subrenal aorta when the woman is on her back. Restricted blood flow means lower cardiac output during chest compressions. The pressure being applied to these blood vessels can be relieved during CPR by carefully manually moving the fetus from the right side toward the left side of the abdomen, a technique known as lateral uterine displacement (LUD).

In the event of cardiac arrest, high quality CPR care should begin. Appropriate modifications to pre-hospital BLS care include:

- Make sure the 911 dispatcher is aware that the woman in cardiac arrest is pregnant, with your best estimate of how far along she may be (if the exact number of months or weeks is not known).
- Increased concern for opening and maintaining an open airway is needed due to likely airway restriction and possible vomiting (advanced airways may be needed).
- Incorporating oxygen as soon as it is available.
- Performing manual left **lateral uterine displacement** (**LUD** - see *Pregnancy and CPR* box above) if the patient is visibly within the later half of the second trimester of their pregnancy (at about 20 weeks of gestation).

All other components of BLS remain the same, including the compression location and the use of an AED as soon as it is available (AED energy is unlikely to harm the fetus).

Anaphylaxis with Cardiac Arrest

Around 200 people in the United States die from anaphylaxis each year. Anaphylaxis is shock brought on by a severe allergic reaction, coupled with life threatening respiratory responses, including bronchospasm and obstructive airway edema. These respiratory responses will result in immediate respiratory distress and quickly deteriorate to respiratory arrest, with cardiac arrest following shortly thereafter. The patient's respiratory issues combined with hypotension will complicate prehospital resuscitative efforts. The earlier in the emergency that this is corrected, the more likely pre-hospital BLS care and later ACLS care, will be effective.

Signs of Anaphylaxis include:

- Difficulty breathing or swallowing (early sign of obstructive airway edema)
- Swelling of the face, throat, or tongue (sign of obstructive airway edema)
- Wheezing, persistent cough, difficulty speaking or a hoarse voice
- Skin irritation, hives
- Pale and "floppy" (young children)
- Rapid heart rate with low blood pressure (hypotension)
- Dizziness, loss of consciousness

At the first sign of an allergic reaction:

- If it can be done without delaying care, remove the allergin. if known and/or remove the patient from the environment containing the allergin (if possible and safe to do so).
- Obtain the patient's epinephrine autoinjector (most commonly an EpiPen® or AuviQ® - **Figure 5.6**).
  - → If the patient is responsive and able to do so, provide the patient the autoinjector to self-administer.
  - → If the patient is unresponsive or is otherwise unable to self-administer the injection, you or another available responder should administer the autoinjector to the patient as quickly as possible (see general instructions on page 51)
- Call EMS - if obstructive airway edema has set in, provide this information so responders can be ready with an advanced airway.
- Assist the patient onto a firm, flat surface.
  - → If the patient is responsive, place in the recovery position and monitor their airway
  - → If the patient is unresponsive, place them onto their back and begin the primary check and initiate rescue breathing or CPR care, based on assessment.

  Keep in mind: If obstructive airway edema has compromised the airway, standard BLS airway management techniques may not be effective, requiring that an advanced airway be placed as soon as possible.

- Provide a second dose of epinephrine (if available) within 5-15 minutes of the first dose, unless rapid improvement is maintained following the first dose.

Sufferers have been known to suddenly lapse back into a state of anaphylactic shock, even after appearing to have fully recovered. Following care, continuously monitor the patient, with any remaining epinephrine ready if needed. When emergency services arrives, transport is advisable to allow physicians to evaluate impacted body systems and to quickly facilitate refills of used autoinjectors.

Figure 5.6

Examples of Epinephrine delivery systems.

Figure 5.7

Hold the epinephrine injector safely and remove the safety cap.

Figure 5.8

Hold the leg still and press the injector firmly against the outer thigh.

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 5.7)**.
2. Place the patient in a seated position and hold the knee firmly so that the leg does not move during injection (take additional precautions if preforming 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 (listing for a "click") and hold for the number of seconds indicated for the device being used (EpiPen®, 3 seconds; AuviQ® 2 seconds). **(Figure 5.8)**
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.

Laryngectomy

A person who has had a **laryngectomy** has had his or her larynx surgically removed. This person breathes through a small opening in the front of the neck called a **stoma**. To provide rescue breathing for a person with a laryngectomy, close the person's mouth and nose, place the resuscitation mask over the stoma, and give ventilations **Figure 2.15.**

Figure 5.9

A person with a laryngectomy breathes through a stoma.

Dentures

If you are providing rescue breathing for a guest with dentures, it is not necessary to remove them. Dentures will help maintain a seal with the mask. However, if the dentures are very loose they may prevent air from entering freely. If this is the case, carefully remove the dentures with your gloved hand.

Opioid Overdose

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 effects nearly every demographic, with the primary age range of victims being being aged 25 - 65. Heath care providers in BLS working in the community are likely to encounter someone experiencing an opioid related medical emergency, so understanding it is a must.

Naloxone Auto-Injectors for Opioid Overdose

Naloxone is a medication administered to those who overdose on opioids and are unresponsive and not breathing adequately (very slow, gasping or no breathing). Naloxone is considered to be generally safe and non-toxic, even if administered to an individual not suffering from opioid intoxication.

To use the muscle auto injector to aid an overdose patient:

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

Figure 5.9

Examples of Naloxone delivery systems.

To use the nasal spray to aid an overdose patient (Figure 5.10):

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

Figure 5.10

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

BLS Care Guidelines for Opioid Overdose Emergencies:

Because opioid overdose emergencies specifically repress the respiratory system, airway and breathing will take priority in the care provided. However, cardiac arrest will occur if steps are not quickly taken, as soon as the overdose is recognized.

The general sequence of care is as follows:

1. Survey the scene for safety - Be aware of exposed drug paraphernalia, especially used needles and unused drugs. Powerful opioids like fentanyl and heroin can enter your body via inhalation, ingestion, and even brief skin contact. Take appropriate precautions and be aware of your environment.

2. Check for responsiveness - Your patient may only respond to more vigorous stimuli or may alternate between responsiveness and unresponsiveness. If either are the case, consider the patient unresponsive.

3. Shout for assistance and activate emergency response - Getting additional help, if alone, may increase the safety of the scene and aid in moving the patient or determining what the patient took and when. Calling EMS and informing the dispatcher that it is an opioid related emergency will help responders prepare with equipment and naloxone. If you have access to naloxone, be sure to let the dispatcher know. Note: Contact Poison Control Centers at 800-222-1222, in addition to EMS, If you believe the patient has overdosed or ingested a non-opioid drug, known or unknown substance, toxin, chemical, poison, etc.

4. Retrieve or send for an AED and Naloxone if either are available - Place the patient in the recovery position if you are alone and leaving the scene to retrieve anything. Return quickly (always send untrained bystanders for equipment, supplies, or to retrieve additional help, if they are available and willing).

5. Check for normal breathing - Place the patient on their back, open their airway and look, listen and feel for breathing - a quick check (similar to how it was performed under the past "ABC" protocol).

→ **The patient is breathing** - Prevent deterioration and monitor their airway and breathing.

- Provide physical and audible stimuli, continue to "tap and shout" at them to stimulate their central nervous system.
- Administer naloxone if you have any available.
- Continue to monitor the patient closely until EMS arrives.

→ **The patient is not breathing** - Check for a pulse for up to 10 seconds.

→ The patient does not have a pulse - Start CPR and attach an AED if available.

- If you have naloxone available, administer a dose, if it does not delay the delivery of CPR or AED care. If it can only be administered if you stop CPR, skip it and continue High quality CPR care. Continue care until breathing is restored or EMS arrives.

→ **The patient does have a pulse** - Open the airway and begin rescue breathing using a BVM or resuscitation mask (attach oxygen if available).

- If you have naloxone available, administer a dose as soon as possible. It is reasonable to pause rescue breathing care to administer naloxone.

6. Breathing restored - "Tap and shout" for responsiveness. If responsive, prevent deterioration following the steps noted above. If unresponsive, consider administering an additional dose of naloxone.

7. EMS arrives - Relay to EMS responders the care you provided, including the number of doses of naloxone you have administered. If the patient is responsive, encourage the patient to transport with EMS.

Final items to note: Be prepared to protect yourself from the patient if your care efforts combined with naloxone are successful. The patient may not be fully aware of their actions and may be very aggressive. If they are suffering from an addiction, they may be displeased that you have intervened. When EMS arrives, it is important to encourage the patient to be transported. Victims of opioid overdose may quickly and suddenly return to an intoxicated state with a depressed CNS and respiratory system and will need additional doses of naloxone and perhaps additional BLS care until the opioids finally leave their system. If they transport, this will be done at the hospital. If they do not transport, you will have to determine if you or someone else will continue to monitor the patient.

Care Following Successful Resuscitation - Secondary Check

Most frequently, the **return of spontaneous circulation** (**ROSC**) and the return of regular breathing will occur during the delivery of ACLS in a hospital setting. However, if high quality BLS care is initiated quickly after respiratory or cardiac arrest and maintained, it is possible that the patient may be successfully resuscitated before EMS arrives or in-hospital care is available. This is ideal and if the patient's condition can be maintained at the scene through delivery to a hospital, the long term prospects for the patient tend to be positive. Following a successful resuscitation while still at the scene, deliberate on-going assessment and care is still needed. This is done first by performing a **secondary check**, followed by appropriate care, while continuously monitoring the patient's airway, breathing, and pulse.

Secondary Check

If you have determined that the patient is breathing but remains unresponsive, place the patient into the recovery position (described in Chapter 2). If the patient is responsive, you may still consider the recovery position, especially if there is reason to anticipate vomiting. In all cases, it is important to keep the patient lying on the ground or floor to avoid likely syncope (fainting) and to be in the best position to resume BLS care if the patient lapses back into respiratory or cardiac arrest.

The secondary check begins at the head and ends at the feet. It is performed by closely looking at and gently feeling for signs of injury on the body. Refer to the mnemonic **DOTS** to help you remember specific signs of injury. DOTS stands for: Deformity, Open wounds, Tenderness (pain), and Swelling. Make mental notes as you proceed or consider taking out your phone (if available) and recording your findings as you proceed. Look for medical alert necklaces and bracelets. Frequently re-check pulse and breathing as you proceed (or assign the monitoring of these indicators of life to an available second provider). If the airway, breathing, or pulse are compromised or cannot be confirmed, the secondary check, including the care of *any injury or illness* found so far must immediately stop, in favor of appropriate BLS care. This care may be modified appropriately if a condition found impacts your ability to provide effective care, with examples discussed in this chapter.

If the patient is verbally responsive, explain what you are doing and why (confirm consent). Ask for pain and tenderness feedback as you move to each area of the body. For the chest, ask the patient to take in a big breath of air and then release. Look for signs of pain or discomfort as they do this. At the pelvis, place your hands on the iliac crests of the patient's pelvis and apply gentle downward pressure. Again, look for signs of pain or discomfort. Note any DOTS issues encountered during the assessment and provide appropriate care.

Answer the patient's questions and try to keep them talking by asking helpful questions of your own, including:

- ✓What is your name? What happened to you? What caused this? What is the name and phone number of someone who should know about your condition? Where is your mobile phone? Offer to look up the number on their behalf following care.
- ✓Do you have any pre-existing conditions, allergies, illnesses, or injuries?
- ✓Do you currently have any prescriptions? What are there names? When did you last take each?
- ✓What have you consumed today, including food, drink, medications, supplements, drugs and alcohol? What was it, how much, and when was the last time?
- ✓When was the last time you: slept, exercised, visited the hospital, physician, or other health professional?

Having the patient frequently verbally respond to you also continuously establishes that the patient has an open airway, is breathing, and has a pulse. Silence should prompt you to directly check. Provide the patient with constant reassurance that you are helping them and that more help is on the way.

If you encounter signs of injuries or medical conditions, care for these in order of severity (potential to be life threatening) and in line with your present ability to do so, considering your access to supplies, equipment availability, scope of training, etc. *To help ensure your ability to handle secondary conditions found during this check, training in at least standard first aid is strongly recommended.* When EMS or other providers arrive, relay all your findings, along with a summary of all the care you have provided. Attempt to document (or ask someone to document) these findings as soon as possible.

Chapter 5 RECAP

Key Terms

Alveoli	Opioid	Auto Injector	Surfactant
Drowning	Naloxone	Nasal Injector	Epinephrine
Electrocution	Anaphylaxis	Dentures	Laryngectomy
Hypothermia	LUD	Stoma	Secondary Check

Key Points

- Drowning is the submersion or immersion in a liquid, impairing the respiratory system. A drowning person should be rescued quickly and receive CPR if he or she is in cardiac arrest, until a defibrillator is available. If the airway has any debris it should be removed.
- Hypothermia is a condition that occurs when the body loses heat faster than it can produce heat, resulting in a dangerously low body temperature of below 95 F (35 C).
- Care for hypothermia involves gradual rewarming, and careful handling to avoid heart arrhythmias. If an AED advises the need for a shock, deliver the initial shock, resume CPR and continue efforts to rewarm the person.
- If you suspect a person has a head or neck injury, take precautions to keep the head in line with the body. Use the jaw thrust technique without head tilt to open the airway
- If an electrocuted person is unresponsive, non-breathing, and pulseless, begin CPR. Conduct a secondary check whenever possible, searching for electrical burns that may include both an entrance wound and an exit wound. Cover these wounds with sterile dressings.

A pregnant woman in cardiac arrest needs immediate care, with special attention paid to oxygenation and her airway. At approximately 20 weeks of gestation the LUD technique should be used during CPR.

Opioid overdose can be treated with naloxone and rescue breathing care. If in cardiac arrest, naloxone should only be administered if it does not delay CPR/AED care.

Anaphylaxis may result in both respiratory and cardiac arrest due to airway swelling and hypotension. Providing the patient with their epinephrine autoinjector as soon as signs appear is critical.

A secondary check is performed following successful management of BLS priorities of Circulation, Airway, and breathing. Utilizing DOTS, physically examine the patient for secondary medical conditions, treating anything found, prioritizing the most severe. The status of the primary conditions must be monitored. if the patient is responsive, maintain communication to gather key information and to confirm ongoing responsiveness.

For Discussion

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

- ✓ Can you describe the process of drowning and how to provide resuscitative care for drowning victims?
- ✓ Can you describe the process of hypothermia and how to provide resuscitative care for victims of hypothermia?
- ✓ Can describe how to provide resuscitative care for victims of trauma?
- ✓ Can you describe how to provide resuscitative care for victims of electrocution, suspected opioid overdose, or late term pregnancy?

APPENDICES

SKILL SHEET: ONE RESCUER ADULT / CHILD CPR

Name:

Date:

Instructor:

Task	*Instructor Prompts*	Satisfactory	Unsatisfactory
Check responsiveness.	Person is unresponsive.		
Activate your emergency response system.	EMS/Code team activated		
Check carotid pulse & breathing simultaneously.	Breathing & Pulse are absent.		
Provide 30 chest compressions at a rate of approximately 110/min and adequate compression depth (100 - 120 rate range).			
Open the airway and give 2 ventilations to achieve chest rise.			
Continue CPR until an AED is available.	It has been 2 minutes. An AED is available.		

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SKILL SHEET: ONE RESCUER INFANT CPR

Name:

Date:

Instructor:

Task	Instructor Prompts	Satisfactory	Unsatisfactory
Check responsiveness.	Person is unresponsive.		
Activate Emergency Response system.	EMS/Code team activated.		
Check brachial pulse & breathing simultaneously.	Breathing & Pulse are absent.		
Provide 30 chest compressions at a rate of approximately 110/min and adequate compression depth (100 - 120 rate range).			
Open the airway and give 2 ventilations to achieve chest rise.			
Continue CPR until an AED is available.	It has been 2 minutes. An AED is available.		

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SKILL SHEET: TWO RESCUER ADULT / CHILD CPR

Name:

Date:

Instructor:

Task	*Instructor Prompts*	Satisfactory	Unsatisfactory
Check responsiveness.	Person is unresponsive.		
Activate Emergency Response system.	EMS/Code team activated.		
Check carotid pulse and breathing simultaneously.	Breathing and Pulse are absent.		
Rescuer #1 provides 30 chest compressions (adult); 15 compressions (child), at a rate of approximately 110/min and adequate compression depth (100 - 120 rate range).			
Rescuer #2 opens the airway and gives 2 ventilations to achieve chest rise.			
After 2 minutes (5 cycles), rescuers switch roles.	It has been 2 minutes.		
Continue CPR until an AED is available.	An AED is available.		

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SKILL SHEET: TWO RESCUER INFANT CPR

Name:

Date:

Instructor:

Task	*Instructor Prompts*	Satisfactory	Unsatisfactory
Check responsiveness.	Person is unresponsive.		
Activate Emergency Response system.	EMS/Code team activated.		
Check carotid pulse and breathing simultaneously.	Breathing and Pulse are absent.		
Rescuer #1 provides 15 chest compressions (using 2 thumbs) at a rate of approximately 110/min and adequate compression depth (100 - 120 rate range).			
Rescuer #2 opens the airway and gives 2 ventilations to achieve chest rise.			
After 2 minutes (5 cycles), rescuers switch roles.	It has been 2 minutes.		
Continue CPR until an AED is available.	An AED is available.		

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SKILL SHEET: ADULT AED

Name:

Date:

Instructor:

Task	*Instructor Prompts*	Satisfactory	Unsatisfactory
Check responsiveness.	Person is unresponsive.		
Activate Emergency Response system.	EMS/Code team activated.		
Check carotid pulse and breathing simultaneously.	Breathing and Pulse are absent.		
Provide 30 chest compressions at a rate of approximately 110/min and adequate compression depth (100 - 120 rate range).			
Open the airway and give 2 ventilations to achieve chest rise.			
Continue CPR until an AED is available.	An AED is available.		
Turn on the Device.	Device is on.		
Ensure chest is bare and dry.			
Apply electrode pads to chest.	Pads are applied.		
Stand clear.			
Initiate analysis.	Shock advised.		
Deliver shock.	Shock delivered.		
Resume CPR, starting with chest compressions.			
Reanalyze rhythm after 2 minutes.	No shock advised.		
Resume CPR if still needed, starting with chest compressions, and reanalyze after 2 minutes.			

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SKILL SHEET: ADULT / CHILD AIRWAY OBSTRUCTION

Name:

Date:

Instructor:

Task	*Instructor Prompts*	Satisfactory	Unsatisfactory
Responsive Person			
Determine that the person is choking.	Person is unable to speak, cough, cry.		
Provide abdominal thrusts (Heimlich Maneuver) until the obstruction is relieved or the person becomes unresponsive.	Person becomes unresponsive.		
Unresponsive Person			
Position the person supine on the ground.			
Have someone activate EMS / Code Team.	EMS/Code Team is activated.		
Provide 30 chest compressions at a rate of approximately 110/min and adequate compression depth.			
Open the airway and look in the mouth. Remove any object that is visible.	No object is visible.		
Attempt ventilation.	Ventilation is unsuccessful.		
If ventilation is unsuccessful, reposition the head and mask, and reattempt ventilation.	Ventilation is unsuccessful.		
Repeat chest compressions, check mouth for an object, and attempt ventilations until the obstruction is relieved or EMS / code team arrives.	Object is visible.		

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SKILL SHEET: INFANT AIRWAY OBSTRUCTION

Name:

Date:

Instructor:

Task	*Instructor Prompts*	Satisfactory	Unsatisfactory
Responsive Infant			
Determine that the infant is choking.	Infant is unable to speak, cough, cry.		
Provide 5 back slaps and 5 chest compressions. Check mouth for object and remove if visible	Obstruction is not relieved.		
Repeat procedures until the obstruction is relieved or the infant becomes unresponsive.	Infant becomes unresponsive.		
Unresponsive Infant			
Position the infant supine on a hard, flat surface.			
Have someone activate EMS / Code Team.	EMS/Code Team is activated.		
Provide 30 chest compressions at a rate of approximately 110/ min and adequate compression depth.			
Open the airway and look in the mouth. Remove any object that is visible.	No object is visible.		
Attempt ventilation.	Ventilation is unsuccessful.		
If ventilation is unsuccessful, reposition the head and mask, and reattempt ventilation.	Ventilation is unsuccessful.		
Repeat chest compressions, check mouth for an object, and attempt ventilations until the obstruction is relieved or EMS / code team arrives.	Object is visible.		

Notes:

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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.

Advance Directive Written instructions that describe a person's desires regarding his or her health care decisions. Examples are Living Wills and Do Not Resuscitate (DNR) orders.

Airway Obstruction Choking

Alveoli Small sacs located within tiny blood vessels at the end of the bronchioles; this is where oxygen and carbon dioxide are exchanged.

Arrhythmias Electrical disturbance of the electrical conduction system in the heart.

Asystole The absence of electrical activity in the heart; flat line.

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**.**

Atrioventricular (AV) nodeA critical electrical pathway located between the atria and ventricles.

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

Bag-Valve-Mask A device used to manually provide ventilations to a person in respiratory arrest.

Basic Life Support (BLS) The initial care that health care professionals provide 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.

BronchiolesThe division of the bronchi into smaller branches.

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

Carbon dioxide A waste product produced by the body and exhaled.

Cardiac arrest The absence of responsiveness, breathing, and pulse.

Cardiopulmonary resuscitation (CPR) The care provided to a person in cardiac arrest.

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.

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

Cardiopulmonary Resuscitation (CPR) The initial care provided to a person who is unresponsive, not breathing, and pulseless.

Confidentiality Private information provided to health care providers that should only be shared with other health care providers directly responsible for the care of the person.

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.

Diaphragm Primary muscle associated with breathing.

Documentation Accurate written records of the events surrounding a person's illness or injury.

Drowning The submersion or immersion in a liquid, commonly water.

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

Dysrhythmia Electrical disturbance of the electrical conduction system in the heart.

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

Electrocution A related set of injuries caused by direct contact with live electrical connections.

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

Epiglottis Thin flap of tissue that allows air to enter the lungs while diverting food and fluid down the esophagus to the stomach.

Exhalation The process of removing waste products, such as carbon dioxide.

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.

Hypothermia A condition that occurs when the body loses heat faster than it can produce heat.

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, and designed to recognize and correct certain types of abnormal heart rhythms.

Inhalation The process of delivering oxygen to the lungs

Jaw Thrust A techniqueused by health care professionals to open the airway, with or without head tilt.

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

Laryngospasm Constriction (spasm) of the larynx (vocal cords), temporarily preventing air or water from entering the lungs.

Myocardial infarction Death to portions of heart muscle tissue as a result of lack of oxygen; heart attack.

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

Oxygen A colorless, odorless, gaspresent in the atmosphere and required for life.

Pacemaker Specialized muscle fibers within the heart that send out electrical impulses to regulate the heartbeat. If the heart's built-in pacemaker does not function properly, an artificial pacemaker can be used.

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.

Pharynx The throat.

Primary Assessment The initial process of checking for consciousness, breathing, and pulse.

Purkinje fibers specialized cardiac muscle fibers forming a network in the walls of the ventricles that conduct electric impulses resulting in the contractions of the ventricles.

Rescue breathing The process of manually providing oxygen to the lungs of a person in respiratory arrest, by giving ventilations using your own breath, or by an artificial means.

Respiratory arrest Stoppage of breathing.

Respiratory distress Difficulty breathing.

Respiratory System The system by which oxygen is taken into the body and an exchange of oxygen and carbon dioxide takes place.

Scope of Practice Certain responsibilities and skills that have been acquired through training and licensure / certification.

Sinoatrial Node The point where normal electrical impulse in the heart originates; found in the upper part of the right atria.

Standard of Care The expectation that health care providers responding to an emergency will provide care with a certain level of knowledge and skill equal to that of similar health care providers.

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.

Surfactant Fluid secreted by the cells of the alveoli (the tiny air sacs in the lungs) that contributes to the elastic properties of lung tissue, preventing the alveoli from collapsing.

Trachea The windpipe.

Tuberculosis (TB) A communicable airborne disease.

Ventricles The two lower chambers of the heart.

Ventricular fibrillationA condition of disorganized, chaotic electrical activity that results in quivering of the ventricles in the heart.

Ventricular tachycardia An electrical disturbance thatcauses the ventricles to beat far too fast. Due to the speed the chambers cannot fill properly or pump blood effectively.