ELLIS & ASSOCIATES

Health Care Provider Basic Life Support

MEETS CURRENT CPR & ECC GUIDELINES

AUTHORIZED IACET PROVIDER

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Contents

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. Over more than 30 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 diseases that pose a risk of transmission to health care providers and precautions to minimize disease transmission.
4. Describe types of cardiovascular disease.
5. Identify and describe the links in the Chain of Survival, and the roles of the health care providers within each link.

CHAPTER QUICK LOOK

1. Health Care Providers
2. A Duty to Respond
3. Critical Skills of Basic Life Support
4. Diseases of Concern to Health Care Providers
5. Standard Precautions
6. Handling an Exposure
7. Understanding Cardiovascular Disease
8. The Chain of Survival: Taking Action
9. Recap

Health Care Providers

Health care providers are traditionally thought of as physicians, physician assistants, nurses, and EMS personnel, such as EMTs and Paramedics. But others can be included such as firefighters, law enforcement officers, lifeguards, athletic trainers, ski patrollers, and occupational therapists.

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 1.1**

figure 1.1

Health care providers are actively involved in many fields.

A Duty to Respond

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 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 1.2**
- ✓ **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.
- ✓ **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 1.2

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.

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 4 critical skills:

- Clear an Airway Obstruction - This is provided to a person who is choking.
- Provide Rescue Breathing - This is provided to a person who is unresponsive, has a pulse, but is not breathing normally (or only gasping).
- Provide Cardiopulmonary Resuscitation (CPR) – CPR is the initial care provided to a person who is unresponsive, not breathing, and pulseless.
- 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 1.3**

figure 1.3

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

This manual and course cover these skills, as well as special situations that health care providers may encounter when giving care.

Diseases of Concern to Health Care Providers

Health care providers must understand the risks of disease transmission when providing emergency care, and take proper precautions at all times. Fluids that might contain hepatitis B virus (HBV), hepatitis C virus (HCV), or human immunodeficiency virus (HIV) include blood, body fluids, secretions, and excretions excluding sweat. Blood contains the greatest threat of transmission in the emergency setting. If blood is not visible, it is still likely that very small quantities of blood are present in other fluids, such as saliva, but the risk for transmitting HBV, HCV, or HIV is extremely low.

Ebola is another disease of concern to health care providers. Those infected exhibit respiratory complaints and fever of unknown origin, as well as a recent travel history to areas where the disease is epidemic. Health care providers should take full precautions when providing care for a person suspected of being infected with Ebola. **Table 1.1** provides information on more common diseases of concern.

Table 1.1 Pathogens of Concern

Disease	Overview	Vaccination for Health Care Providers
Hepatitis B	A bloodborne virus causing serious disease of the liver. Hepatitis B infection can lead to long term liver disease, including cirrhosis and cancer.	An effective vaccine is available and must be offered to employees within a few days following new employment.
Hepatitis C	A bloodborne virus causing serious disease of the liver Hepatitis C infection can lead to long term liver disease, including cirrhosis and cancer.	None
Human Immunodeficiency Virus (HIV)	A bloodborne virus that attacks white blood cells, destroying the body's ability to fight infection, and leading to AIDS in most cases.	None
Tuberculosis	An airborne bacterial infection primarily affecting the lungs.	Bacille Calmette-Guérin (BCG) is a vaccine for tuberculosis. BCG vaccination of health care workers is rarely needed, and should be considered on an individual basis. Providers must be counseled as to need, risks, and benefits associated with the BCG vaccination.
Measles	A highly contagious airborne virus resulting in a high fever lasting numerous days, characteristic rash, cough, and conjunctivitis.	The measles vaccine is effective at preventing the disease.

Standard Precautions

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 Personal Protective Equipment (PPE) when providing care.

PPE includes:

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

Health care providers are to be given proper PPE to do their jobs, as well as 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.

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

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 the exposure involves a splash to areas such as the eyes, flush the area with water or saline.
- Document the event.
- Report the event to your supervisor immediately. **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.

Understanding Cardiovascular Disease

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. **Figure 1.6**

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

figure 1.6

Cardiovascular disease is the number one killer of Americans

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.

Many of the causes leading to heart disease can be can be prevented by adopting a heart healthy lifestyle that reduces the risk of heart disease. There are two types of risk factors, those that can be controlled and those that cannot be controlled. Those that can be controlled include conditions or behaviors including stress, obesity, sedentary lifestyle, high blood pressure, high cholesterol, and cigarette smoking. Those risk factors that cannot be controlled include aging, gender, and heredity.

Take the Pledge

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

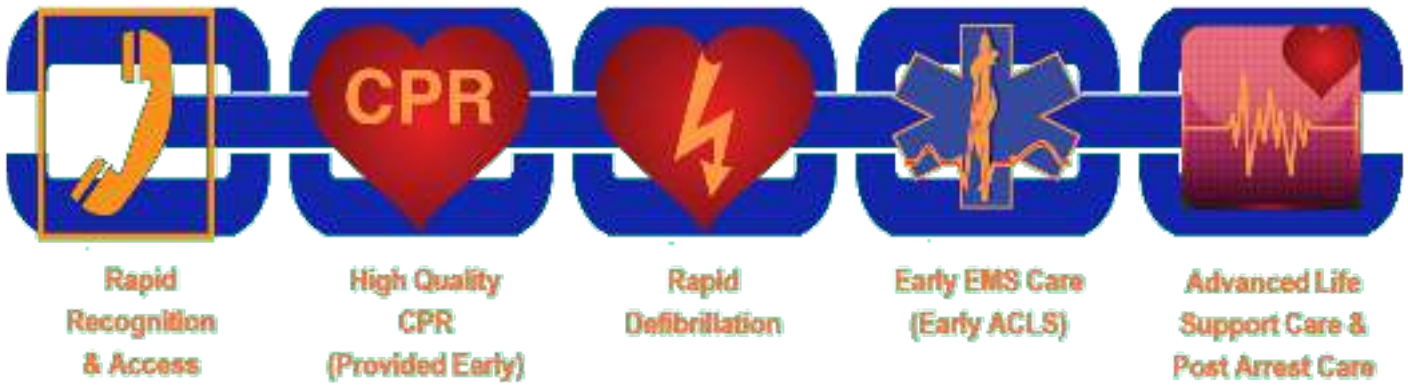
- Achieve a healthy weight. Being overweight or obese cause many preventable deaths.
- Be active. Commit to at least 30 minutes of moderate-intensity activity daily.
- Eat smart. Choose a diet that includes whole grains, vegetables and fruits, and one that is low in saturated fat, trans fat, and cholesterol..
- 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

The Chain of Survival: Taking Action

The **Chain of Survival** refers to a series of actions that must be linked together to provide the best care and chance of survival for a person in cardiac arrest. **Figure 1.7.** While the links in this chain vary slightly based on whether the arrest occurs in or outside of a hospital, the general focus is on:

- Rapid recognition and activation of the emergency response system (Early Access)
- Immediate high quality CPR
- Rapid defibrillation
- Care by basic and advanced EMS personnel
- Advanced life support and post arrest care

figure 1.7



Rapid Recognition and Activation of Emergency Response

The role of the first responder at the scene is to rapidly assess the person's condition and summon appropriate personnel. In the pre-hospital setting local emergency medical services (EMS) can normally be summoned by calling 9-1-1. Very few areas of the country are without 9-1-1. A prompt call gets EMS personnel on their way. The sooner they arrive the better the person's chances of recovery.

Among hospital professionals, a code team is activated when a person suffers cardiac arrest. This team is comprised of physicians, nurses, respiratory specialists, and technicians.

Immediate 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. It is often the first skill that is performed for the person in cardiac arrest, and should be done with limited interruptions.

Rapid 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.

Early Basic and Advanced Care by EMS

Advanced cardiac life support, commonly referred to as ACLS, involves specialized care procedures initiated by paramedics and EMTs in the prehospital setting, and physicians and nurses in the hospital setting. ACLS includes intravenous (IV) therapy, medication administration, advanced airway management, 12-lead ECG and protocols for transport to a hospital with coronary catheterization capabilities.

Advanced Life Support and Post Arrest Care

This link refers to specialized advanced life support measures provided in the hospital, and aimed at returning the person to optimal health. This may include reperfusion therapy, angioplasty, stent insertion, or coronary artery bypass grafts. Specialists involved in brain injury, as well as physical therapists provided a comprehensive, integrated plan to make the person as well as possible.

Chapter 1 RECAP

Key Terms

Abandonment
Advance directive
Advanced cardiac life support (ACLS)
Atherosclerosis
Basic life support (BLS)
Cardiopulmonary resuscitation (CPR)
Cardiovascular disease
Chain of survival
Confidentiality
Consent
Defibrillation
Documentation
Duty to act
Dysrhythmias
Good Samaritan laws
Heart attack
Negligence
Personal protective equipment (PPE)
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.
- The Chain of Survival refers to a series of actions represented by 5 links in a chain that must work together to provide the best care and chance of survival for a person 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? (Pg 2)
- ✓ What are the basic legal considerations that apply to health care providers rendering care? (Pg 2-3)
- ✓ Can you name 4 diseases that pose a risk of transmission to health care providers? (Pg 4)
- ✓ What precautions should be followed to minimize the transmission of the diseases in the previous question? (Pg 5)
- ✓ How does a heart attack occur? (Pg 6)
- ✓ Can you name and describe each of the 5 links in the Chain of Survival? (Pg 8)

2 RESPIRATORY EMERGENCIES

OBJECTIVES

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

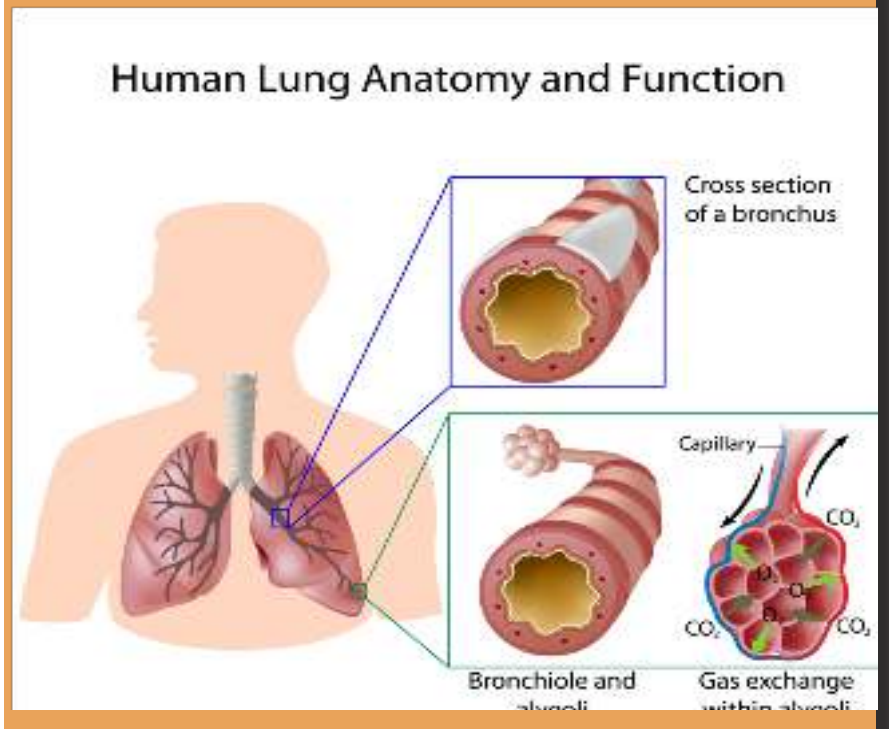
1. Describe the components and function of the respiratory system.
2. Identify causes of respiratory emergencies.
3. Describe how to assess a person experiencing respiratory distress.
4. Describe how to care for a person experiencing respiratory distress.
5. Demonstrate how to provide rescue breathing 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.These include:

- Airway obstruction
- Inhaling smoke or other poisonous chemicals.
- Aspiration (Breathing in stomach contents while throwing up)
- Asthma
- Lung infections such as pneumonia.
- Near drowning
- Suffocation
- Chest trauma
- Narcotic overdose
- 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: **Figure 2.2**

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

figure 2.2

A person in respiratory distress needs immediate help.

Follow these guidelines to care for a person experiencing respiratory distress:

- Help the person rest in a position that makes breathing easier. This is often a seated position.
- Comfort and reassure the person.
- Summon more advanced care providers.
- Assist the person with any of his or her prescribed medications, such as an inhaler.
- Administer supplemental oxygen if signs of hypoxia are present, supported by pulse oximetry, and in accordance with your local protocols.
- Keep the person's airway clear.

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 Assessment

A person found motionless must be assessed using a systematic approach. After making sure the scene is safe, approach the motionless person. The **primary assessment** 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

figure 2.3

Check responsiveness.

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 unresponsive, activate your EMS system or code team, if this has not already been done **Figure 2.3.**

Continue your assessment by simultaneously checking for breathing and pulse for up to 10 seconds. Look at the chest to see if it is moving. Listen for sounds that would indicate a person is not breathing normally, such as agonal respirations. Check the carotid pulse in the neck for a child (age 1- puberty) or an adult. To find the carotid pulse, 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.** Because a carotid pulse is hard to detect in infants (birth – 1 year), due to their short necks, check the brachial pulse in the inside of the upper arm for an infant. **Figure 2.5.**

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.

figure 2.4

Check for a carotid pulse in an adult or child

figure 2.5

Check for a brachial pulse in an infant.

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.

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.

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.

figure 2.8

Opening the airway using the Head tilt – Chin Lift.

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 facemask 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

figure 2.13

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

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 2.14

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

When ventilations are provided, they should be given gently, over a period of one second. Provide one ventilation about every 5 seconds for an adult, or about every 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. See Table 2.1 for an overview of the steps for rescue breathing.

Table 2.1 Rescue Breathing Overview

Body	Overview	Steps
Adult	>12 years of age (older than puberty)	1 ventilation (lasting 1 second). Make the chest rise. Repeat about every 5 seconds.
Child	1 year to Puberty (Approximately 12 years of age)	1 ventilation (lasting 1 second). Make the chest rise. Repeat about every 3 seconds.
Infant	Birth to 1 year of age	1 ventilation (lasting 1 second). Make the chest rise. Repeat about every 3 seconds.

Special Situation: 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 2.15

A person with a laryngectomy breathes through a stoma.

Rescue Breathing: What Really Matters?

Ventilations must be provided in a manner that does not overinflate the lungs or end up in the stomach. Breathing too rapidly (hyperventilation) or forcefully can damage the lungs 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 in anyone receiving rescue breathing.

Airway Obstruction (Choking) In a Responsive Adult or Child

Airway obstruction (choking) in a conscious 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 2.16.**

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.

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 2.17.** 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 2.18**.

figure 2.16

Distress sign of choking.

figure 2.17

Provide inward and upward abdominal thrusts to relieve the obstruction.

figure 2.18

Provide chest thrusts for a pregnant or large person.

FYI: How the Heimlich Maneuver Works

Ventilations must be provided in a manner that. 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. This action forces air out of the lungs under pressure, which is often adequate to dislodge an object in a conscious choking adult or child.

Airway Obstruction (Choking) In a Responsive Infant

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

1. 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 2.19.**
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 2.20.**

figure 2.19

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

figure 2.20

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.

Airway Obstruction (Choking) In an Unresponsive Person

If at any time your ventilations do not make the chest rise, reposition the head and mask, and repeat ventilations. If still unsuccessful, suspect an airway obstruction. Start CPR by providing 30 chest compressions. CPR is covered in detail in the next chapter. Look in the mouth for any object, and sweep the object out with your finger if you see it. Reattempt ventilations. This is normally all that is needed to dislodge the object. Repeat this process until chest rise is obtained.

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 5 seconds for adults, and one every 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, suspect 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? (Pg 11)
- ✓ What are the causes of respiratory emergencies? (Pg 11)
- ✓ What are the signs and symptoms of respiratory distress? (Pg 11-12)
- ✓ Can you describe how to care for a person experiencing respiratory distress? (Pg 13-14)
- ✓ How should you provide rescue breathing for an adult, child, and infant in respiratory arrest? (Pg 14-17)
- ✓ How should you provide care for an airway obstruction in a conscious or unconscious adult, child, and infant? (Pg 18-19)

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.

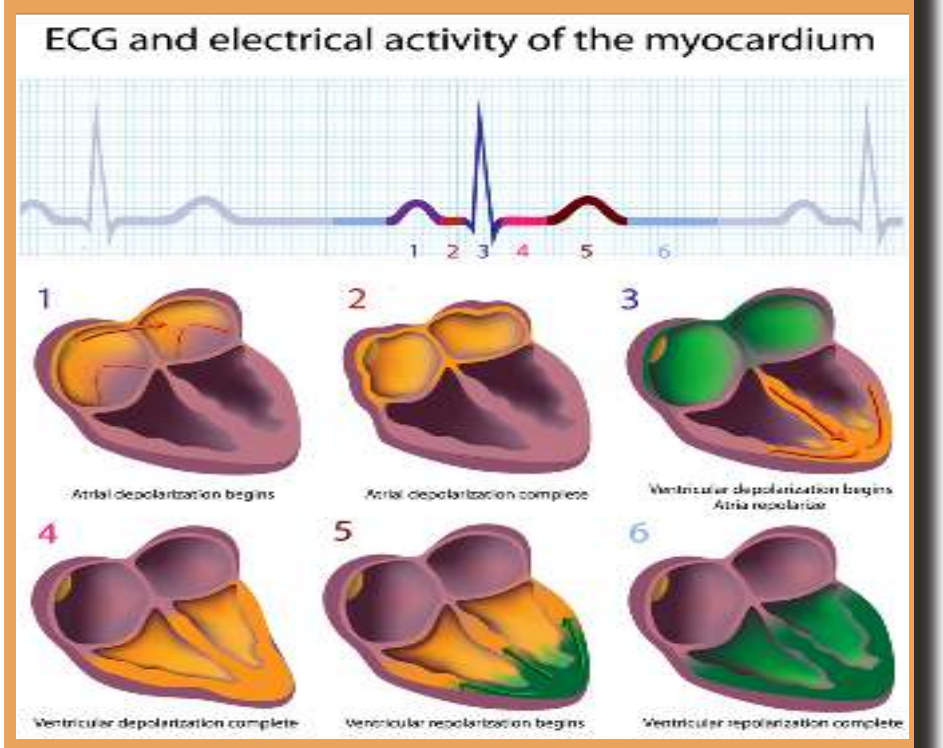
CHAPTER QUICK LOOK

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 chambersthrough 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.

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, lightheadedness, dizziness, fainting and sometimes sudden death.
3. Age – As people age the risks of cardiovascular disease increase.

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.

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.

Caring for a Heart Attack

Follow these steps to care for a heart attack:

- Call 9-1-1 or summon more advanced medical care.
- Have the person stop all activity and rest in a comfortable position.
- Loosen any restrictive clothing
- 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 use it and give CPR.

figure 3.3

Nitroglycerin is a frequently prescribed heart medication.

FYI: Chances of Heart Attack

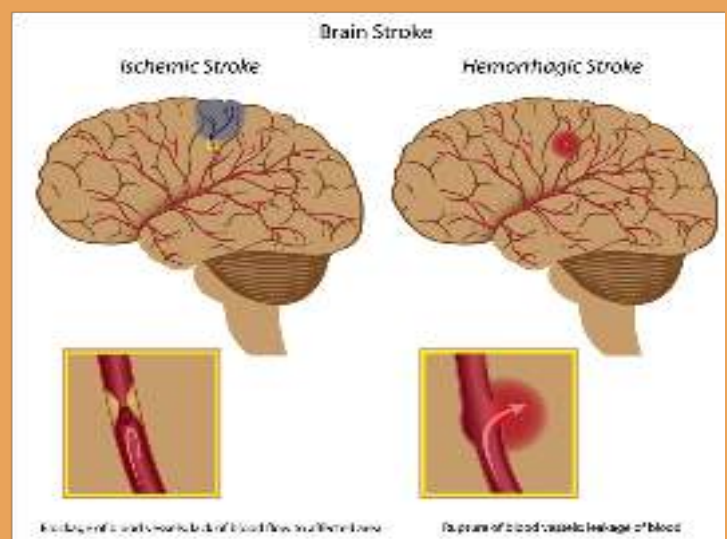
Studies show that heart attacks are more likely to occur in the morning hours than any other time of day. Mondays are the most likely day of the week for a heart attack to occur. And people are far more likely to experience a heart attack in the winter months than at any other time.

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.

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**

figure 3.4



Ischemic and hemorrhagic stroke

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

See **Table 3.1** for a FAST way to recognize stroke.

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 9-1-1 or summon more advanced care.

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.

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 pulseless. 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 pulseless, 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 rate of 110 compressions per minute; range of 100 - 120).
- Push deep (Compress at least 2 inches, but not more than 2.4 inches for an adult. Less for children and infants).
- Push rhythmically.
- Allow for complete recoil of the chest (do not lean on the chest).
- Minimize interruptions.

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 the back on a hard surface.
2. Determine that the adult is unresponsive, not breathing (or only gasping), and pulseless.
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

figure 3.5

Chest compressions provided to an adult during CPR

figure 3.6

Ventilations provided to an adult during CPR

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**
7. Repeat cycles of 30 compressions and 2 ventilations until a defibrillator is available or the person shows signs of life.

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 pulseless.
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

One Rescuer Infant CPR

figure 3.9

Use two fingers to provide chest compressions to an infant.

figure 3.10

Ventilations provided to an infant during 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 pulseless.
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

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. One rescuer performs chest compressions continuously, 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.

Two-rescuer CPR using an advanced airway.

Table 3.1 summarizes the changes between one and two-rescuer CPR for adults, children, and infants.

Table 3.1 CPR for Adults, Children, and Infants

Steps	Adults	Children (Age 1-Puberty)	Infants (Birth to Age 1)
Compression Location	2 hands, center of the chest	1 or 2 hands , center of the chest	2 fingers, center of the chest, just below the nipples
Compression Depth	At least 2 inches	1/3 the depth of the chest. About 2 inches	1/3 the depth of the chest. About 1.5 inches
Compression Rate	110 per min. target. (100 - 120 per min.)	110 per min. target. (100 - 120 per min.)	110 per min. target. (100 - 120 per min.)
Ventilations	Each ventilation lasts one second and makes the chest rise.	Each ventilation lasts one second and makes the chest rise.	Each ventilation lasts one second and makes the chest rise.
1 Rescuer CPR Cycles	30 compressions and 2 breaths	30 compressions and 2 breaths	30 compressions and 2 breaths
2 Rescuer CPR Cycles	30 compressions and 2 breaths	15 compressions and 2 breaths	15 compressions and 2 breaths. Two-thumbs with hands encircling chest technique for compressions

Revisiting the Chain of Survival

The "Chain of Survival" is a concept based on a series of actions that must occur for a person to have the best chance to survive cardiac arrest. It is similar to the links in a chain, where the strength of the chain is dependent upon all the links. The links in the chain are:

- Rapid recognition and activation of the emergency response system (Early Access)
- Immediate high quality CPR
- Rapid defibrillation
- Care by basic and advanced EMS personnel
- Advanced life support and post arrest care

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

figure 3..14

Impedance Threshold device (ITD)

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.

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 pulseless, 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? (Pg 22)
- ✓ What are the risk factors of cardiovascular disease? (Pg 23)
- ✓ What are the signs and symptoms of a heart attack? (Pg 24)
- ✓ Can you describe how to care for a person experiencing a heart attack? (Pg 24)
- ✓ How should you provide care for a person experiencing a stroke? (Pg 25)
- ✓ Can you identify the signs and symptoms of a person experiencing a stroke? (Pg 25)
- ✓ How should you provide CPR for an adult, child, and infant in cardiac arrest? (Pg 26-29)

4 AUTOMATED EXTERNAL DEFIBRILLATION (AED)

OBJECTIVES

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

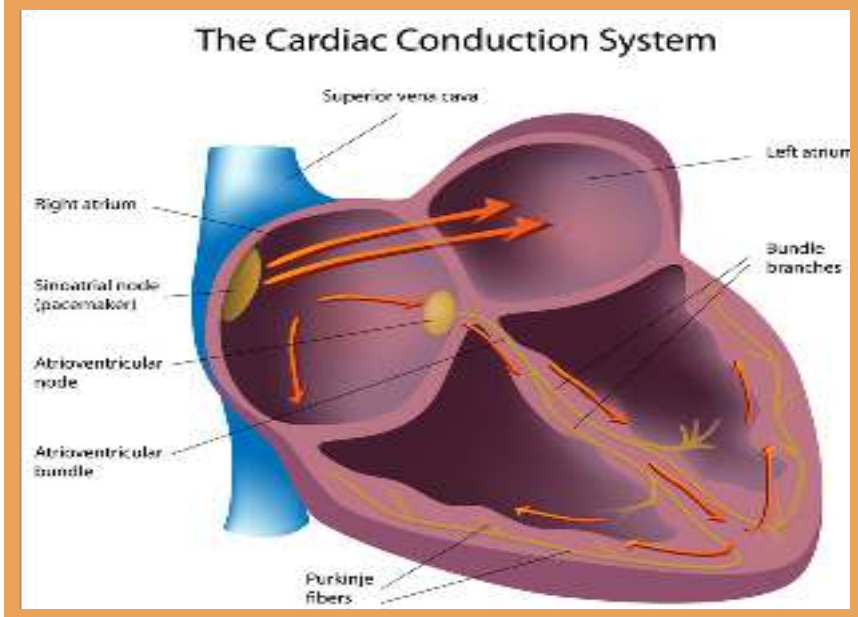
1. Explain the electrical conduction system of the heart.
2. Explain the two abnormal heart rhythms that the AED can correct.
3. Identify the elements common to all AEDs.
4. Describe how an AED works to help a person in cardiac arrest.
5. Describe special considerations when using an AED.
6. Describe 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

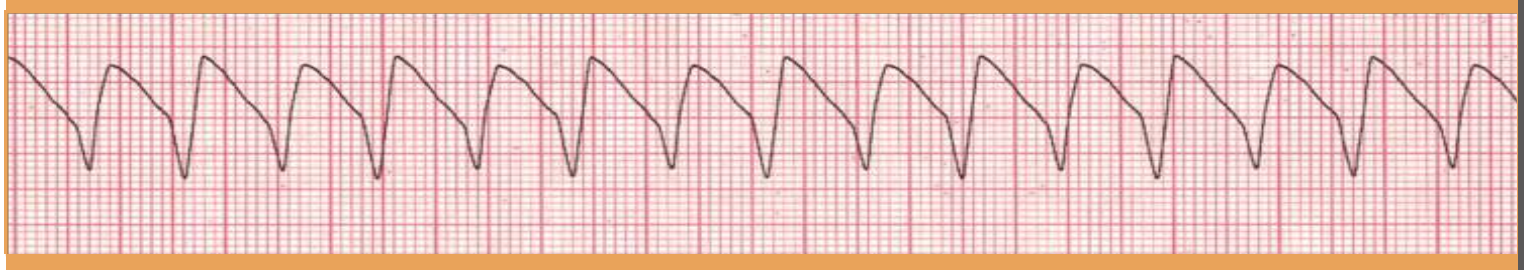


The heart's electrical conduction system

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**

figure 4.2



Ventricular tachycardia (V-tach).

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 pulseless. **Figure 4.3**

figure 4.3

Ventricular fibrillation (V-fib)

About AEDs

figure 4.4

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

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**:

figure 4.5

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

- 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

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 Piercings

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

figure 4.11

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

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.**

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.**

figure 4.12

Remove the person from any free standing water before use.

Implanted Devices

figure 4.13

An implanted cardioverter defibrillator (ICD).

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.**

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? (Pg 34)
- ✓ What are the two abnormal heart rhythms that an AED can correct? (Pg 34)
- ✓ What elements are common to all AEDs? (Pg 35)
- ✓ Can you describe how an AED works? (Pg 36)
- ✓ What are four special considerations to be aware of when using an AED? (Pg 38)
- ✓ Can you explain how to use an AED for an adult, child, and infant in cardiac arrest? (Pg 38-39)
- ✓ How should an AED be maintained to insure proper working condition? (Pg 39)

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 drowning victims.
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.
4. Describe how to provide resuscitative care for victims of electrocution.
5. Describe how to provide resuscitative care for victims of opioid overdose and those in late term pregnancy.

CHAPTER QUICK LOOK

Drowning

Drowning is the process of experiencing respiratory impairment as a result of immersion(face/airway) or submersion (entire body) in a liquid, commonly water. Suffocation and death can occur when the air supply to the lungs is blocked in this manner. The drowning person may live or die as a result of this process.

A responsivedrowning person will attempt to hold his or her breath while struggling to access air. This often results in panic and further struggling in the water, which uses up oxygen and reduces the amount of time it will take to become unresponsive. **Figure 5.1**.

When a person is not breathing, oxygen is used up, and carbon dioxide builds up. The reflex to breatheislinked to the amount of carbon dioxide in the blood, and will increase until the person will try to breathe, even when submerged. This results in water entering the lungs, washing away the **surfactant**, resulting in the collapse of the alveoli in the lungs.

figure 5.1

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

figure 5.2

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

A person rescued quickly stands a good chance of surviving the event. Time is the big determinant of survival in any drowning incidents, as the lack of oxygen and chemical changes in the lungs can cause cardiac arrest.

Once removed from the water the person should be quickly assessed. If the person is in cardiac arrest, CPR should be started, until a defibrillator is available. If the person has a heartbeat, but is just not breathing, then rescue breathing should be provided. If the airway has debris in the airway 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**.

Not all drowning persons need transport to a hospital. Lifeguards make many rescues of drowning persons who are treated and released. But those who continue to experience respiratory distress or other concerning signs or symptoms must be transported for detailed evaluation.

Hypothermia

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.

figure 5.3

Rewarming a hypothermic person.

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

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**

figure 5.4

Trauma is major cause of death each year

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 of an unresponsive, non-breathing or pulseless person.

A person experiencing mild or moderate injury can benefit from the care provided by thousands of emergency departments. But, for severe trauma, a personneeds 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."

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.

figure 5.5

Cover any electrical exit wounds.

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 pulseless, begin CPR. If the person is not breathing but has a pulse, provide rescue breathing. 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.**Figure 5.5**

A responsive personmay complain of numbness, tingling, or "pins & needles" in the area where the electricity has passed through body. An unresponsive person needs the same care provided to any unresponsive person – check breathing and pulse, and provide rescue breathing or CPR / AED as needed. Anyone suffering from serious electrocution, whether responsive or unresponsive, needs to be evaluated at a hospital.

!! Caution !!

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.

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 only several minutes.

Source: NOAA National Severe Storms Laboratory, 2014

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).

Opioid Overdose

Opioid overdose resulting from prescription medications or illegal drugs is a growing problem in the US. Opioid overdose can cause respiratory depression and arrest. ***Naloxone*** is a medication available in intramuscular and intranasal forms that should be administered to anyone in respiratory arrest expected of having overdosed on an opioid substance.

Chapter 5 RECAP

Key Terms

Alveoli
Drowning
Electrocution
Hypothermia
Surfactant

Key Points

- Drowning is the submersion or immersion in a liquid, impairing the respiratory system.
- Laryngospasm occurswhen the larynx constricts, temporarily preventing air and additional water from entering the lungs.
- A drowning person should 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 of an unresponsive, non-breathing or pulseless person.
- 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.

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? (Pg 42)
- ✓ Can you describe the process of hypothermia and how to provide resuscitative care for victims of hypothermia? (Pg 43)
- ✓ Can describe how to provide resuscitative care for victims of trauma? (Pg 43-44)
- ✓ Can you describe how to provide resuscitative care for victims of electrocution, suspected opioid overdose, or late term pregnancy? (pg 44-45)

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.		

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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.

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