American Red Cross

Responding to Emergencies

Comprehensive First Aid/CPR/AED

American Red Cross

Responding to Emergencies: Comprehensive First Aid/CPR/AED

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This participant's textbook is part of the American Red Cross *Responding to Emergencies: Comprehensive First Aid/CPR/AED* program. By itself, it does not constitute complete and comprehensive training. Visit redcross.org to learn more about this program.

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

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Scan this code with your smartphone to access free skill refreshers, or visit **redcross.org/RTErefresher**.

Acknowledgments

This textbook is dedicated to the thousands of employees and volunteers of the American Red Cross who contribute their time and talent to supporting and teaching lifesaving skills worldwide and to the thousands of course participants and other readers who have decided to be prepared to take action when an emergency strikes. Many individuals shared in the development and revision process in various supportive, technical and creative ways. *Responding to Emergencies: Comprehensive First Aid/CPR/AED* was developed through the dedication of both employees and volunteers. Their commitment to excellence made this textbook possible.

This textbook reflects the 2010 Consensus on Science for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (ECC) and the Guidelines 2010 for First Aid. These treatment recommendations and related training guidelines have been reviewed by the American Red Cross Scientific Advisory Council. The American Red Cross Scientific Advisory Council is a panel of nationally recognized experts in the fields of emergency medicine, sports medicine, emergency medical services (EMS), emergency preparedness, disaster mobilization, and other public health and safety fields.

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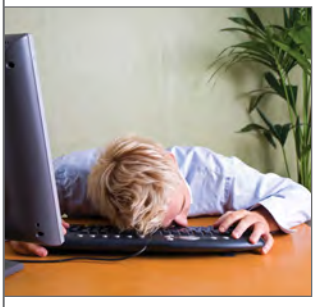


Detailed Table of Contents

About This Course

People need to know what to do in an emergency before medical help arrives. It is, after all, lay responders such at yourself who are most likely to be on the scene of an emergency first. This course will prepare you to make appropriate decisions regarding first aid care, and equip you to act on your decisions, whether at home, at your workplace or in the community.

The first critical step in any emergency depends on the presence of someone who will take appropriate action. After completing this course, you should be able to:

- Recognize when an emergency has occurred.
- Follow the emergency action steps: **CHECK—CALL—CARE**.
- Provide care for injury or sudden illness until advanced medical personnel arrives.

HOW YOU WILL LEARN

Course content is presented in various ways. The textbook, which will be assigned reading, contains the information that will be discussed in class, as well as visual support to illustrate the key skills and concepts you will be learning. In addition, you will view videos demonstrating how to correctly perform specific skills and aid in skill practice. Participating in all class activities will increase your confidence in your ability to respond to emergencies.

The course design allows you to frequently evaluate your progress in terms of skills competency, knowledge and decision making. Certain chapters in the textbook include directions for skill practice sessions that are designed to help you learn specific first aid skills. Some of the practice sessions require practice on a manikin. Others give you the opportunity to practice with another person. This will give you a sense of what it would be like to care for a real person in an emergency situation and help reduce any concerns or fears you may have about giving care. Your ability to perform specific skills competently will be checked by your instructor during the practice sessions.

Your ability to make appropriate decisions when faced with an emergency will be enhanced as you participate in the class activities. Periodically, you will be given situations in the form of scenarios that provide you the opportunity to apply the knowledge and skills you have learned. These scenarios also provide an opportunity to discuss with your instructor the many different situations that you may encounter in any emergency.

REQUIREMENTS FOR AMERICAN RED CROSS CERTIFICATION

By taking this course, you will be eligible for American Red Cross certification in Responding to Emergencies: First Aid/CPR/AED.

Red Cross certification means that on a particular date an instructor verified that a participant demonstrated competency in all required skills taught in the course. Competency is defined as being able to demonstrate correct decision-making, sequence care steps properly, and proficiently complete all required skills without any coaching or assistance.

To obtain certification, you must:

- Attend all class sessions.
- Participate in all course activities, including scenarios.
- Demonstrate competency in all required skills.
- Pass each final written exam with at least an 80% score.

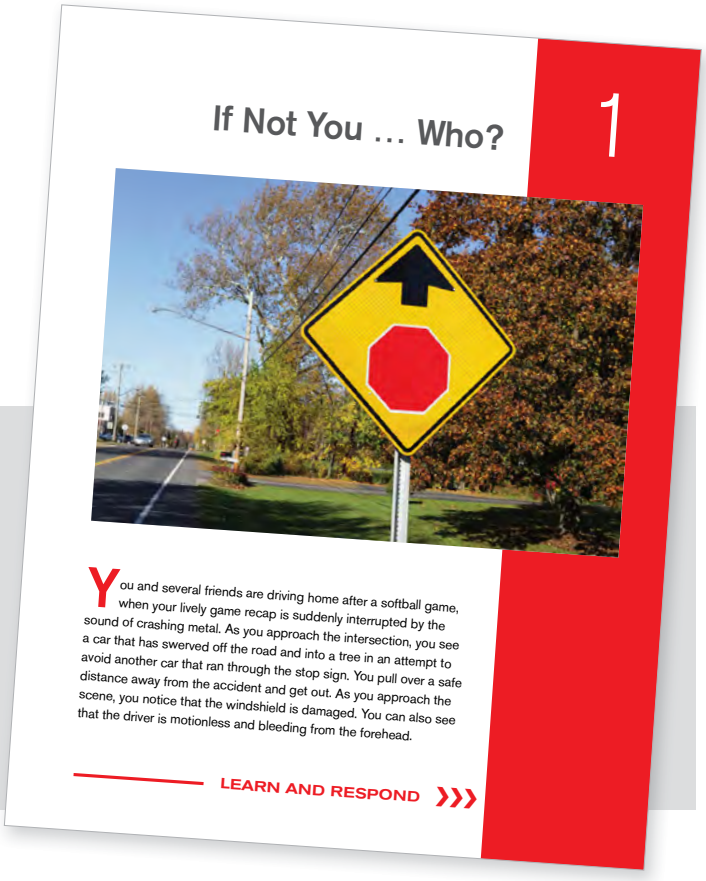
If this course is taught at a college or university, there may be additional academic requirements, such as graded quizzes and other assignments, in order to pass this course. Your instructor will explain these requirements to you.

HOW TO USE THIS TEXTBOOK

This textbook has been designed to facilitate your learning and understanding of the knowledge and skills required to effectively respond to emergency situations. The following pages graphically point out the features of this text so that you may use them to your best advantage.

Learn and Respond ▶

Every chapter opens with a brief scenario that presents an event involving some aspect of the chapter content. The story in *Learn and Respond* will be used to answer the application questions at the end of the chapter, entitled *Ready to Respond?*.


If Not You … Who?

1

You and several friends are driving home after a softball game, when your lively game recap is suddenly interrupted by the sound of crashing metal. As you approach the intersection, you see a car that has swerved off the road and into a tree in an attempt to avoid another car that ran through the stop sign. You pull over a safe distance away from the accident and get out. As you approach the scene, you notice that the windshield is damaged. You can also see that the driver is motionless and bleeding from the forehead.

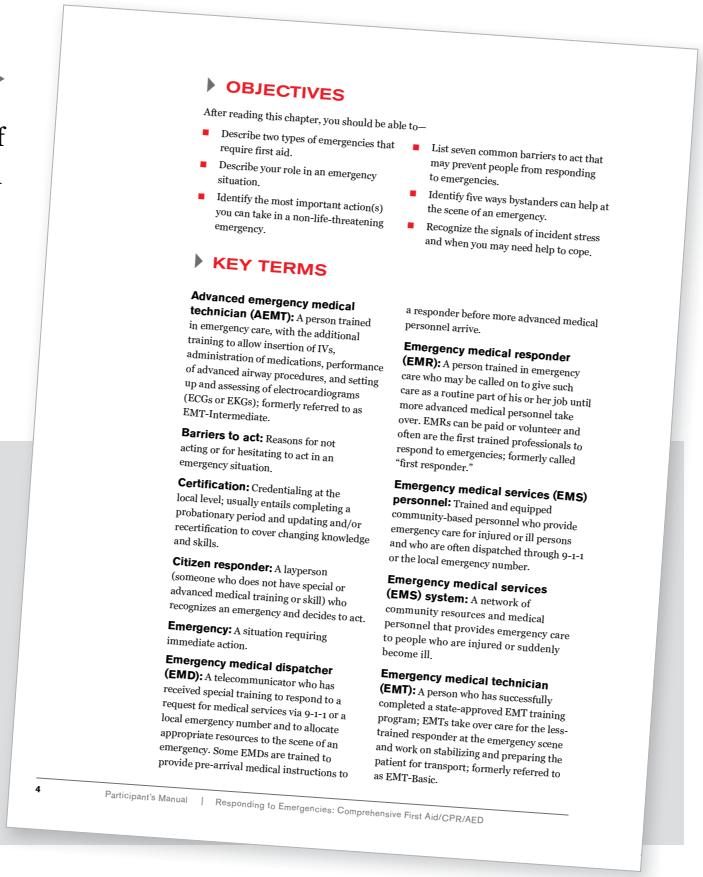
LEARN AND RESPOND ❯❯❯

Objectives

At the beginning of each chapter is a bulleted list of objectives. Each item describes something you should know or be able to do after reading the chapter and participating in class activities. Read this list carefully, and refer back to it as you read the chapter. These objectives form the basis for the testing and assessment that will determine your mastery of the material.

Key Terms

A list of key terms with their definitions also appears at the beginning of each chapter. You need to know these key terms and their meanings to understand the material in the chapters. These key terms are printed in ***boldface italics*** the first time they are explained in the chapter and also appear, defined, in the Glossary, located in the back of the textbook. Additional glossary terms appear in **boldface** within the chapter content.



OBJECTIVES

After reading this chapter, you should be able to—

- Describe two types of emergencies that require first aid.
- Describe your role in an emergency situation.
- Identify the most important action(s) you can take in a non-life-threatening emergency.
- List seven common barriers to act that may prevent people from responding to emergencies.
- Identify five ways bystanders can help at the scene of an emergency.
- Recognize the signals of incident stress and when you may need help to cope.

KEY TERMS

Advanced emergency medical technician (AEMT): A person trained in emergency care, with the additional training to allow insertion of IVs, administration of medications, performance of advanced airway procedures, and setting up and assessing of electrocardiograms (ECGs or EKGs); formerly referred to as EMT-Intermediate.

Barriers to act: Reasons for not acting or for hesitating to act in an emergency situation.

Certification: Credentialing at the local level; usually entails completing a probationary period and updating and/or recertification to cover changing knowledge and skills.

Citizen responder: A layperson (someone who does not have special or advanced medical training or skill) who recognizes an emergency and decides to act.

Emergency: A situation requiring immediate action.

Emergency medical dispatcher (EMD): A telecommunicator who has received special training to respond to a request for medical services via 9-1-1 or a local emergency number and to allocate appropriate resources to the scene of an emergency. Some EMDs are trained to provide pre-arrival medical instructions to a responder before more advanced medical personnel arrive.

Emergency medical responder (EMR): A person trained in emergency care who may be called on to give such care as a routine part of his or her job until more advanced medical personnel take over. EMRs can be paid or volunteer and often are the first trained professionals to respond to emergencies; formerly called "first responder."

Emergency medical services (EMS) personnel: Trained and equipped community-based personnel who provide emergency care for injured or ill persons and who are often dispatched through 9-1-1 or the local emergency number.

Emergency medical services (EMS) system: A network of community resources and medical personnel that provides emergency care to people who are injured or suddenly become ill.

Emergency medical technician (EMT): A person who has successfully completed a state-approved EMT training program; EMTs take over care for the less-trained responder at the emergency scene and work on stabilizing and preparing the patient for transport; formerly referred to as EMT-Basic.

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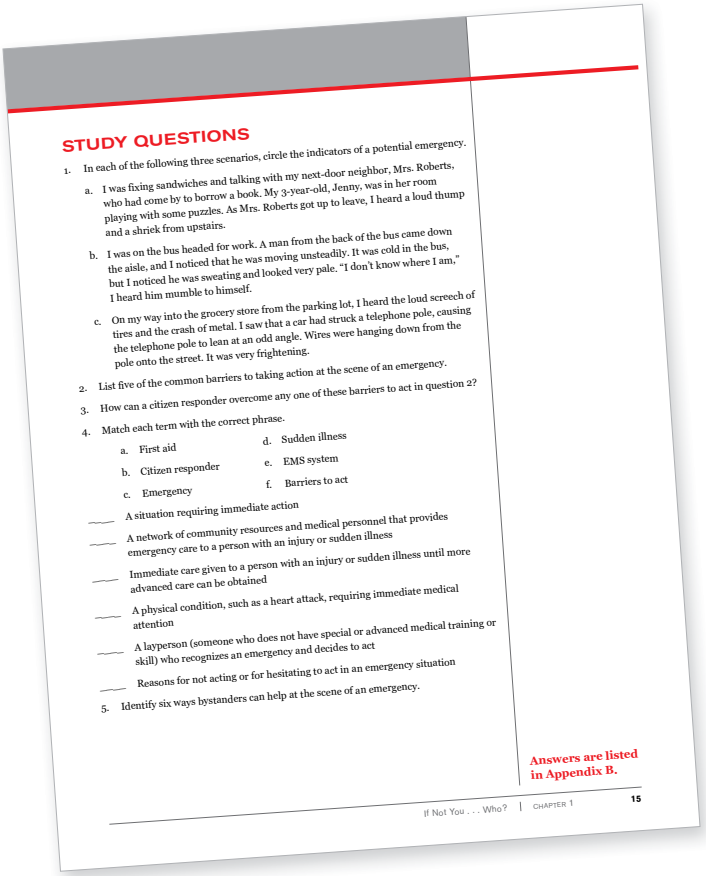


STUDY QUESTIONS

1. In each of the following three scenarios, circle the indicators of a potential emergency.
   a. I was fixing sandwiches and talking with my next-door neighbor, Mrs. Roberts, who had come by to borrow a book. My 3-year-old, Jenny, was in her room playing with some puzzles. As Mrs. Roberts got up to leave, I heard a loud thump and a shriek from upstairs.
   b. I was on the bus headed for work. A man from the back of the bus came down the aisle, and I noticed that he was moving unsteadily. It was cold in the bus, but I noticed he was sweating and looked very pale. "I don't know where I am," I heard him mumble to himself.
   c. On my way into the grocery store from the parking lot, I heard the loud screech of tires and the crash of metal. I saw that a car had struck a telephone pole, causing the telephone pole to lean at an odd angle. Wires were hanging down from the pole onto the street. It was very frightening.
2. List five of the common barriers to taking action at the scene of an emergency.
3. How can a citizen responder overcome any one of these barriers to act in question 2?
4. Match each term with the correct phrase.
   a. First aid
   b. Citizen responder
   c. Emergency
   d. Sudden illness
   e. EMS system
   f. Barriers to act

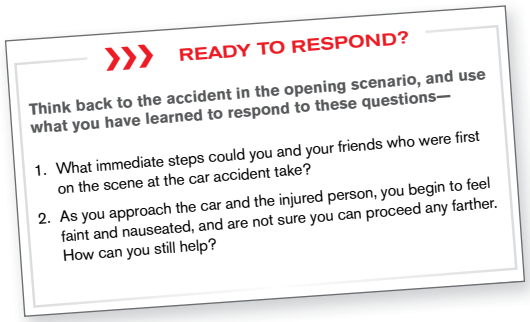
   ____ A situation requiring immediate action
   ____ A network of community resources and medical personnel that provides emergency care to a person with an injury or sudden illness
   ____ Immediate care given to a person with an injury or sudden illness until more advanced care can be obtained
   ____ A physical condition, such as a heart attack, requiring immediate medical attention
   ____ A layperson (someone who does not have special or advanced medical training or skill) who recognizes an emergency and decides to act
   ____ Reasons for not acting or for hesitating to act in an emergency situation
5. Identify six ways bystanders can help at the scene of an emergency.

Answers are listed in Appendix B.

If Not You . . . Who? | CHAPTER 1 15

Study Questions

At the end of each chapter are a series of study questions designed to test your retention and understanding of the chapter content and key terms. Completing these questions will help you determine how well you understand the material and also help you prepare for the final written exam. The answers to Study Questions are located in *Appendix B* of this text.


READY TO RESPOND?

Think back to the accident in the opening scenario, and use what you have learned to respond to these questions—

1. What immediate steps could you and your friends who were first on the scene at the car accident take?
2. As you approach the car and the injured person, you begin to feel faint and nauseated, and are not sure you can proceed any farther. How can you still help?

Ready to Respond?

This feature includes application questions to challenge you to apply the information you have learned in the chapter and build a solution. The questions are based on the *Learn and Respond* scenario that appears at the front of the chapter. Answers to these questions can be found in *Appendix B* of this text.

What If...?

This boxed feature appears throughout each chapter and offers answers to some of the questions that participants may have as they learn about how to react in an emergency, especially regarding unexpected situations that may arise as you give care, and information on how to deal with them.


What if...

I really don't know what is wrong with the person I am trying to help, or how serious his or her injury is?

Citizen responders decide not to act for many reasons; fear of not knowing what to do or of doing something wrong is normally at the top of the list. Rest assured, however, that regardless of your knowledge and skill level, you can always help by taking one simple but important step in an emergency: calling 9-1-1 or the local emergency number. After that, if you are uncomfortable with actually performing any emergency care, providing patient comfort and reassurance and controlling the scene would be the next best things you can do.


HONORING OUR HEROES: THE RED CROSS CERTIFICATE OF MERIT

The Certificate of Merit is the highest honor that the American Red Cross awards to citizens. The American Red Cross confers this certificate on individuals who are not part of the community's EMS system but who save or sustain a person's life with skills learned in an American Red Cross Health and Safety course.

Although the survival of the person is not a criterion for eligibility for the award, nominees must have performed every possible lifesaving skill prior to the person's receiving medical care. Sometimes team certificates are awarded. In such a case, each member of the team must contribute directly to the lifesaving act.

The Certificate of Merit program began in 1911 and was originally a cash award given annually to four railway workers who performed first aid. The next year, the Red Cross decided to recognize four individuals from the general public who demonstrated exemplary first aid skills. In 1915, water safety skills and rescues were included in the certificate criteria. From 1912 to 1925, the Red Cross gave cash awards to 66 individuals.

In 1928, the Red Cross reevaluated its cash award program. Because the cash awards could be given only to a few individuals a year and because the rescuers did not receive any lasting reminder of the award, the Red Cross decided to eliminate the cash award and institute the present-day Certificate of Merit. The certificate is signed by the President of the United States, who is also the honorary chairman of the Red Cross (a tradition begun in 1913 by William Howard Taft), and often awarded in a local ceremony. Over 12,000 individuals have received a Certificate of Merit since 1911.

What kinds of people receive the Certificate of Merit? A brief look at those individuals who were honored in previous years reveals that honorees come from all walks of life, are of all ages, from 4 to 76, and perform their lifesaving skills in a variety of different places and situations. A 15-year-old gives care to her father who suffers a stroke at home. A day care worker gives abdominal thrusts to a 5-year-old who is choking on food during lunch. A woman controls bleeding, cares for shock, and checks breathing and signs of life for a person stabbed at a gas station. During a water emergency, a man frees a companion from underneath an overturned canoe, splints the person's broken leg and gives care for hypothermia and shock.

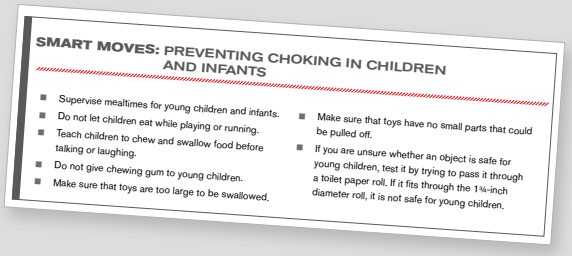
Perhaps the one common element in all these cases is that the rescuer provided lifesaving skills in an emotionally charged situation. These individuals demonstrate that life-sustaining first aid care can be rendered even when the emergency threatens the life of a loved one, a child or a badly injured stranger. A Red Cross training course can teach you the practical skills you need to help a person in danger and can equip you to handle an emergency even when you are frightened or feel panic.

Sidebars

Feature articles called sidebars enhance the information presented in the main body of the text. They present historical and current information and events that relate to the content of the chapter. You will not be tested on any information presented in these sidebars as part of the American Red Cross certification requirements.

Smart Moves Prevention Boxes

Applicable chapters include a boxed feature that outlines recommended preventive measures to avoid the injuries and/or illnesses discussed in the chapter.


SMART MOVES: PREVENTING CHOKING IN CHILDREN AND INFANTS

- Supervise mealtimes for young children and infants.
- Do not let children eat while playing or running.
- Teach children to chew and swallow food before talking or laughing.
- Do not give chewing gum to young children.
- Make sure that toys are too large to be swallowed.
- Make sure that toys have no small parts that could be pulled off.
- If you are unsure whether an object is safe for young children, test it by trying to pass it through a toilet paper roll. If it fits through the 1¾-inch diameter roll, it is not safe for young children.

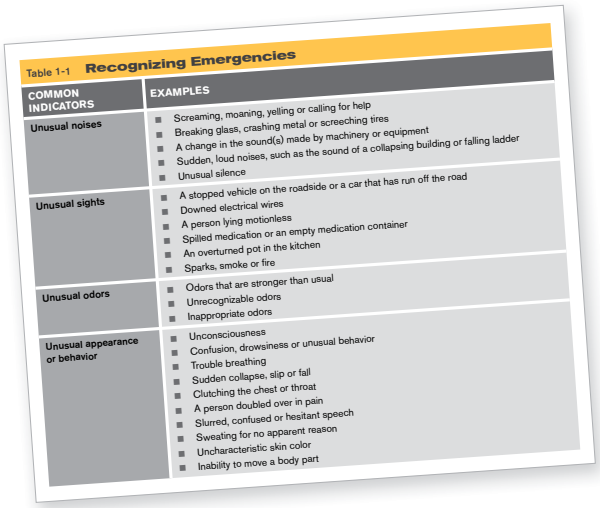


Table 1-1 **Recognizing Emergencies**

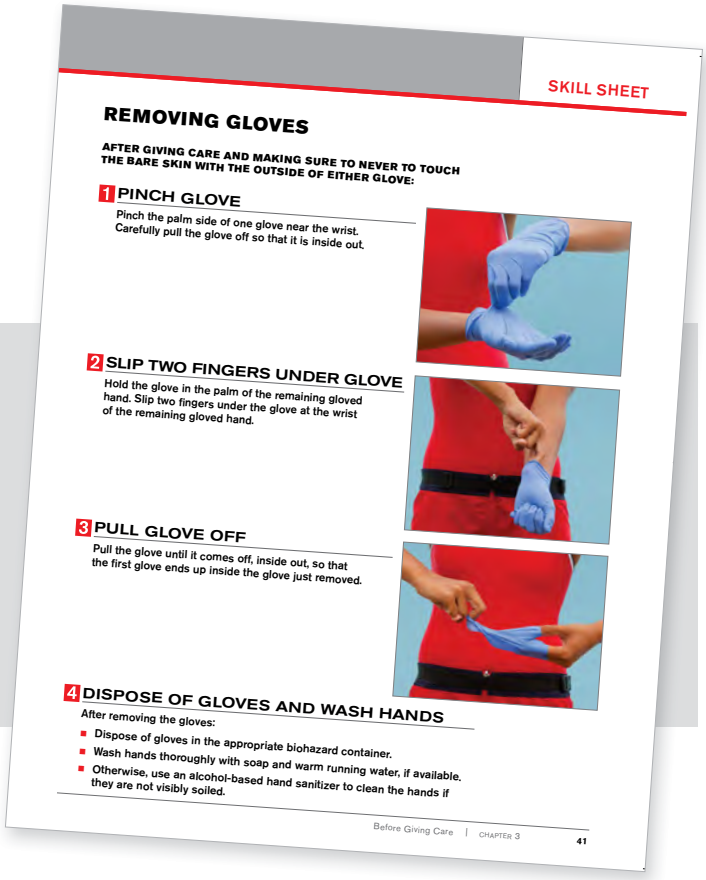
COMMON INDICATORS	EXAMPLES
Unusual noises	■ Screaming, moaning, yelling or calling for help ■ Breaking glass, crashing metal or screeching tires ■ A change in the sound(s) made by machinery or equipment ■ Sudden, loud noises, such as the sound of a collapsing building or falling ladder ■ Unusual silence
Unusual sights	■ A stopped vehicle on the roadside or a car that has run off the road ■ Downed electrical wires ■ A person lying motionless ■ Spilled medication or an empty medication container ■ An overturned pot in the kitchen ■ Sparks, smoke or fire
Unusual odors	■ Odors that are stronger than usual ■ Unrecognizable odors ■ Inappropriate odors
Unusual appearance or behavior	■ Unconsciousness ■ Confusion, drowsiness or unusual behavior ■ Trouble breathing ■ Sudden collapse, slip or fall ■ Clutching the chest or throat ■ A person doubled over in pain ■ Slurred, confused or hesitant speech ■ Sweating for no apparent reason ■ Uncharacteristic skin color ■ Inability to move a body part

◀ Tables

Tables are included in many chapters. They summarize key concepts and information and may aid in studying.

Skill Sheets ▶

At the end of certain chapters, Skill Sheets are available to give step-by-step directions for performing specific skills. Learning specific skills that you will need to give appropriate care for a person with an injury or sudden illness is an important part of this course. Photographs enhance each skill sheet.



SKILL SHEET

REMOVING GLOVES

AFTER GIVING CARE AND MAKING SURE TO NEVER TO TOUCH THE BARE SKIN WITH THE OUTSIDE OF EITHER GLOVE:

1 PINCH GLOVE

Pinch the palm side of one glove near the wrist. Carefully pull the glove off so that it is inside out.

2 SLIP TWO FINGERS UNDER GLOVE

Hold the glove in the palm of the remaining gloved hand. Slip two fingers under the glove at the wrist of the remaining gloved hand.

3 PULL GLOVE OFF

Pull the glove until it comes off, inside out, so that the first glove ends up inside the glove just removed.

4 DISPOSE OF GLOVES AND WASH HANDS

After removing the gloves:

- Dispose of gloves in the appropriate biohazard container.
- Wash hands thoroughly with soap and warm running water, if available.
- Otherwise, use an alcohol-based hand sanitizer to clean the hands if they are not visibly soiled.

Before Giving Care | CHAPTER 3 41

FIVE STEPS TO SUCCESS: STUDY TIPS WHILE USING THIS TEXTBOOK

You should complete the following five steps for each chapter to gain the most from this text while studying from it:

1. Read the chapter *Objectives* before reading the chapter.
2. As you read the chapter, keep the *Objectives* in mind. When you finish, go back and review them. Check to see that you can meet them without difficulty.
3. Review figures and illustrations. Read captions and labels.
4. Answer the *Ready to Respond?* questions at the end of each chapter. Check your answers with those in *Appendix B*. If you cannot answer or do not understand the answers given, ask your instructor to help you with concepts or questions with which you are having difficulty.
5. Answer the *Study Questions* at the end of each chapter. Mark or write your answers in the text to facilitate your review or study. Answer as many questions as you can without referring to the chapter. Then review the information covering any questions you were unable to answer, and try them again. Check your responses to the questions with the answers in *Appendix B*. If you have not answered a question appropriately, reread that part of the chapter to ensure that you understand why the answer is correct. This exercise will help you gauge how much information you are retaining and which areas you need to review. If, after rereading that part of the chapter, you still do not understand, ask your instructor to help you.

Health Precautions and Guidelines During Training

The American Red Cross has trained millions of people in first aid, CPR and AED using manikins as training aids. The Red Cross follows widely accepted guidelines for cleaning and decontaminating training manikins. If these guidelines are adhered to, the risk of any kind of disease transmission during training is extremely low.

To help minimize the risk of disease transmission, you should follow some basic health precautions and guidelines while participating in training. You should take additional precautions if you have a condition that would increase your risk or other participants' risk of exposure to infections. Request a separate training manikin if you:

- Have an acute condition, such as a cold, sore throat or cuts or sores on your hands or around your mouth.
- Know that you are seropositive (have had a positive blood test) for hepatitis B surface antigen (HBsAg), which indicates that you are currently infected with the hepatitis B virus.*
- Know that you have a chronic infection as indicated by long-term seropositivity (long-term positive blood tests) for HBsAg* or a positive blood test for anti-HIV, that is, a positive test for antibodies to human immunodeficiency virus (HIV), the virus that causes many severe infections, including acquired immunodeficiency syndrome (AIDS).
- Have had a positive blood test for hepatitis C virus.
- Have a type of condition that makes you extremely likely to get an infection.

To obtain information about testing for individual health status, go to the Centers for Disease Control and Prevention website (cdc.gov).

After a person has had an acute hepatitis B infection, he or she will no longer test positive for HBsAg but will test positive for the hepatitis B antibody (anti-HBs). People who have been vaccinated against hepatitis B will also test positive for anti-HBs. A positive test for anti-HBs should not be confused with a positive test for HBsAg.

If you decide that you should have your own manikin, ask your instructor if he or she can provide one for you. You will not be asked to explain why you make this request. The manikin will not be used by anyone else until it has been cleaned according to the recommended end-of-class decontamination procedures. Because the number of manikins available for class use is limited, the more advance notice you give, the more likely it is that you can be provided a separate manikin.

*People with hepatitis B infection will test positive for HBsAg. Most people infected with hepatitis B virus will get better in time. However, some hepatitis B infections will become chronic and linger for much longer. People with these chronic infections will continue to test positive for HBsAg. Their decision to participate in CPR training should be guided by their physician.

GUIDELINES

In addition to taking the precautions regarding manikins, you can protect yourself and other participants from infection by following these guidelines:

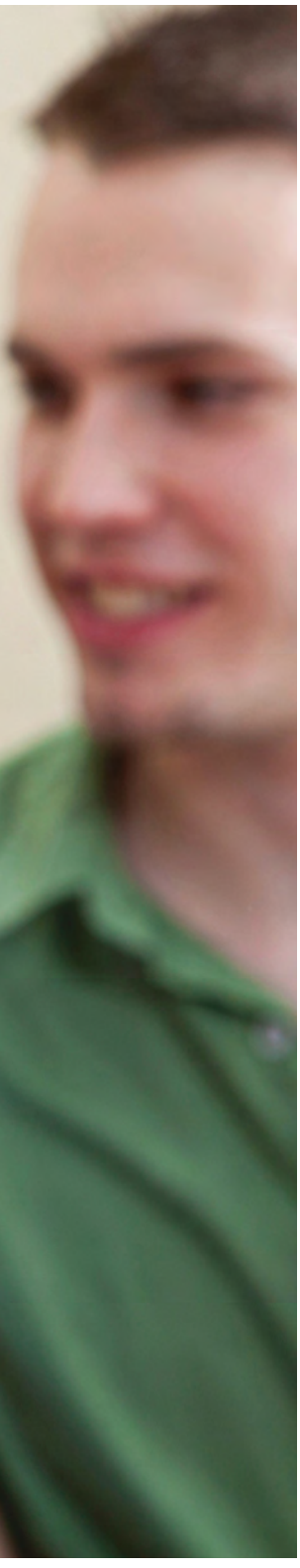
- Wash your hands thoroughly before participating in class activities.
- Do not eat, drink, use tobacco products or chew gum during class when manikins are used.
- Clean the manikin properly before use.
- For some manikins, cleaning properly means vigorously wiping the manikin's face and the inside of its mouth with a clean gauze pad soaked with either a fresh solution of liquid chlorine bleach and water (¼ cup of sodium hypochlorite per gallon of tap water) or rubbing alcohol. The surfaces should remain wet for at least 1 minute before they are wiped dry with a second piece of clean, absorbent material.
- For other manikins, cleaning properly means changing the manikin's face. Your instructor will provide you with instructions for cleaning the type of manikin used in your class.
- Follow the guidelines provided by your instructor when practicing skills such as clearing a blocked airway with your finger.

PHYSICAL STRESS AND INJURY

Successful course completion requires full participation in classroom and skill sessions, as well as successful performance during skill and knowledge evaluations. Because of the nature of the skills in this course, you will participate in strenuous activities, such as performing CPR on the floor. If you have a medical condition or disability that will prevent you from taking part in the skill practice sessions, please tell your instructor so that accommodations can be made.

If you are unable to participate fully in the course, you may audit the course and participate as much as you can or desire but you will not be evaluated. To participate in the course in this way, you must tell the instructor before training begins. Be aware that you will not be eligible to receive a course completion certificate.

Responding to Emergencies: Comprehensive First Aid/CPR/AED



Part One

Introduction

1

If Not You … Who?

You and several friends are driving home after a softball game, when your lively game recap is suddenly interrupted by the sound of crashing metal. As you approach the intersection, you see a car that has swerved off the road and into a tree in an attempt to avoid another car that ran through the stop sign. You pull over a safe distance away from the accident and get out. As you approach the scene, you notice that the windshield is damaged. You can also see that the driver is motionless and bleeding from the forehead.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Describe two types of emergencies that require first aid.
- Describe your role in an emergency situation.
- Identify the most important action(s) you can take in an emergency.
- List seven common barriers to act that may prevent people from responding to emergencies.
- Identify five ways bystanders can help at the scene of an emergency.
- Recognize the signals of incident stress and when you may need help to cope.

KEY TERMS

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Emergency medical services (EMS) personnel: Trained and equipped community-based personnel who provide emergency care for injured or ill persons and who are often dispatched through 9-1-1 or the local emergency number.

Emergency medical services (EMS) system: A network of community resources and medical personnel that provides emergency care to people who are injured or suddenly become ill.

Emergency medical technician (EMT): A person who has successfully completed a state-approved EMT training program; EMTs take over care for the less-trained responder at the emergency scene, and work on stabilizing and preparing the patient for transport; formerly referred to as EMT-Basic.

First aid: Immediate care given to a person with an injury or sudden illness until more advanced care can be obtained.

Good Samaritan laws: Laws that protect people who willingly give first aid without accepting anything in return.

Injury: Damage that occurs when the body is subjected to an external force, such as a blow, a fall, a collision, an electrical current or temperature extremes.

Life-threatening emergency: An illness or injury that impairs a person's ability to circulate oxygenated blood to all the parts of his or her body.

Non-life-threatening emergency: A situation that does not have an immediate impact on a person's ability to circulate oxygenated blood but still requires medical attention.

Paramedic: A person with more in-depth training than an AEMT; paramedics can perform all of the duties of an AEMT plus have more knowledge about more invasive procedures than any other prehospital care provider; formerly referred to as EMT-Paramedic.

Prehospital care: Emergency medical care provided before a person arrives at a hospital or medical facility.

Sudden illness: A physical condition requiring immediate medical attention.

INTRODUCTION

An ***emergency*** is a situation requiring immediate action. An emergency can happen at any place (on the road, in your home, where you work), to anyone (a friend, relative, stranger) and at any time. This text provides you with basic ***first aid*** information and skills so that you will recognize and respond to any emergency appropriately by knowing how to give care to a person with an injury or sudden illness until more advanced care can be obtained. Your decision to act and the care provided may help save a life.

TYPES OF EMERGENCIES

There are two types of emergencies that require first aid: injury and sudden illness (usually referred to simply as illness). An ***injury*** is damage to the body from an external force, such as a broken bone from a fall. A ***sudden illness*** is a physical condition that requires immediate medical attention. Examples of sudden illness include a heart attack and a severe allergic reaction.

Emergencies can be further categorized as life-threatening and non-life-threatening. A ***life-threatening emergency*** is an illness or injury that impairs a person's ability to circulate oxygenated blood to all parts of his or her body. A ***non-life-threatening emergency*** is a situation that does not have an immediate impact on a person's ability to circulate oxygenated blood but still requires medical attention. You will learn more about caring for life-threatening and non-life-threatening emergencies as you progress through this text.

YOUR ROLE IN AN EMERGENCY

The ***emergency medical services (EMS) system*** is a network of community resources and medical personnel that provides emergency care to people who have been injured or are experiencing sudden illness. Think of the EMS system as a chain made up of several links. Each link depends on the others for success. Without the involvement of ***lay***

responders such as you, the EMS system cannot function effectively. As a lay responder, your primary role in an emergency includes:

- Recognizing that an emergency exists.
- Deciding to act.
- Activating the EMS system by calling 9-1-1 or the local emergency number.
- Giving care until medical help arrives and takes over.

In the first few minutes of an emergency, a lay responder trained in first aid can provide help that can save a life or make the difference between a complete recovery and permanent disability. See "The EMS System" below for an overview of the roles played by professionals in responding to an emergency.

THE EMS SYSTEM

Emergency Medical Services Dispatcher

EMS call takers, also known as ***emergency medical dispatchers (EMDs)***, work in emergency communications centers. When 9-1-1 is dialed, an EMD receives the call and quickly determines what help is needed. He or she then dispatches the appropriate ***emergency medical services (EMS) personnel***. EMS personnel include the four nationally recognized levels of training in ***prehospital care***: emergency medical responders, emergency medical technicians, advanced emergency medical technicians and paramedics. An increasing number of dispatchers are trained EMDs and can provide instructions on how to help until EMS personnel arrive.

Emergency Medical Responder

The first of four nationally recognized levels of training for prehospital care is the ***emergency medical responder (EMR)***. EMRs have the basic knowledge and skills needed to provide emergency care to people who are injured or who have become ill. They are certified to provide care until a more highly trained professional—such as an EMT—arrives. This level of training used to be called *first responder*.

Emergency Medical Technician

Emergency medical technicians (EMTs) have the next highest level of training. Their ***certification*** involves a minimum of 110 hours of training. EMTs take over the care from the responder who is initially at the emergency scene, and work on stabilizing and preparing the patient for transport. This level of training used to be called *EMT-Basic*.

Advanced Emergency Medical Technician

Advanced emergency medical technicians (AEMTs) receive more training than EMTs, which allows them to insert IVs, administer medication, perform advanced airway procedures, and set up and assess electrocardiograms (ECGs or EKGs). This level of care used to be called *EMT-Intermediate*.

Paramedic

Paramedics have more in-depth training than AEMTs, including more knowledge about performing physical exams. They may also perform more invasive procedures than any other prehospital care provider. This level of care used to be called *EMT-Paramedic*.

Recognizing an Emergency

The ability to recognize that an emergency has occurred is the first step toward taking appropriate action. You may become aware of an emergency from certain indicators, including:

- Unusual noises.
- Unusual sights.
- Unusual odors.
- Unusual appearances or behaviors.

Table 1-1 provides examples for each of these indicators. See also **Figure 1-1**.

Always put your own safety first if you smell an unusual or very strong odor because many fumes are poisonous. An unusual odor on a person's breath may also be a clue to an emergency situation. A person experiencing a diabetic emergency, for example, may have a sweet breath odor that can be mistaken for the smell of alcohol. You will learn about diabetic emergencies in Chapter 15.

It may also be difficult to tell if someone's appearance or behavior is unusual, particularly if he or she is a stranger. If you see someone collapse to the floor, he or she obviously

Table 1-1 Recognizing Emergencies

COMMON INDICATORS	EXAMPLES
Unusual noises	■ Screaming, moaning, yelling or calling for help ■ Breaking glass, crashing metal or screeching tires ■ A change in the sound(s) made by machinery or equipment ■ Sudden, loud noises, such as the sound of a collapsing building or falling ladder ■ Unusual silence
Unusual sights	■ A stopped vehicle on the roadside or a car that has run off the road ■ Downed electrical wires ■ A person lying motionless ■ Spilled medication or an empty medication container ■ An overturned pot in the kitchen ■ Sparks, smoke or fire
Unusual odors	■ Odors that are stronger than usual ■ Unrecognizable odors ■ Inappropriate odors
Unusual appearance or behavior	■ Unconsciousness ■ Confusion, drowsiness or unusual behavior ■ Trouble breathing ■ Sudden collapse, slip or fall ■ Clutching the chest or throat ■ A person doubled over in pain ■ Slurred, confused or hesitant speech ■ Sweating for no apparent reason ■ Uncharacteristic skin color ■ Inability to move a body part

FIGURE 1-1 *Unusual sounds, sights or behaviors are some of the indicators of an emergency.*

requires your immediate attention. You will not know if your help is needed until you approach the person. He or she may merely have slipped and may not need your immediate help. On the other hand, the person may be unconscious and need immediate medical assistance.

Deciding to Act

Once you recognize that an emergency has occurred, you must decide how to help and what to do. There are many ways you can help in an emergency, but in order to help, you must act.

Overcoming Barriers to Act

Sometimes people simply do not recognize that an emergency has occurred. At other times, people recognize an emergency but are reluctant to act. People have various reasons for hesitating or not acting. These reasons, called ***barriers to act***, are based on feelings that are personal and real. Common reasons people give for not acting include:

- Panic or fear of doing something wrong.
- Being unsure of the person's condition and what to do.
- Assuming someone else will take action.
- The type of injury or illness.
- Fear of disease.
- Fear of being sued.
- Being unsure of when to call 9-1-1 or the local emergency number.

Thinking about these barriers and mentally preparing yourself to overcome them will help you respond more confidently when an actual emergency occurs.

Panic or Fear of Doing Something Wrong

The reactions of people during an emergency vary. Some people are afraid of doing the wrong thing and making matters worse. Sometimes people simply panic. Knowing what to do in an emergency can instill confidence that can help you to avoid panic and be able to give the right care. If you are not sure what to do during an emergency, immediately call 9-1-1 or the local emergency number and follow the instructions of the emergency medical dispatcher (EMD). The worst thing to do in an emergency is nothing.

Being Unsure of the Person's Condition and What to Do

Because most emergencies happen in or near the home, you are more likely to find yourself giving care to a family member or a friend than to a stranger. However, you may be faced with an emergency situation involving a stranger, and you might feel uneasy about helping someone whom you do not know. For example, the person may be much older or much younger than you, be of a different gender or race, have a disabling condition, be of a different status at work or be the victim of a crime.

Sometimes, people who have been injured or become suddenly ill may act strangely or be uncooperative. The injury or illness, stress or other factors, such as the effects of illicit drugs,

alcohol or medications, may make people unpleasant or angry and difficult to deal with. Do not take this behavior personally. If you feel at all threatened by the person's behavior, leave the immediate area and call 9-1-1 or the local emergency number for help.

Assuming Someone Else Will Take Action

If several people are standing around, it might not be easy to tell if anyone is giving care. Always ask if you can help. Just because there is a crowd does not mean someone is caring for the injured or ill person. In fact, you may be the only one on the scene who knows first aid.

Although you may feel embarrassed about coming forward in front of other people, this should not stop you from offering help. Someone has to take action in an emergency, and it may have to be you.

What if...

I really don't know what is wrong with the person I am trying to help, or how serious his or her injury is?

Lay responders decide not to act for many reasons; fear of not knowing what to do or of doing something wrong is normally at the top of the list. Rest assured, however, that regardless of your knowledge and skill level, you can always help by taking one simple but important step in an emergency: calling 9-1-1 or the local emergency number. After that, if you are uncomfortable with actually performing any emergency care, providing comfort and reassurance and controlling the scene would be the next best things you can do.

If others already are giving care, ask if you can help. If bystanders do not appear to be helping, tell them how to help **(Figure 1-2)**. You can ask them to call 9-1-1 or the local emergency number, meet the ambulance and direct it to your location, keep the area free of onlookers and traffic, send them for blankets or other supplies such as a first aid kit or an automated external defibrillator (AED), or help to give care.

Type of Injury or Illness

An injury or illness sometimes may be very unpleasant. Blood, vomit, unpleasant odors, deformed limbs, or torn or burned skin can be very upsetting. You may have to turn away for a moment and take a few deep breaths before giving care. If you still are unable to give care, you can help in other ways, such as volunteering to call 9-1-1 or the local emergency number.

Fear of Catching a Disease

Many people worry about the possibility of being infected with a disease while giving care. Although it is possible for diseases to be transmitted in a first aid situation, it is extremely unlikely that you will catch a disease this way. In Chapter 3, you will learn how to take steps, such as hand washing and using protective barriers, to prevent disease transmission.

Fear of Being Sued

Sometimes people worry that they might be sued for giving care. In fact, lawsuits against people who give emergency care at a scene of an accident are highly unusual and rarely successful. The vast majority of states and the District of Columbia have ***Good Samaritan laws*** that protect people who willingly give first aid without accepting anything in return. More information on Good Samaritan laws can be found in Chapter 3.

Being Unsure When to Call 9-1-1

People sometimes are afraid to call 9-1-1 or the local emergency number because they are not sure that the situation is a real emergency and do not want to waste the time of EMS personnel.

FIGURE 1-2 *A bystander can help you respond to an emergency in many ways.*

What if...

I mistakenly call 9-1-1 or the local emergency number from a landline phone?

First, some background. There are two types of 9-1-1 systems—basic and enhanced. The basic 9-1-1 system automatically routes your emergency call to the Public Safety Answering Point (PSAP) that handles the area where the phone is located. An enhanced 9-1-1 system (E9-1-1) goes a step further by also automatically displaying the telephone number, address and name in which the phone is listed. In either case if you were to dial 9-1-1 accidentally—do not hang up! Instead, explain to the dispatcher what happened. In the case of a call coming in on an E9-1-1 line, if you were to hang up before speaking with the call taker, it would trigger an automatic call back. If the dispatcher was unable to reach anyone, appropriate personnel would be sent to investigate the situation, potentially tying up valuable resources.

What if...

I only have a cell phone or Voice-Over Internet Protocol (VOIP) program at home, and not a landline? Will I still have access to 9-1-1?

The answer depends on your provider and, sometimes, your geographical location. According to the Federal Communications Commission (FCC), the governmental agency responsible for regulating communications, although "wireless phones can be an important public safety tool, they also create unique challenges … Since wireless phones are mobile, they are not associated with one fixed location or address … while the cell site closest to the 9-1-1 caller may provide a general indication of the caller's location, that information is not usually specific enough for rescue personnel to deliver assistance to the caller quickly." That is changing though. The FCC now requires wireless carriers to provide 9-1-1 and E9-1-1 capability where a PSAP requests it. Once implemented fully, wireless E9-1-1 will provide an accurate location for 9-1-1 calls from wireless phones. In the meantime, the FCC suggests that when you replace your handset, ask about its E9-1-1 capabilities. In the case of VOIP, you should ask your provider about both basic and enhanced 9-1-1 capabilities, as these are constantly being upgraded. Finally, if you do need to call 9-1-1, remember not to hang up until you are sure the dispatcher has all of the information necessary to send help to exactly where it is needed.

Your decision to act in an emergency should be guided by your own values and by your knowledge of the risks that may be present. However, even if you decide not to give care, you should at least call 9-1-1 or the local emergency number to get emergency medical help to the scene if it is warranted.

Activating the EMS System

Calling 9-1-1 or the local emergency number is the most important action you and other lay responders can take in an emergency. Early arrival of EMS personnel increases the person's chances of surviving a life-threatening emergency. Remember, some facilities, such as hotels, office and university buildings and some stores, require you to dial a 9 or some other number to get an outside line before you dial 9-1-1 (e.g., 9-9-1-1). There are also a few areas that still are without access to a 9-1-1 system and use either a 7- or 10-digit local emergency number instead. Becoming familiar with your local system is important so you are ready when an emergency occurs.

When you dial 9-1-1 or the local emergency number, your call will normally be answered by an EMD. An EMD has special training in dealing with crises over the phone and providing pre-arrival medical instructions. The EMD will ask you for a phone number and address of the emergency and will ask other key questions to determine whether you need police, fire or EMS assistance.

The information you provide helps the EMD to send the type of help needed based on the severity of the emergency. You should not hang up until directed by the EMD. Once EMS personnel are on the way, the EMD may stay on the line and continue to talk with you to give first aid instructions so he or she can assist you with life-saving techniques until EMS personnel take over **(Figure 1-3)**.

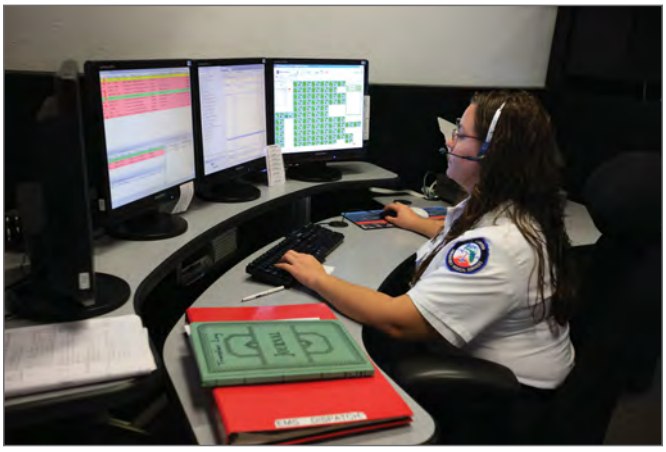

FIGURE 1-3 *Many EMDs give instructions to lay responders for what to do before EMS personnel arrive.*

Giving Care Until Help Arrives

There are many actions you, other lay responders or bystanders can take before EMS personnel arrive. Always follow the pre-arrival instructions provided by the EMD. These instructions may range from taking actions that make the scene safer and more accessible to EMS personnel (confining household pets, turning on extra lights, gathering the person's medications) to giving care. You will learn to give more advanced care for an ill or injured person as you progress through this course.

In general, you should give appropriate care to an injured or ill person until one or more of the following occurs:

- You are giving CPR and see an obvious sign of life, such as breathing.
- Another trained responder or EMS personnel take over.
- You are too exhausted to continue.
- The scene becomes unsafe.
- The person you are helping is conscious and competent and asks you to stop giving care.

INCIDENT STRESS

After responding to an emergency involving a serious injury, illness or death, it is not unusual to experience acute stress. Sometimes, people who have given first aid or performed CPR in these situations feel that they are unable to cope with the stress. This feeling is known as incident stress. If not appropriately managed, this acute stress may lead to a serious condition called post-traumatic stress disorder.

Signals of Incident Stress Reactions

Some effects may appear right away, whereas others may take longer to develop. Signals of incident stress include:

- Anxiousness and inability to sleep.
- Nightmares.
- Restlessness and other problems.
- Confusion.
- Lower attention span.
- Poor concentration.
- Denial.
- Guilt.
- Depression.
- Anger.
- Nausea.
- Change in interactions with others.
- Increased or decreased eating.
- Uncharacteristic, excessive humor or silence.
- Unusual behavior.
- Difficulty performing one's job.

Coping with Incident Stress

Incident stress may require professional help to prevent post-traumatic stress from developing. Other things that you may do to help reduce stress include using relaxation techniques, eating a balanced diet, avoiding alcohol and drugs, getting enough rest and participating in some type of physical exercise or activity.

PREPARING FOR AN EMERGENCY

If you are prepared for emergencies, you can help ensure that care begins as soon as possible—for yourself, your family and your fellow citizens. Steps you can take in preparing for an emergency include becoming trained in first aid and making or purchasing a first aid kit.

First aid training provides you with both the knowledge and skills necessary to respond confidently to emergency situations. Your training will give you a basic plan of action to use in any emergency. You will be better able to manage your fears and overcome barriers to act by knowing what to do. Your training will enable you to respond more effectively in your role as a lay responder.

You can be ready for most emergencies if you do the following things now:

- Keep important information about you and your family or household in a handy place, such as on the refrigerator door and in your automobile glove compartment. Include your address, everyone's date of birth, medical conditions, allergies, and prescriptions and dosages. List everyone's physicians' names and phone numbers.
- Keep medical and insurance records up to date and in a secure location.
- Find out if your community is served by the 9-1-1 system. If not, look up the local emergency number for police, fire, EMS services and poison control (National Poison Control Center, 1-800-222-1222). These numbers are usually listed in the front of the telephone book.
- Teach children how to call for help as soon as they are old enough to use the telephone.
- Keep emergency telephone numbers listed in a handy place, such as by the telephone and in your first aid kit. Include the home and office phone numbers of family members, friends or neighbors who can help. Be sure to keep both the list and the telephone numbers current.
- Keep a first aid kit readily available in your home, automobile, workplace and recreation area **(Figure 1-4)**. Store each kit in a dry place, and replace used and expired contents regularly. A first aid kit for a family of four should contain the following items, as well as items based on past experiences and situations and individual needs:
  - 2 absorbent compress dressings (5 × 9 inches)
  - 25 adhesive bandages (assorted sizes)

FIGURE 1-4 *It is important to keep a well-stocked first aid kit in your home, automobile, workplace and recreation area.*

- 1 adhesive cloth tape (3/8 inch × 2.5 yards)
- 5 antibiotic ointment packets (approximately 1 gram each)
- 1 bottle hand sanitizer
- 2 packets of 2 chewable aspirin (81 mg each)
- 1 blanket (space blanket)
- 1 CPR breathing barrier (with one-way valve)
- 1 instant cold compress
- 2 pairs of nonlatex gloves (size: large)
- 2 hydrocortisone ointment packets (approximately 1 gram each)
- Scissors
- 4 roller bandages (3 inches wide × 4 yards)
- 4 roller bandages (4 inches wide × 4 yards)
- 1 elastic bandage (3 × 5 yards or 4 × 5 yards)
- 1 malleable splint
- 8 sterile gauze pads (3 × 3 inches)
- 8 sterile gauze pads (4 × 4 inches)
- Oral thermometer (nonmercury/nonglass)
- 4 triangular bandages
- Tweezers
- 2 storage bags (1 quart and 1 gallon)
- Oral glucose tablets for diabetic emergency
- First aid instruction booklet

- Learn first aid and CPR skills, and practice regularly.
- Make sure your house or apartment number is easy to read. Numerals are easier to read than spelled-out numbers. Report any downed or missing street signs to the proper authorities.
- Wear a medical ID bracelet if you have a potentially serious medical condition, such as epilepsy, diabetes, heart disease or allergies.

SUMMARY

An emergency can happen at any place, to anyone and at any time. The EMS system is a network of community resources and medical personnel that provides emergency care to victims of injury or sudden illness. However, the EMS system cannot function properly without the actions of a trained lay responder like you. By learning to recognize an emergency and, more importantly, deciding to act (calling 9-1-1 or the local emergency number and giving care), you can help save the life of a person with an injury or sudden illness. Once you have taken care of the injured or ill person, remember to also consider your own feelings about the emergency situation and take signals of incident stress seriously if any are present.

In the following chapters, you will learn how to manage different kinds of emergencies. You will learn emergency action steps that you can apply to any emergency situation, and how to give care in both life-threatening and non-life-threatening situations.

HONORING OUR HEROES: THE RED CROSS CERTIFICATE OF MERIT

The Certificate of Merit is the highest honor that the American Red Cross awards to citizens. The American Red Cross confers this certificate on individuals who are not part of the community's EMS system, but who save or sustain a person's life with skills learned in an American Red Cross Health and Safety course.

Although the survival of the person is not a criterion for eligibility for the award, nominees must have performed every possible lifesaving skill prior to the person's receiving medical care. Sometimes team certificates are awarded. In such a case, each member of the team must contribute directly to the lifesaving act.

The Certificate of Merit program began in 1911 and was originally a cash award given annually to four railway workers who performed first aid. The next year, the Red Cross decided to recognize four individuals from the general public who demonstrated exemplary first aid skills. In 1915, water safety skills and rescues were included in the certificate criteria. From 1912 to 1925, the Red Cross gave cash awards to 66 individuals.

In 1928, the Red Cross reevaluated its cash award program. Because the cash awards could be given only to a few individuals a year and because the rescuers did not receive any lasting reminder of the award, the Red Cross decided to eliminate the cash award and institute the present-day Certificate of Merit. The certificate is signed by the President of the United States, who is also the honorary chairman of the Red Cross (a tradition begun in 1913 by William Howard Taft), and often awarded in a local ceremony. Over 12,000 individuals have received a Certificate of Merit since 1911.

What kinds of people receive the Certificate of Merit? A brief look at those individuals who were honored in previous years reveals that honorees come from all walks of life, are of all ages, from 4 to 76, and perform their lifesaving skills in a variety of different places and situations. A 15-year-old gives care to her father who suffers a stroke at home. A day care worker gives abdominal thrusts to a 5-year-old who is choking on food during lunch. A woman controls bleeding, cares for shock, and checks breathing and signs of life for a person stabbed at a gas station. During a water emergency, a man frees a companion from underneath an overturned canoe, splints the person's broken leg, and gives care for hypothermia and shock.

Perhaps the one common element in all these cases is that the rescuer provided lifesaving skills in an emotionally charged situation. These individuals demonstrate that life-sustaining first aid care can be rendered even when the emergency threatens the life of a loved one, a child or a badly injured stranger. A Red Cross training course can teach you the practical skills you need to help a person in danger and can equip you to handle an emergency even when you are frightened or feel panic.

READY TO RESPOND?

Think back to the accident in the opening scenario, and use what you have learned to respond to these questions—

1. What immediate steps could you and your friends who were first on the scene at the car accident take?
2. As you approach the car and the injured person, you begin to feel faint and nauseated, and are not sure you can proceed any farther. How can you still help?

STUDY QUESTIONS

1. In each of the following three scenarios, circle the indicators of a potential emergency.

   a. I was fixing sandwiches and talking with my next-door neighbor, Mrs. Roberts, who had come by to borrow a book. My 3-year-old, Jenny, was in her room playing with some puzzles. As Mrs. Roberts got up to leave, I heard a loud thump and a shriek from upstairs.

   b. I was on the bus headed for work. A man from the back of the bus came down the aisle, and I noticed that he was moving unsteadily. It was cold in the bus, but I noticed he was sweating and looked very pale. "I don't know where I am," I heard him mumble to himself.

   c. On my way into the grocery store from the parking lot, I heard the loud screech of tires and the crash of metal. I saw that a car had struck a telephone pole, causing the telephone pole to lean at an odd angle. Wires were hanging down from the pole onto the street. It was very frightening.

2. List five of the common barriers to taking action at the scene of an emergency.

3. How can a lay responder overcome any one of these barriers to act in question 2?

4. Match each term with the correct phrase.

   a. First aid
   b. Lay responder
   c. Emergency
   d. Sudden illness
   e. EMS system
   f. Barriers to act

_____ A situation requiring immediate action

_____ A network of community resources and medical personnel that provides emergency care to a person with an injury or sudden illness

_____ Immediate care given to a person with an injury or sudden illness until more advanced care can be obtained

_____ A physical condition, such as a heart attack, requiring immediate medical attention

_____ A layperson (someone who does not have special or advanced medical training or skill) who recognizes an emergency and decides to act

_____ Reasons for not acting or for hesitating to act in an emergency situation

5. Identify six ways bystanders can help at the scene of an emergency.

Answers are listed in Appendix B.

Responding to an Emergency

2

As you arrive at your parents' house one Saturday morning, you are surprised that your dad is not in his usual spot—in the driveway tinkering with the antique car he is currently restoring. It's a little chilly today though, and you hear music coming from the garage, so you figure he is in there. When you open the garage door to say hello, you are not prepared to find your dad lying on the floor apparently unconscious. You need to do something, but what?

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Identify and describe the three emergency action steps.
- Explain when and how to call 9-1-1 or the local emergency number.

KEY TERM

Emergency action steps: Three basic steps you should take in any emergency: **CHECK—CALL—CARE**.

INTRODUCTION

An emergency scene can be overwhelming. It poses questions that demand immediate answers. What should I do first? Where can I get help? What can I do to help the injured or ill person? By learning how to check an emergency scene and prioritize your actions, you will be able to respond effectively in any emergency situation.

EMERGENCY ACTION STEPS

The ***emergency action steps*** are three steps you should take in any emergency situation. These steps are:

- **CHECK** the scene and the person.
- **CALL** 9-1-1 or the local emergency number.
- **CARE** for the person.

FIGURE 2-1 *Before attempting to help an ill or injured person, check the scene for anything that may threaten your safety or that of the person or bystanders. Can you identify the hazards shown above?*

Check

Before you can help an injured or ill person, you must make sure the scene is safe for you and any bystanders **(Figure 2-1)**. As you look over the scene, answer these questions:

- Is the scene safe?
- Is immediate danger involved?
- What happened?
- How many people are involved?
- Are bystanders available to help?
- What is wrong with the person?

Is the Scene Safe?

Check for anything unsafe, such as spilled chemicals, traffic, fire, escaping steam, downed electrical lines, smoke or extreme weather. Avoid entering confined areas with no ventilation or fresh air, places where there might be poisonous gas, collapsed structures, or places where natural gas, propane or other substances could explode.

Such areas should be entered only by responders who have special training and equipment, such as respirators and self-contained breathing apparatus.

If these or other dangers threaten, stay at a safe distance and call 9-1-1 or the local emergency number immediately. If the scene still is unsafe after you call, do not enter. Dead or injured heroes are no help to anyone! Leave dangerous situations to professionals such as firefighters and police. Once they make the scene safe, you can offer to help.

Is Immediate Danger Involved?

Do not move a seriously injured person unless there is an immediate danger, such as fire, flood or poisonous gas; you have to reach another person who may have a more serious injury or illness; or you need to move the injured person to give proper care *and* you are able to do so without putting yourself in danger. If you must move the person, do it as quickly and carefully as possible. More on moving a person is included in Chapter 3. If there is no danger, tell the person to remain still until you can assess his or her condition. Tell any bystanders not to move the person.

What Happened?

Look for clues to what caused the emergency and how the person might have been injured. Nearby objects, such as a fallen ladder, broken glass or a spilled bottle of medicine, may give you information. Your check of the scene may be the only way to determine what happened.

If the injured or ill person is a child, keep in mind that he or she may have been moved by well-meaning adults. Be sure to ask about this when you are checking out what happened. If you find that a child has been moved, ask the adult where the child was and how he or she was found.

What if...

I am trying to help out a neighbor, but the family dog starts acting aggressively towards me when I enter the house? Should I try to enter anyway?

An aggressive animal is complex and unpredictable, and the potential consequences of being attacked by such an animal can be serious. You should not risk becoming a patient yourself, complicating the emergency further. Instead of continuing into the house, immediately call 9-1-1 or the local emergency number from a safe place, and explain that you need to report an emergency and that there is an aggressive animal blocking your access to the person. The dispatcher will make sure that the appropriate resources are dispatched to the scene to handle the full situation safely and appropriately. The same would be true if you encountered downed power lines, falling rocks, fire, smoke or the like.

What if...

I am helping on the scene of a car accident in which a downed power line has fallen on someone's car and is touching the ground? Should I help the person exit the car?

No! The person should stay in the car. When a person is in the vehicle, he or she is not a part of the electricity's path to the ground; therefore, the car is the safest place to be under the circumstances. Have the person wait in the car until qualified electrical workers turn the power off. At the same time, you should stay as far away from the scene as possible. Electricity can spread out through the ground in a circle from any downed line, making more than just the vehicle electrically charged.

How Many People Are Involved?

Look carefully for more than one person. You might not spot everyone at first. If one person is bleeding or screaming, you might not notice an unconscious person lying nearby. It also is easy to overlook a small child or an infant. In an emergency with more than one injured or ill person, you may need to prioritize care (in other words, decide who needs help first) based on the severity of the injuries or illness.

Are Bystanders Available to Help?

You have already learned that the presence of bystanders does not mean that a person is receiving help. You may have to ask them to help. Bystanders may be able to tell you what happened or make the call for help while you provide care. If a family member, friend or co-worker is present, he or she may know if the person is ill or has a medical condition.

What if...

The car in the previous scenario catches fire?

The only circumstances in which someone should consider leaving a car that is in contact with a downed power line is if the vehicle catches on fire. If this happens, the person in the car should open the door, but not step out. The best action is to jump completely free of the vehicle with both feet together to avoid contact with the live car (metal) and the ground at the same time. The person should hop as far away as possible from the vehicle, keeping both feet together; or shuffle with both feet together, taking small steps and keeping both feet in contact with each other and with the ground at all times.

The injured or ill person may be too upset to answer your questions. Anyone who awakens after having been unconscious also may be frightened. Bystanders can help to comfort the person and others at the scene. A child may be especially frightened. Parents or guardians who are present may be able to calm a frightened child. They also can tell you if a child has a medical condition.

What Is Wrong with the Person?

When you reach the person, try to find out what is wrong. Look for signals that may indicate a life-threatening emergency. First, check to see if the injured or ill person is conscious. Sometimes this is obvious. The person may be able to speak to you. He or she may be moaning, crying, making some other noise or moving around. If the person is conscious, reassure him or her and try to find out what happened.

If the person is lying on the ground, silent and not moving, he or she may be unconscious. If you are not sure whether someone is unconscious, tap him or her on the shoulder and ask if he or she is OK. Use the person's name if you know it. Speak loudly. If you are not sure whether an infant is unconscious, check by tapping the infant's shoulders and shouting or flicking the bottom of the infant's foot to see if the infant responds.

Unconsciousness is a life-threatening emergency. If the person does not respond to you in any way, assume that he or she is unconscious. Make sure that someone calls 9-1-1 or the local emergency number right away.

Look for other signals of life-threatening injuries, including trouble breathing, the absence of breathing or breathing that is not normal, and/or severe bleeding.

While you are checking the person, use your senses of sight, smell and hearing. They will help you to notice anything abnormal. For example, you may notice an unusual smell that could be caused by a poison. You may see a bruise or a twisted arm or leg. You may hear the person say something that explains how he or she was injured.

At times you may be unsure if advanced medical personnel are needed. Your first aid training will help you to make this decision. The most important step you can take when giving care to a person who is unconscious or has some other life-threatening condition is to call for emergency medical help. With a life-threatening condition, the survival of a person often depends on both emergency medical help and the care you can give. You will have to use your best judgment—based on the situation, your assessment of the injured or ill person, information gained from this course and other training you may have received—to make the decision to call 9-1-1 or the local emergency number. When in doubt, and you think a life-threatening condition is present, make the call.

Call

As a citizen responder, your top priority is to ensure that the person receives more advanced care as soon as possible. The emergency medical services (EMS) system works more effectively if you can give information about the person's condition when the call is placed. This information helps to ensure that the person receives proper medical care

as quickly as possible. Make the call quickly and return to the person. If possible, ask a bystander to make the call.

When to Call

As a general rule, call 9-1-1 or the local emergency number if the person has any of the following conditions:

- Unconsciousness or an altered level of consciousness (LOC), such as drowsiness or confusion
- Breathing problems (trouble breathing or no breathing)
- Chest pain, discomfort or pressure lasting more than a few minutes; that goes away and comes back; or that radiates to the shoulder, arm, neck, jaw, stomach or back
- Persistent abdominal pain or pressure
- Severe external bleeding (bleeding that spurts or gushes steadily from a wound) or internal bleeding (bleeding inside the body which may be difficult to recognize)
- Vomiting blood or passing blood
- Severe (critical) burns
- Suspected poisoning
- Seizures
- Stroke (sudden weakness on one side of the face/facial droop, sudden weakness on one side of the body, sudden slurred speech or trouble getting words out or a sudden, severe headache)
- Suspected or obvious injuries to the head, neck or spine
- Painful, swollen, deformed areas (suspected broken bone) or an open fracture

Also call 9-1-1 or the local emergency number immediately for any of these situations:

- Fire or explosion
- Downed electrical wires
- Swiftly moving or rapidly rising water
- Presence of poisonous gas
- Serious motor-vehicle collisions
- Injured or ill persons who cannot be moved easily

These conditions and situations do not comprise a complete list. Trust your instincts. If you think there is an emergency, there probably is **(Figure 2-2)**.

FIGURE 2-2 *Do not hesitate to call 9-1-1 or the local emergency number if you think there is an emergency. Trust your instincts!* Courtesy of Michelle Lala Clark.

Making the Call

When calling 9-1-1 or the local emergency number, give the emergency medical dispatcher (EMD) the necessary information. Most EMDs will ask:

- The exact address or location and the name of the city or town. Be prepared to provide the names of nearby intersecting streets (cross streets or roads) and landmarks; and the name of the building, the floor and the room number.
- The telephone number and address from which the call is being made.

- The caller's name.
- What happened, for example, a motor vehicle collision, a fall, a fire, sudden onset of chest pain.
- The number of people involved.
- The condition of the person(s), for example, unconsciousness, chest pain, trouble breathing, bleeding.
- The care being given.

If you are calling from a landline phone, your location and telephone number may be automatically transmitted to the dispatcher. This technology, called enhanced 9-1-1 (E9-1-1), can save valuable time in an emergency and get resources to the scene faster. As the Federal Communication Commission's wireless E9-1-1 rules continue to take effect, wireless phones are also beginning to provide more precise location information. However, this service is not yet available everywhere, and even with the best technology currently available, accuracy is only within 50 to 300 meters. Call your service provider for more information about E9-1-1. However, you should *always* ensure that the dispatcher has your correct location, including city, street, number, floor and apartment number, if applicable.

Do not hang up until the dispatcher tells you to. Make sure the dispatcher has all the information needed to send the right help to the scene. Some EMDs may also be able to provide instructions on how best to care for the person until help arrives.

If possible, ask a bystander to call 9-1-1 or the local emergency number for you. Sending someone else to make the call allows you to stay with the person. Tell the bystander the person's condition and the care being given. Tell him or her to report to you after making the call and tell you what the EMD said.

If You Are Alone

If you are in a situation in which you are the only person other than the injured or ill person, you must make a decision to *Call First* or *Care First*.

Call First

You should *Call First,* that is, call 9-1-1 or the local emergency number before giving care, for:

- An unconscious adult or adolescent age 12 or older.
- A witnessed sudden collapse of a child (1–12 years of age) or infant (<1 year of age).
- An unconscious child or infant known to have heart (cardiac) problems.

Call First situations are likely to be cardiac emergencies, such as sudden cardiac arrest, where time is critical. These are covered in depth in Chapter 6.

Care First

Care First, that is, provide 2 minutes of care, then call 9-1-1 or the local emergency number, for:

- An unconscious person younger than 12 years of age who you did not see collapse.
- Any person who had a drowning incident.

Care First situations are likely to be related to breathing emergencies rather than sudden cardiac arrest. In these situations provide support for airway, breathing and circulation as described in Chapter 7.

Care

Once you have checked the scene and the person, and have made a decision about calling 9-1-1 or the local emergency number, you may need to provide care. Always care for life-threatening conditions before those that are not life threatening. For example, a breathing emergency would take priority over an injured (e.g., bruised) leg. While you are waiting for more advanced medical help, follow these general guidelines:

- *Do no* further harm.
- Monitor the person's level of consciousness and breathing. A change in the person's condition may be a signal of a more serious illness or injury. A condition that may not appear serious at first may become serious over time.
- Help the person rest in the most comfortable position.
- Keep the person from becoming chilled or overheated.
- Comfort and reassure the person, but do not provide false hope.
- Give any specific care as needed.

You will learn more about how to care for an injured or ill person as you progress through this course. See "Adult, Child or Infant?" below for information on whether a person should be considered an adult, child or infant for first aid care in which such a distinction is made.

Transporting the Person Yourself

In some cases, you may decide to take the injured or ill person to a medical facility yourself instead of waiting for EMS personnel. *Never* transport a person:

- When the trip may aggravate the injury or illness or cause worsening of the condition.
- When the person has or may develop a life-threatening condition.
- If you are unsure of the nature of the injury or illness.

If you decide it is safe to transport the person, ask someone to come with you to keep the person comfortable. Also, be sure you know the quickest route to the nearest medical facility capable of handling emergency care. Pay close attention to the injured or ill person and watch for any changes in his or her condition.

Discourage an injured or ill person from driving him- or herself to the hospital or physician's office. An injury may restrict movement, or the person may become groggy or faint. A sudden onset of pain may be distracting. Any of these conditions can make driving very dangerous for the person, passengers, other drivers and pedestrians.

ADULT, CHILD OR INFANT?

While you would not normally think of a 14-year-old boy as an adult, or you might consider a 1-year-old still more of a baby than a child, the definitions when it comes to giving emergency care are different.

For purposes of first aid, follow these guidelines:

- An adult is defined as someone about age 12 (adolescent) or older.
- A child is someone between the ages of 1 and 12.
- An infant is someone younger than 1 year.

When using an AED:

- A child is considered to be someone between the ages of 1 and 8 years or weighing less than 55 pounds.

SUMMARY

Emergency situations are often confusing and frightening. To take appropriate actions in any emergency, follow the three basic emergency action steps: **CHECK—CALL—CARE**. **CHECK** the scene and the person, **CALL** 9-1-1 or the local emergency number to activate the EMS system and **CARE** for the person until more advanced medical personnel arrive.

READY TO RESPOND?

Think back to the scene in the garage in the opening scenario, and use what you have learned to respond to these questions:

1. What dangers could exist in the garage?
2. What specific factors in the garage could influence your decision to move or not move your dad?
3. After checking the scene in the garage and moving your dad to safety if needed, what would you do next? Why?

STUDY QUESTIONS

1. List the emergency action steps.

Answer questions 2-5 based on the scenario below.

You are driving along the interstate. It is getting dark. Rain has been falling steadily and is now beginning to freeze. Suddenly a tractor-trailer that you can see in the distance ahead of you begins to sway and slide, then jackknifes and crashes onto its left side. Drivers put on their brakes and swerve, and by some miracle, everyone close by manages to avoid crashing into the fallen truck or each other. You pull onto the median and stop a safe distance behind the truck.

2. List the possible dangers to be aware of at the scene of this emergency.
3. Describe the actions you should take if you determine that the scene is unsafe.
4. You check the driver and discover that he is unconscious. You tell a bystander to call 9-1-1 or the local emergency number. List the information that the bystander should have when calling 9-1-1 or the local emergency number.
5. Describe the actions you would take if no one else was available to help.

Answers are listed in Appendix B.

Before Giving Care

3

You are about to head out for a jog from the parking lot of a local recreation area when you see a group of kids come running off the trail. One boy suddenly pitches forward after tripping on his shoelace, and lands right on his hands and face on the pavement. You'd be surprised if he's not scraped up pretty good, so you quickly grab your first aid kit from the car and hurry over to see how you can help. A moment later, his mother emerges from the trail and runs to his side.

LEARN AND RESPOND ❯❯❯

OBJECTIVES

After reading this chapter, you should be able to:

- List four conditions that must be present for disease transmission to occur.
- Identify two ways in which a pathogen can enter the body.
- Describe how to minimize the risk of disease transmission when giving care in a situation that involves visible blood.
- Describe the difference between expressed consent and implied consent.
- Describe the purpose of Good Samaritan laws.
- List six situations in which moving a person is necessary.
- List five limitations you should be aware of before you attempt to move someone.
- Describe six ways to move a person.

After reading this chapter and completing the class activities, you should be able to:

- Demonstrate how to remove disposable gloves.

KEY TERMS

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

Competence: The injured or ill person's ability to understand the responder's questions and the implications of the decisions made.

Direct contact transmission: Mode of transmission of pathogens that occurs through directly touching infected blood or body fluid, or other agents such as chemicals, drugs or toxins.

Disease transmission: The passage of a disease from one person to another.

Expressed consent: Permission to receive emergency care granted by a competent adult either verbally or nonverbally; also referred to as **consent**.

Implied consent: Legal concept that assumes a person would consent to receive emergency care if he or she were physically able or old enough to do so.

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

Personal protective equipment: The equipment and supplies that help prevent the responder from directly contacting infected materials; includes gloves, gowns, masks, shields and protective eyewear.

Refusal of care: The declining of care by a competent person; a person has the right to refuse the care of anyone who responds to an emergency scene.

Standard precautions: Safety measures taken to prevent exposure to blood and body fluids when giving care to injured or ill persons; assumes that all body fluids, secretions and excretions (except sweat) are potentially infective.

INTRODUCTION

As a lay responder, you have made an important decision to help an injured or ill person. However, in any emergency situation your top priority is to ensure your own safety. In this chapter, you will learn how to protect yourself from disease transmission, as well as how to properly move a person in a way that is safe for both the person and you. In addition, this chapter provides you with some basic legal information you need to know before giving care.

PREVENTING DISEASE TRANSMISSION

Bloodborne pathogens, such as bacteria and viruses, are present in blood and body fluids and can cause disease. They are acquired from other people, animals, insects or things that have been in contact with the pathogen. Because some infectious diseases such as hepatitis and human immunodeficiency virus (HIV) are very serious, you must learn how to protect yourself and others from ***disease transmission***, or the passage of disease from one person to another, while helping a person who has been injured or is ill.

How Diseases Spread

The disease process begins when a **pathogen** (e.g., a **bacteria** or **virus**) enters the body. When pathogens enter the body, they can sometimes overpower the body's natural defense systems and cause illness. This type of illness is called an **infection**. Most infectious diseases are caused by bacteria and viruses.

Bacteria are everywhere. They do not depend on other organisms for life and can live outside the human body. Most bacteria do not infect humans. Those that do may cause serious illness. Bacterial meningitis and **tetanus** are examples of diseases caused by bacteria. The body's ability to fight infection depends on its immune system. In a person with a healthy immune system, a bacterial infection is often avoided. However, another person may have difficulty fighting infection caused by bacteria. When an infection is present, physicians may prescribe antibiotics that either kill the bacteria or weaken them enough for the body to get rid of them. Commonly prescribed antibiotics include penicillin, erythromycin and tetracycline.

Unlike bacteria, viruses depend on other organisms to live and reproduce. Viruses can cause many diseases, including the common cold (caused by the rhinovirus), hepatitis and HIV. Once in the body, viruses may be difficult to eliminate because very few medications are effective against viral infections. Although there are some medications that kill or weaken viruses, the body's own immune system is the main defense against them.

How Bloodborne Pathogens Spread

For any disease to be spread, including bloodborne disease, all four of the following conditions must be met:

- A pathogen is present.
- There is sufficient quantity of the pathogen present to cause disease.
- The pathogen passes through the correct entry site (i.e., eyes, mouth and other mucous membranes or skin pierced or broken by cuts, abrasions, bites and sharp objects).
- A person is susceptible to the pathogen.

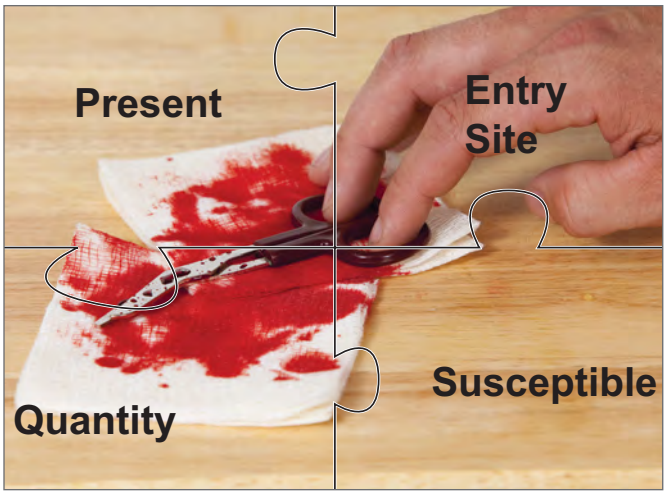

FIGURE 3-1 *If any one of these conditions is missing, infection will not occur.*

FIGURE 3-2, A–B **A,** *Example of direct contact transmission*
B, *Example of indirect contact transmission*

To understand how infections occur, think of these four conditions as pieces of a puzzle. All of the pieces have to be in place for the picture to be complete. If any one of these conditions is missing, an infection cannot occur **(Figure 3-1)**.

Bloodborne pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV can spread from person to person through ***direct contact transmission*** and ***indirect contact transmission*** with infected blood or other body fluids. HBV, HCV and HIV are not spread by food or water or by casual contact such as hugging or shaking hands.

Direct contact transmission occurs when the infected blood or body fluids from one person enter another person's body at a correct entry site. For example, direct transmission can occur through infected blood splashing in the eye or by directly touching body fluids from an infected person **(Figure 3-2, A)**.

Indirect contact transmission can occur when a person touches an object that contains the blood or another body fluid of an infected person, and that infected blood or other body fluid enters the body through a correct entry site. These objects include soiled dressings, equipment and work surfaces that are contaminated with an infected person's blood or other body fluids. For example, indirect contact transmission can occur when a person picks up blood-soaked bandages with a bare hand and the pathogens enter through a break in the skin on the hand **(Figure 3-2, B)**.

Standard Precautions When Giving Care

Standard precautions are safety measures taken to prevent exposure to blood and body fluids when giving care to injured or ill persons. This approach to infection control means that you should consider all body fluids and substances as infectious. These precautions and practices include personal hygiene, using personal protective equipment (PPE), using proper equipment for cleaning and disinfecting contaminated surfaces and properly disposing of contaminated materials (e.g., use of biohazard bags).

Personal Hygiene

Good personal hygiene habits, such as frequent hand washing, help to prevent disease transmission. You should always wash and scrub your hands after giving care, even if you never came into contact with a person's blood or other body fluids **(Figure 3-3)**.

To wash your hands correctly, you should:

- Wet your hands with warm water.
- Apply antimicrobial liquid soap to your hands.
- Rub your hands vigorously for at least 15 seconds, covering all surfaces of the hands and fingers.
  - Use soap and warm running water.
  - Scrub nails by rubbing them against the palms of your hands.
- Rinse your hands with water.
- Dry your hands thoroughly with a paper towel.
- Turn off the faucet using the paper towel.

FIGURE 3-3 *Thorough hand washing after giving care helps to protect you against disease.*

Alcohol-based hand sanitizers allow you to clean your hands when soap and water are not readily available and your hands are not visibly soiled. Always keep alcohol-based hand sanitizers out of the reach of children. When using alcohol-based hand sanitizers:

- Apply the product to the palm of one hand.
- Rub hands together.
- Rub the product over all surfaces of the hands and fingers until hands are dry.
- Wash your hands with antimicrobial soap and warm water as soon as they are available.

Personal Protective Equipment

Personal protective equipment is the equipment that helps keep you from directly contacting infected materials. This equipment includes but is not limited to disposable gloves (such as nitrile or vinyl) and breathing barriers used when performing rescue breaths. To reduce the risk of receiving or transmitting an infectious disease, follow these guidelines for the use of PPE:

- Be prepared by having a first aid kit handy and stocked with PPE, such as disposable gloves, CPR breathing barriers, eye protection and other supplies **(Figure 3-4)**.
- Wear disposable (single-use) gloves whenever giving care, particularly if you may come in contact with blood or body fluids.
- Remove jewelry, such as rings, bracelets and watches, before putting on disposable gloves.
- Cover any of your own cuts, scrapes or sores with a bandage prior to putting on protective equipment.
- Do not use disposable gloves that are discolored, torn or punctured.
- Do not clean or reuse disposable gloves.
- Change gloves before you give care to a different person.

FIGURE 3-4 *Use of PPE includes disposable gloves and CPR breathing barriers.*

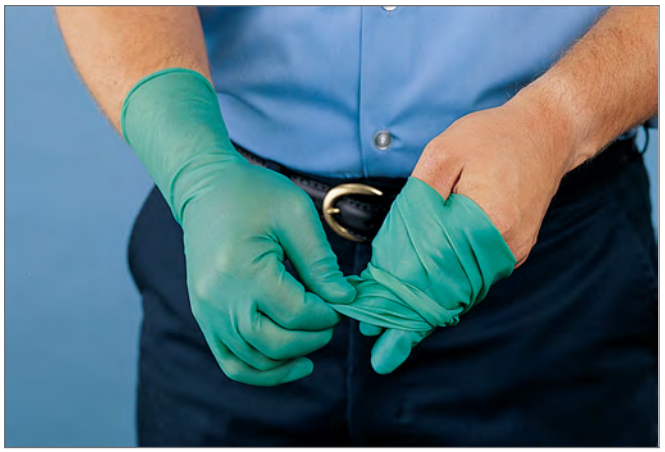

FIGURE 3-5 *Remove disposable gloves without contacting the soiled part of the gloves, and dispose of them in a proper container.*

What if...

I need to help someone who is bleeding severely, but there are no disposable gloves available to protect me against bloodborne pathogens?

Protecting yourself and others from disease transmission especially in the presence of visible blood requires the use of standard precautions. However, if PPE, such as disposable gloves, is not readily available, a conscious person may be able to apply direct pressure to his or her own wound. If that is not an option, consider the use of items such as a plastic sandwich bag, plastic wrap or a plastic shopping bag. While not "ideal," any of these can help to minimize exposure to potentially infectious body fluids while disposable gloves are located.

FIGURE 3-6 *When cleaning up a blood spill, follow all standard precautions.*

- Wear protective coverings, such as a mask, eyewear or gown, whenever you are likely to come in contact with blood or other body fluids that may splash.
- Use protective CPR breathing barriers when giving rescue breaths.
- Remove disposable gloves without contacting the soiled part of the gloves, and dispose of them in a proper container **(Figure 3-5)**.

Review the Skill Sheet at the end of this chapter for detailed steps for safely removing disposable gloves.

Additional Precautions

When giving care, you should also take the following precautions to protect yourself and the person you are helping:

- Do not eat, drink or touch your mouth, nose or eyes when giving care or before you wash your hands after care is given.
- Avoid handling any of your personal items, such as pens or combs, while giving care or before you wash your hands.
- Do not touch objects that may be soiled with blood or other body fluids.

Cleaning Up After Providing Care or a Blood Spill

Thoroughly clean and disinfect all surfaces that may have come into contact with the injured or ill person as well as any materials that may have become contaminated while providing care.

If a blood spill occurs:

- Clean up the spill immediately or as soon as possible after the spill occurs.
- Use disposable gloves and other PPE when cleaning up spills.
- Wipe up the spill with paper towels or other absorbent materials **(Figure 3-6)**.
  - If the spill is mixed with sharp objects, such as broken glass or needles, do not pick these up with your hands. Use tongs, a broom and dustpan or two pieces of cardboard to scoop up the sharp objects.
- After the area has been wiped up, flood the area with an appropriate disinfectant, such as a fresh solution

of approximately 1½ cups of liquid chlorine bleach to 1 gallon of fresh water (1 part bleach per 9 parts water). Let stand for at least 10 minutes.

- Dispose of the contaminated material used to clean up the spill in a labeled biohazard container.
- Contact your worksite safety representative or your local health department regarding the proper disposal of potentially infectious materials.

If You Are Exposed

If you are exposed to blood or other body fluid (person's blood gets into a cut on your hand, bloody saliva splashes into your mouth or eyes), take the following steps immediately:

- Clean the contaminated area thoroughly with soap and water.
- Flush splashes of blood or other infectious material in the mouth or nose with water.
- If the eyes are involved, irrigate with clean water, saline or sterile irrigants for 20 minutes.

Be sure to notify a police officer or other professional on the scene, such as a firefighter or emergency medical services (EMS) personnel, or your health care provider, that you have been exposed. Seek immediate medical attention.

LEGAL CONSIDERATIONS

Obtaining Consent

People have a basic right to decide what can and cannot be done to their bodies. They have the legal right to accept or refuse emergency care. Therefore, before giving care to an injured or ill person, you must obtain the person's permission. This permission is referred to as **consent** and must be obtained, either verbally or nonverbally (i.e., through a gesture), before providing care to an injured or ill person. To obtain consent you must:

- Identify yourself to the person.
- Give your level of training.
- Ask the person whether you may help.
- Explain what you observe.
- Explain what you plan to do.

When a conscious, ***competent*** adult understands your questions and what you plan to do, then gives you permission to give care, this is called ***expressed consent***. Expressed consent can be verbal, nonverbal or through gestures. If the person is a child or infant (a minor), consent to give care must come from the parent or guardian. Do not touch or give care to a conscious person who refuses it. If the person refuses care or withdraws consent at any time (assuming they are competent and able to make rational, informed decisions), you should still call 9-1-1 or the local emergency number.

Sometimes, adults may not be able to give expressed consent. This includes people who are unconscious or unable to respond, confused, mentally impaired, seriously injured or seriously ill. In these cases, the law assumes that if the person could respond, he or she would agree to care. This is called ***implied consent***. Consent is also implied for a minor if a parent or guardian is not present or immediately available. A minor is usually anyone considered under the age of 18, but this varies by state.

What if...

A person in obvious need of help refuses care—but then becomes unconscious?

An injured person who is competent has the legal right to refuse first aid care from a lay responder or a medical health professional. As taught in this chapter, you should at least call 9-1-1 or the local emergency number, even if the person will not let you give care yourself. If while waiting for additional help to arrive that person becomes unconscious or otherwise unresponsive and is critically injured, the rules of implied consent should be followed. Implied consent assumes that the person would want care for a life-threatening condition if he or she could give consent.

Refusal of Care

Some injured or ill people may refuse care, even those who may desperately need it. Even though a person may be seriously injured or ill, you should honor their ***refusal of care***.

Persons with decision-making capacity who are of legal age have a right to refuse care. If this occurs, you must ensure that the person is competent and able to make rational, informed decisions. Refusal of care does not have to be all or nothing. A person can agree to receive part of the care that you have suggested, but refuse another part.

If an injured or ill person does not consent to care, do not argue. Call 9-1-1 or the local emergency number and monitor the person for changes in condition, including consciousness, until more advanced medical personnel arrive.

Abandonment

Just as you must obtain the injured or ill person's consent before beginning care, you must also continue to give care once you have begun. Once you have started emergency care, you are legally obligated to continue that care until a person with equal or higher training relieves you, you are physically unable to continue or the person refuses care. Usually, your obligation for care ends when more advanced medical professionals take over. If you stop your care before that point without a valid reason, such as leaving momentarily to get the proper equipment, you could be legally responsible for the ***abandonment*** of a person in need.

Good Samaritan Laws

The vast majority of states and the District of Columbia have enacted **Good Samaritan laws**. These laws give legal protection from claims of negligence to people who willingly give emergency care to ill or injured persons without accepting anything in return.

When a lay person responds to an emergency, and acts as a reasonable and prudent person would under the same conditions, Good Samaritan immunity generally prevails. This legal immunity protects you, as a lay responder, from being sued and found financially responsible for the person's injury. For example, a reasonable and prudent lay responder would:

- Move a person only if his or her life was in danger.
- Ask a conscious person for consent before giving care.
- Check the person for life-threatening emergencies before giving further care.
- Call 9-1-1 or the local emergency number.
- Continue to give care until more highly trained personnel arrive.

Good Samaritan laws were enacted to encourage people to help others in emergency situations. They require that the "Good Samaritan" responder use common sense and a reasonable level of skill, not to exceed the scope of the individual's training in emergency situations. They assume that each person would do his or her best to save a life or prevent further injury.

People are rarely sued for helping in an emergency. However, the existence of Good Samaritan laws does not mean that someone cannot sue. In rare cases, courts have ruled that these laws do not apply when an individual responder's response was grossly or willfully negligent or reckless or when the responder abandoned the person after initiating care.

Good Samaritan laws vary from state to state. If you are interested in finding out about your state's Good Samaritan laws, contact a legal professional or your state attorney general's office, or check your local library.

What if...

I help someone who ends up needing surgery to repair the injury? Can I be sued for trying to give care?

Lay responders in most, if not all, states are protected by their respective state's Good Samaritan law(s). Under these laws, as long as you had honest intentions to give care, did not receive any type of compensation and did not demonstrate gross negligence while giving care during an emergency, you cannot be successfully sued by the person. Please refer to your state's Good Samaritan law(s) for further details.

REACHING AND MOVING A PERSON

Usually, when you give first aid, you will not face hazards that require moving the person immediately. In most cases, you can follow the emergency action steps by checking the scene and the person, calling 9-1-1 or the local emergency number and caring for the person where you find him or her. In fact, one of the most dangerous threats to a seriously injured or ill person is unnecessary movement. Movement can lead to further injury and pain, and can complicate recovery. For example, if the person has a fracture of the leg, movement could result in the end of the bone tearing the skin. Soft tissue damage, damage to nerves, blood loss and infection all could result unnecessarily.

However, there are some situations in which moving the person would be appropriate. You should move a person only when you can do so safely and only in one of the following three situations:

- When you are faced with immediate danger, such as fire, lack of oxygen, risk of explosion or a collapsing structure.
- When you have to get to another person who may have a more serious problem. In this case, you may have to move a person with minor injuries to reach someone needing immediate care.
- When it is necessary to give proper care. For example, if someone needs CPR, he or she might have to be moved from a bed because CPR needs to be performed on a firm, flat surface. If the surface or space is not adequate to give care, the person should be moved.

Before you act, consider the following limitations to moving one or more persons quickly and safely:

- Any dangerous conditions at the scene
- The size of the person
- The distance the person must be moved
- Your physical ability
- Whether others (bystanders) can help you
- The person's condition
- Any aids or equipment to facilitate moving the person at the scene

Considering these limitations will help you decide how to proceed. For example, if you are injured, you may be unable to move the person and attempting to do so will only risk

making the situation worse. If you become part of the problem, EMS personnel will have one more person to rescue.

To protect yourself and the person, follow these guidelines when moving a person:

- Use your legs, not your back, when you bend.
- Bend at the knees and hips, and avoid twisting your body.
- Maintain a firm grip on the person.
- Walk forward when possible, taking small steps and looking where you are going to maintain a firm footing.
- Avoid twisting or bending anyone with a possible head, neck or spinal injury.
- Do not move a person who is too large to move comfortably.
- Use good posture.

Gaining Access

Sometimes you cannot give care because the person is inaccessible. One example is a situation in which someone is able to call for help but is unable to unlock the door of the home or office. A person may also be inaccessible in a motor vehicle collision. Vehicle doors are sometimes locked or crushed, windows may be rolled up or the vehicle may be unstable. Fire, water or other obstacles may prevent you from safely reaching the person.

You must immediately begin to think of how to safely gain access to the person. If you cannot reach the person, you cannot check him or her or give care. But remember, when attempting to reach a person, your safety is the most important consideration. Protect yourself and the person by doing only what you are trained to do and by using equipment appropriate for the situation. In traffic, items such as reflective markers or flares and flashlights may help keep you safe by alerting other drivers.

Emergency Moves

You (and a bystander if available) can move a person to safety in many different ways, but no one way is best for every situation. The objective is to move a person to safety without injuring yourself or causing further injury to the person. The following are six common types of emergency moves (assists, carries and drags) that can all be done by one or two people and with minimal to no equipment:

- Walking assist
- Two-person seat carry
- Pack-strap carry
- Clothes drag
- Blanket drag
- Ankle drag

Walking Assist

The most basic emergency move is the walking assist. Either one or two responders can use this method with a conscious person. To perform a walking assist, place the person's arm across your shoulders and hold it in place with one hand. Support the person with your other hand around the person's waist. In this way, your body acts as a crutch, supporting the person's weight while you both walk **(Figure 3-7, A)**. A second rescuer, if present, can support the person in the same way on the other side **(Figure 3-7, B)**. Do not use this assist if you suspect that the person has a head, neck or spinal injury.

FIGURE 3-7, A–B *The walking assist can be performed with* **A,** *a single responder or* **B,** *two responders.*

Two-Person Seat Carry

The two-person seat carry requires a second responder. This carry can be used for any person who is conscious and not seriously injured. Put one arm behind the person's thighs and the other across the person's back. Interlock your arms with those of a second responder behind the person's legs and across the person's back. Lift the person in the "seat" formed by the responders' arms **(Figure 3-8)**. Responders should coordinate their movement so they walk together. Do not use this assist if you suspect that the person has a head, neck or spinal injury.

Pack-Strap Carry

The pack-strap carry can be used with both conscious and unconscious persons. Using it with an unconscious person requires a second responder to help position the person on your back. To perform the pack-strap carry, have the person stand or have a second responder support the person. Position yourself with your back to the person, back straight, knees bent, so that your shoulders fit into the person's armpits. Cross the person's arms in front of you and grasp the person's wrists. Lean forward slightly, and pull the person up and onto your back. Stand up and walk to safety **(Figure 3-9)**. Depending on the size of the person, you may be able to hold both of the person's wrists with one hand, leaving your other hand free to help maintain balance, open doors and remove obstructions. Do not use this assist if you suspect that the person has a head, neck or spinal injury.

FIGURE 3-8 *The two-person seat carry*

Clothes Drag

The clothes drag can be used to move a conscious or unconscious person suspected of having a head, neck or spinal injury. This move helps keep the person's head, neck and back stabilized. Grasp the person's clothing

FIGURE 3-9 *The pack-strap carry*

behind the neck, gathering enough to secure a firm grip. Using the clothing, pull the person (head-first) to safety. During the move, the person's head is cradled by both clothing and the responder's arms **(Figure 3-10)**. Keep your back as straight as possible and bend your legs. This emergency move is exhausting and may cause back strain for the responder, even when done properly.

Blanket Drag

The blanket drag can be used to move a person in an emergency situation when equipment is limited.
The blanket drag can be used to move a conscious or unconscious person suspected of having a head, neck or spinal injury. Position a blanket (or tarp, drape, bedspread or sheet) next to the person. Keep the person between you and the blanket. Gather half of the blanket and place it against the person's side. Be sure to leave about 2 feet of blanket above the person's head and roll the person as a unit toward you. Reach over and place the blanket so that it is positioned under the person, then gently roll the person onto the blanket. Gather the blanket at the head and move the person **(Figure 3-11)**.

FIGURE 3-10 *The clothes drag*

Ankle Drag

Use the ankle drag (also known as the foot drag) to move a person who is too large to carry or move in any other way. Firmly grasp the person's ankles and move backward. The person's arms should be crossed on his or her chest. Pull the person in a straight line, being careful not to bump the person's head **(Figure 3-12)**. Do not use this assist if you suspect that the person has a head, neck or spinal injury.

FIGURE 3-11 *The blanket drag*

FIGURE 3-12 *The ankle drag*

SUMMARY

In any emergency situation, your top priority is to ensure your own safety. Protect yourself from disease transmission by wearing PPE, such as disposable gloves and breathing barriers, and following good personal hygiene practices, such as hand washing. Always check the scene for safety before you approach a person, and be sure to obtain consent from an adult person who is conscious and alert. If a person does not give consent, do not give care, but do call 9-1-1 or the local emergency number. Never move a person unless the scene is or becomes unsafe. If you must move a person, be sure to do so in a manner that is safe for you and will not cause the person any further harm. By thinking before you give care, you will not only be ensuring the safety of the person but also your own.

READY TO RESPOND?

Think back to the boy in the opening scenario, and use what you have learned to respond to these questions:

1. What steps should you take before beginning to give care?
2. What steps will help to prevent disease transmission after giving care?

STUDY QUESTIONS

For questions 1–5, circle the letter of the correct answer.

1. Disease transmission from a person to a responder requires four conditions to be present. Which of the following is **NOT** one of these four?
   a. The person may or may not be infected with a disease.
   b. The responder must be susceptible to the pathogen.
   c. There must be enough of the pathogen present to cause infection.
   d. The pathogen passes through a correct entry site.

2. You are providing first aid to a child who has fallen off her bike. An untrained bystander picks up the gauze with blood on it. He is not wearing gloves. His action is an example of exposure through—
   a. Direct contact.
   b. Bacterial contact.
   c. Viral contact.
   d. Indirect contact.

3. Safety measures you can use to prevent disease transmission include—
   a. Calling 9-1-1 or the local emergency number.
   b. Using PPE such as disposable gloves.
   c. Correctly removing disposable gloves worn while giving care, and then wiping up a blood spill with a paper towel.
   d. Monitoring the person until EMS personnel arrive.

4. To obtain a person's consent to give care, you must tell the person—
   a. Your level of training.
   b. Your age.
   c. A diagnosis of the problem.
   d. Your job.

5. Which would you use to move a person with a suspected head, neck or spinal injury?
   a. Pack-strap carry
   b. Walking assist
   c. Clothes drag
   d. Two-person seat carry

6. List three situations in which it may be necessary to move a person.

7. List four of the limitations you should consider before attempting to move a person in an emergency.

8. List seven guidelines to follow when moving a person in an emergency.

9. Name six common types of emergency moves.

Answers are listed in Appendix B.

REMOVING GLOVES

AFTER GIVING CARE AND MAKING SURE NEVER TO TOUCH THE BARE SKIN WITH THE OUTSIDE OF EITHER GLOVE:

1 PINCH GLOVE

Pinch the palm side of one glove near the wrist. Carefully pull the glove off so that it is inside out.

2 SLIP TWO FINGERS UNDER GLOVE

Hold the glove in the palm of the remaining gloved hand. Slip two fingers under the glove at the wrist of the remaining gloved hand.

3 PULL GLOVE OFF

Pull the glove until it comes off, inside out, so that the first glove ends up inside the glove just removed.

4 DISPOSE OF GLOVES AND WASH HANDS

After removing the gloves:

- Dispose of gloves in the appropriate biohazard container.
- Wash hands thoroughly with soap and warm running water, if available.
- Otherwise, use an alcohol-based hand sanitizer to clean the hands if they are not visibly soiled.

Part Two

Assessment

4 The Human Body

You are helping your brother Jim with some home renovations when he bangs his head hard on a low beam and falls to the ground. He is unconscious and bleeding from the spot where he struck his head. When you call 9-1-1 from your cell phone, the call taker tells you an ambulance is on the way and instructs you to take steps to control the bleeding and monitor Jim's breathing. "Why watch his breathing?" you wonder, since he injured his head, not his chest.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Identify various anatomical terms commonly used to refer to the body.
- Describe various body positions.
- Describe the major body cavities.
- Identify the eight body systems and the major structures in each system.
- Give examples of how body systems work together.

KEY TERMS

Anatomy: The study of structures, including gross anatomy (structures that can be seen with the naked eye) and microscopic anatomy (structures seen under the microscope).

Body system: A group of organs and other structures that work together to carry out specific functions.

Cells: The basic units that combine to form all living tissue.

Circulatory system: A group of organs and other structures that carry oxygen-rich blood and other nutrients throughout the body and remove waste.

Digestive system: A group of organs and other structures that digest food and eliminate wastes.

Endocrine system: A group of organs and other structures that regulate and coordinate the activities of other systems by producing chemicals (hormones) that influence tissue activity.

Genitourinary system: A group of organs and other structures that eliminate waste and enable reproduction.

Integumentary system: A group of organs and other structures that protect the body, retain fluids and help to prevent infection.

Musculoskeletal system: A group of tissues and other structures that support the body, protect internal organs, allow movement, store minerals, manufacture blood cells and create heat.

Nervous system: A group of organs and other structures that regulate all body functions.

Organ: A structure of similar tissues acting together to perform specific body functions.

Physiology: How living organisms function (e.g., movement and reproduction).

Respiratory system: A group of organs and other structures that bring air into the body and remove waste through a process called breathing, or respiration.

Tissue: A collection of similar cells acting together to perform specific body functions.

Vital organs: Those organs whose functions are essential to life, including the brain, heart and lungs.

INTRODUCTION

As a lay responder, you do not need to be an expert in human body structure and function to give effective care. Neither should you need a medical dictionary to effectively describe an injury. However, knowing some basic anatomical terms, and understanding what the body's structures are and how they work will help you more easily recognize and understand injuries and illnesses, and more accurately communicate with emergency medical services (EMS) personnel about a person's condition.

As you will learn in this chapter, body systems do not function independently. Each system depends on other systems to function properly. When your body is healthy, your body systems work well together. But an injury or illness in one body part or system will often cause problems in others. Knowing the location and function of the major organs and structures within each body system will help you to more accurately assess a person's condition and give the best care.

To remember the location of body structures, it helps to visualize the structures that lie beneath the skin. The structures you can see or feel are reference points for locating the internal structures you cannot see or feel. Using reference points will help you describe the location of injuries and other conditions you may find. This chapter provides you with an overview of important reference points and terminology, while also focusing on body structure ***(anatomy)*** and function ***(physiology)*** of the eight body systems.

ANATOMICAL TERMS

While it is not a must to use correct anatomical terms when providing EMS personnel with information about a person you are helping, you may hear some of the following words being used. As mentioned in the introduction, knowing what they mean and how to use them properly can help you provide more accurate information to an EMS dispatcher, or when handing over care of a person to more advanced medical personnel.

Directions and Locations

When discussing where a person is experiencing signals of an injury or illness, the following anatomical terms are helpful to know **(Figure 4-1, A–B)**:

- Anterior/posterior: Any part toward the front of the body is anterior; any part toward the back is posterior.
- Superior/inferior: Superior describes any part toward the person's head; inferior describes any part toward the person's feet.
- Frontal or coronal plane: That which divides the body vertically into two planes, anterior (the person's front) and posterior (the person's back).
- Sagittal or lateral plane: That which divides the body vertically into right and left planes.
- Transverse or axial plane: That which divides the body horizontally, into the superior (above the waist) and inferior (below the waist) planes.
- Medial/lateral: The terms medial and lateral refer to the midline, an imaginary line running down the middle of the body from the head to the ground, and creating right and left halves. Any part toward the midline is medial; any part away from the midline is lateral.
- Proximal/distal: Proximal refers to any part close to the trunk (chest, abdomen and pelvis); distal refers to any part away from the trunk and nearer to the extremities (arms and legs).

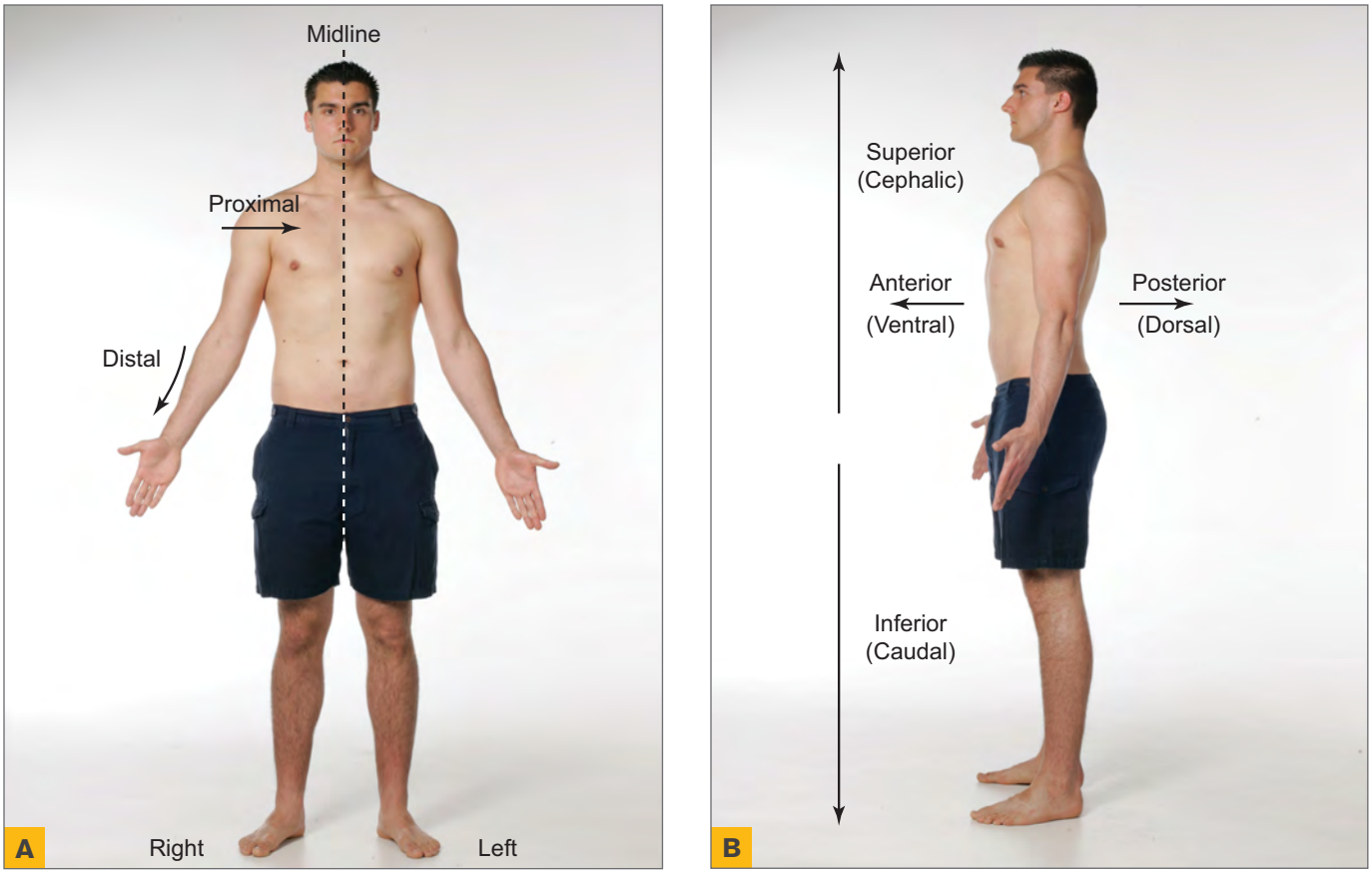

FIGURE 4-1, A–B **A,** *Any part of the body toward the midline is medial; any part away from the midline is lateral. Any part close to the trunk is proximal; any part away from the trunk is distal.* Courtesy of the Canadian Red Cross. **B,** *Anterior refers to the front part of the body; posterior refers to the back of the body. Superior refers to anything toward the head; inferior refers to anything toward the feet.* Courtesy of the Canadian Red Cross.

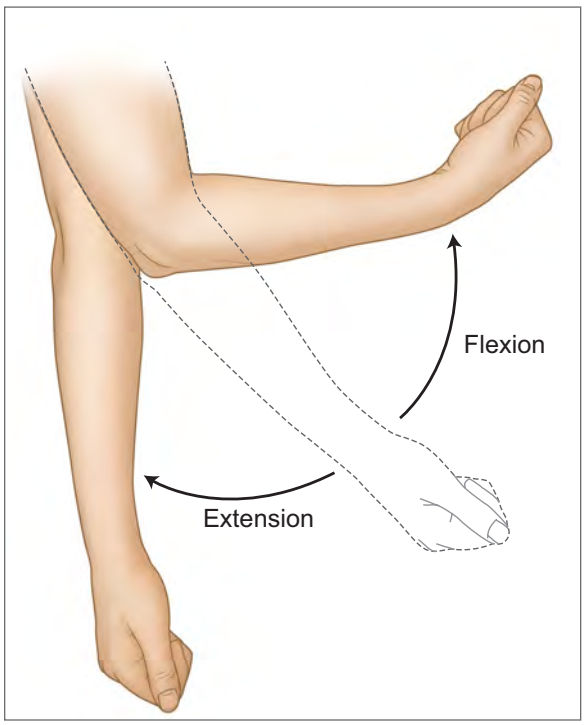

FIGURE 4-2 *Flexion and extension*

- Superficial/deep: Superficial refers to any part near the surface of the body; deep refers to any part far from the surface.
- Internal/external: Internal refers to the inside and external to the outside of the body.
- Right/left: Right and left always refer to the person's right and left, not yours.

Movements

Flexion is the term used to describe flexing or a bending movement, such as bending at the knee or making a fist. Extension is the opposite of flexion—that is, a straightening movement **(Figure 4-2)**. The prefix "hyper" used with either term describes movement beyond the normal position.

Positions

As a lay responder, you will often have to describe a person's position to the EMS dispatcher or other personnel. Using correct terms will help you communicate the extent of a

FIGURE 4-3, A–D *Body positions include:* **A,** *supine position;* **B,** *prone position;* **C,** *right and left lateral recumbent position; and* **D,** *Fowler's position.*

person's injury quickly and accurately. Terms used to describe body positions include:

- Anatomical position. This position, where the person stands with body erect and arms down at the sides, palms facing forward, is the basis for all medical terms that refer to the body.
- Supine position. The person is lying face-up on his or her back **(Figure 4-3, A)**.
- Prone position. The person is lying face-down on his or her stomach **(Figure 4-3, B)**.
- Right and left lateral recumbent position. The person is lying on the left or right side **(Figure 4-3, C)**.
- Fowler's position. The person is lying on his or her back, with the upper body elevated at a 45° to 60° angle **(Figure 4-3, D)**.

Body Cavities

The organs of the body are located within hollow spaces in the body referred to as body cavities **(Figure 4-4)**. The five major body cavities include the:

- Cranial cavity. Located in the head and is protected by the skull. It contains the brain.

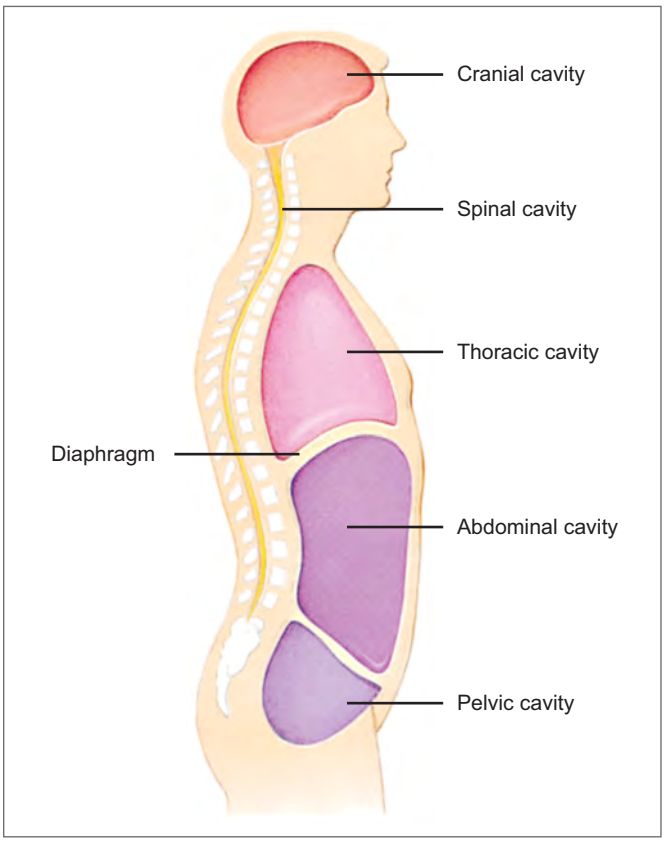

FIGURE 4-4 *The five major body cavities*

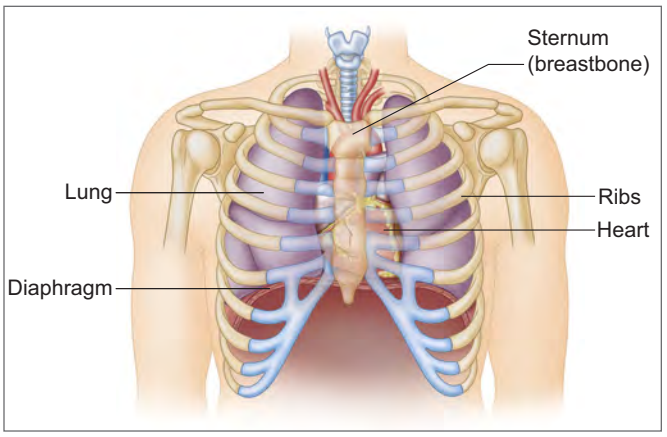

FIGURE 4-5 *The thoracic cavity is located in the trunk between the diaphragm and the neck.*

- Spinal cavity. Extends from the bottom of the skull to the lower back, is protected by the vertebral (spinal) column and contains the spinal cord.
- Thoracic cavity (chest cavity). Located in the trunk between the diaphragm and the neck, and contains the lungs and heart. The rib cage, sternum and the upper portion of the spine protect it. The diaphragm separates this cavity from the abdominal cavity **(Figure 4-5)**.
- Abdominal cavity. Located in the trunk below the ribs, between the diaphragm and the pelvis. It is described using four quadrants created by imagining a line from the breastbone down to the lowest point in the pelvis and another one horizontally through the navel. This creates the right and left, upper and lower quadrants. The abdominal cavity contains the organs of digestion and excretion, including the liver, gallbladder, spleen, pancreas, kidneys, stomach and intestines **(Figure 4-6)**.
- Pelvic cavity. Located in the pelvis, and is the lowest part of the trunk. Contains the bladder, rectum and internal female reproductive organs. The pelvic bones and the lower portion of the spine protect it.

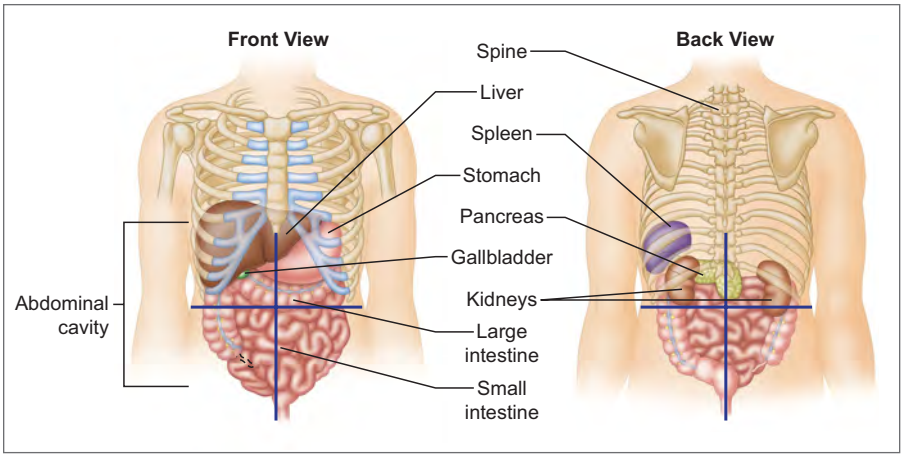

FIGURE 4-6 *The abdominal cavity contains the organs of digestion and excretion.*

Further description of the major organs and their functions are in the next section of this chapter and in later chapters.

BODY SYSTEMS

The human body is a miraculous machine. It performs many complex functions, each of which helps us live. The human body is made up of billions of different types of ***cells*** that contribute in special ways to keep the body functioning normally. Similar cells form together into ***tissues***, and these in turn form together into ***organs***. ***Vital organs*** such as the brain, heart and lungs are organs whose functions are essential for life. Each ***body system*** contains a group of organs and other structures that are specially adapted to perform specific body functions needed for life **(Table 4-1)**.

For example, the ***circulatory system*** consists of the heart, blood and blood vessels. This system keeps all parts of the body supplied with oxygen-rich blood. For the body to work properly, all of the following systems must work well together:

- Musculoskeletal
- Respiratory
- Circulatory
- Nervous
- Integumentary
- Endocrine
- Digestive
- Genitourinary

Table 4-1 **Body Systems**

SYSTEM	MAJOR STRUCTURES	PRIMARY FUNCTION	HOW THE SYSTEM WORKS WITH OTHER BODY SYSTEMS
Musculoskeletal System	Bones, ligaments, muscles and tendons	Provides body's framework; protects internal organs and other underlying structures; allows movement; produces heat; manufactures blood components	Provides protection to organs and structures of other body systems; muscle action is controlled by the nervous system
Respiratory System	Airway and lungs	Supplies the body with oxygen, and removes carbon dioxide and other impurities through the breathing process	Works with the circulatory system to provide oxygen to cells; is under the control of the nervous system
Circulatory System	Heart, blood and blood vessels	Transports nutrients and oxygen to body cells and removes waste products	Works with the respiratory system to provide oxygen to cells; works in conjunction with the urinary and digestive systems to remove waste products; helps give skin color; is under control of the nervous system
Nervous System	Brain, spinal cord and nerves	One of two primary regulatory systems in the body; transmits messages to and from the brain	Regulates all body systems through a network of nerve cells and nerves
Integumentary System	Skin, hair and nails	An important part of the body's communication network; helps prevent infection and dehydration; assists with temperature regulation; aids in production of certain vitamins	Helps to protect the body from disease-producing organisms; together with the circulatory system, helps to regulate body temperature under control of the nervous system; communicates sensation to the brain by way of the nerves
Endocrine System	Glands	Secretes hormones and other substances into the blood and onto skin	Together with the nervous system, coordinates the activities of other systems
Digestive System	Mouth, esophagus, stomach and intestines	Breaks down food into a usable form to supply the rest of the body with energy	Works with the circulatory system to transport nutrients to the body and remove waste products
Genitourinary System	Uterus, genitalia, kidneys and bladder	Performs the processes of reproduction; removes wastes from the circulatory system and regulates water balance	Assists in regulating blood pressure and fluid balance

The Musculoskeletal System

The ***musculoskeletal system*** is a combination of two body systems, the muscular and skeletal systems, and consists of the bones, muscles, ligaments and tendons. This system performs the following functions:

- Supports the body
- Protects internal organs
- Allows movement
- Stores minerals
- Produces blood cells
- Produces heat

The adult body has 206 bones. Bone is hard, dense tissue that forms the skeleton. The skeleton forms the framework that supports the body. Where two or more bones join, they form a joint. Fibrous bands called ligaments usually hold bones together at joints. Bones vary in size and shape, allowing them to perform specific functions. Tendons connect muscles to bone.

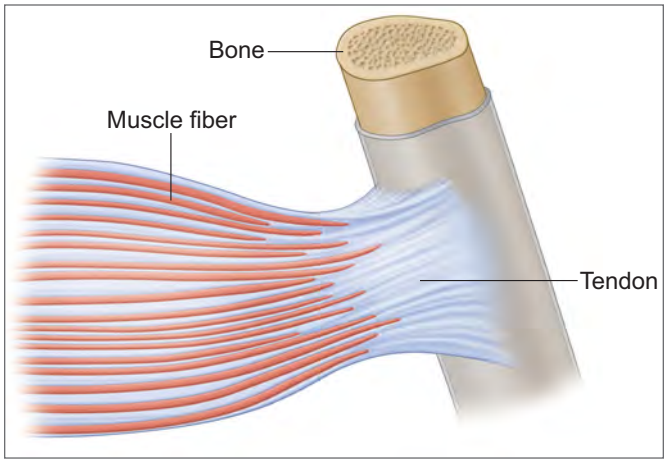

FIGURE 4-7 *Most of the body's muscles are attached to bones by tendons. Muscle cells, called fibers, are long and threadlike.*

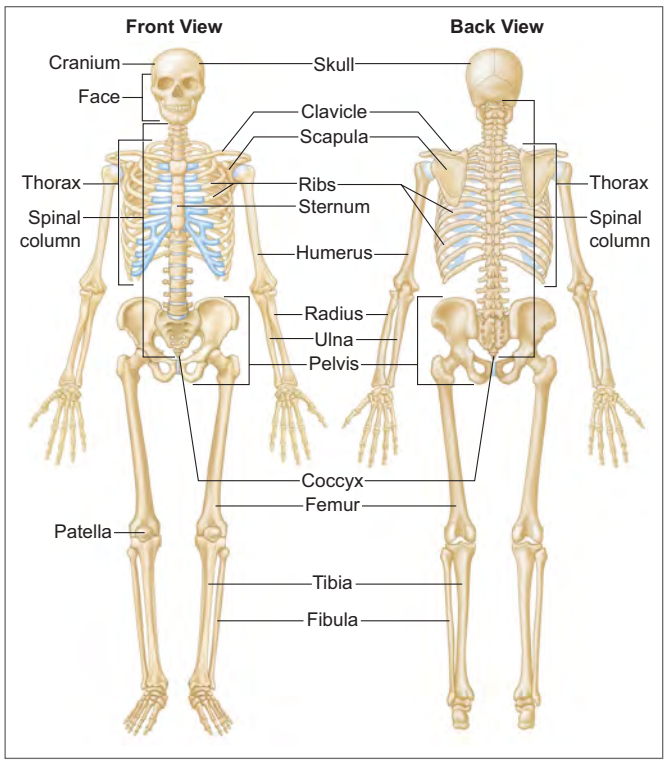

FIGURE 4-8 *The six parts of the skeleton are the skull, the spinal column, the thorax, the pelvis, and the upper and lower extremities.*

The Muscular System

The muscular system allows the body to move. Muscles are soft tissues. The body has more than 600 muscles, most of which are attached to bones by strong tissues called tendons **(Figure 4-7)**. Muscle tissue has the ability to contract (become shorter and thicker) when stimulated by a tiny jolt of an electrical or nerve impulse. Muscle cells, called fibers, are usually long and threadlike and are packed closely together in bundles, which are bound together by connective tissue.

There are three basic types of muscles, including:

- Skeletal. Skeletal, or voluntary, muscles are under the control of the brain and nervous system. These muscles help give the body its shape and make it possible to move when we walk, smile, talk or move our eyes.
- Smooth. Smooth muscles, also called involuntary muscles, are made of longer fibers and are found in the walls of tube-like organs, ducts and blood vessels. They also form much of the intestinal wall.
- Cardiac. Cardiac muscles are only found in the walls of the heart and share some of the properties of the other two muscle types: they are smooth (like the involuntary muscles) and striated (string-like, like the voluntary muscles). They are a special type of involuntary muscle that controls the heart. Cardiac muscles have the unique property of being able to generate their own impulse independent of the nervous system.

The Skeletal System

The skeleton is made up of six sections: the skull, spinal column, thorax, pelvis, and upper and lower extremities **(Figure 4-8)**.

- The skull: The skull is made up of two main parts: the cranium and the face. The cranium is made up of broad, flat bones that form the top, back and sides, as well as the front, which house the brain. Thirteen smaller bones make up the face, as well as the hinged lower jaw, or mandible, which moves freely.
- The spinal column: The spinal column, or spine, houses and protects the spinal cord. It is the principal support system of the body. The spinal column is made up of 33 small bones called vertebrae, 24 of which are movable. They are divided into five sections of the spine: 7 cervical (neck), 12 thoracic (upper back), 5 lumbar (lower back) and 9 sacral (lower spine with fused vertebrae) and coccyx (tailbone) **(Figure 4-9)**.
- The thorax: The thorax, also known as the chest, is made up of 12 pairs of ribs, the sternum (breastbone) and the thoracic spine. The 12 pairs of ribs are attached to the sternum with cartilage. Together, these structures protect the heart and lungs.
- The pelvis: The pelvis, also known as the hip bones, is made up of several bones, including the ilium, pubis and ischium. The pelvis supports the intestines, and contains the bladder and internal reproductive organs.
- Upper extremities: The upper extremities, or upper limbs, include the shoulders, upper arms, forearms, wrists and hands. The upper arm bone is the humerus, and the two bones in the forearm are the radius and the ulna. The upper extremities are attached to the trunk at the shoulder girdle, made up of the clavicle (collarbone) and scapula (shoulder blade).
- Lower extremities: The lower extremities, or lower limbs, consist of the hips, upper and lower legs, ankles and feet. They are attached to the trunk at the hip joints. The upper bone is the femur or thigh bone, and the bones in the lower leg are the tibia and fibula. The kneecap is a small triangular-shaped bone, also called the patella.
- Joints: Joints are the places where bones connect to each other **(Figure 4-10)**. Strong, tough bands called ligaments hold the bones at a joint together. Most joints allow movement but some are immovable, as in the skull, and others allow only slight movement, as in the spine. All joints have a normal range of motion—an area in which they can move freely without too much stress or strain.

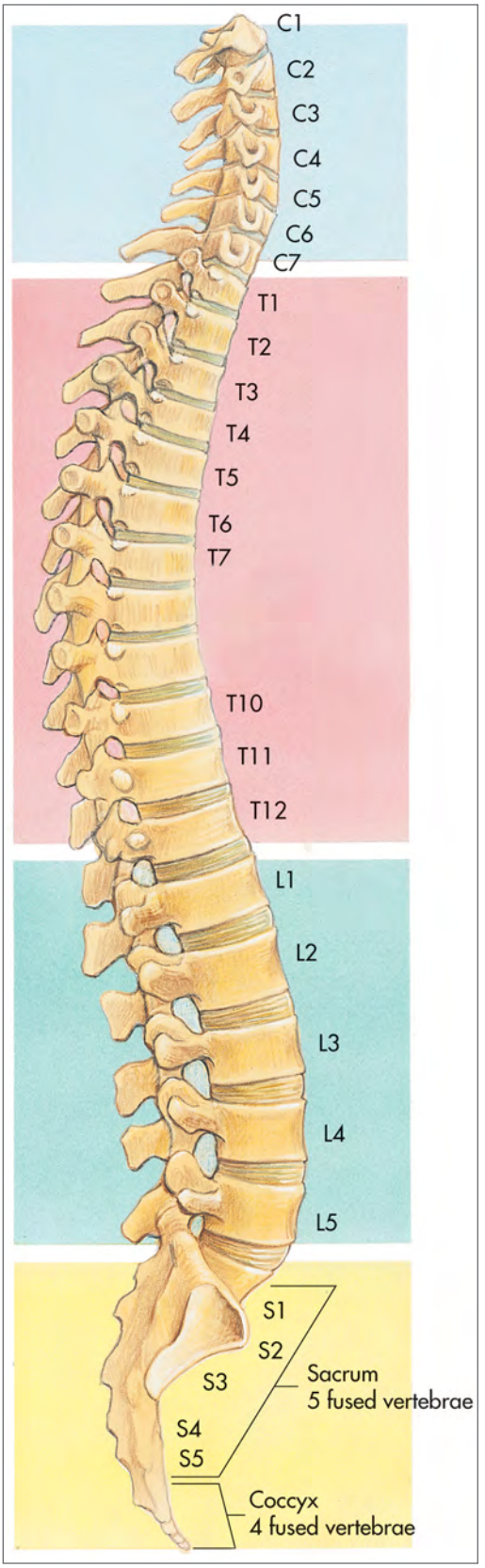

FIGURE 4-9 *The spinal column is divided into five sections: cervical, thoracic, lumbar, sacral and coccyx.*

What if...

A patient has an extra set of ribs? I heard that some people have 13 pairs of ribs, rather than 12. Does this affect care?

While it is true that a very small percentage of the population has a supernumerary or extra set of ribs (about 1 in 200 people), treatment for a person with 12 ribs versus 13 ribs will be no different because as a lay responder, you will be unable to tell how many pairs the person actually has.

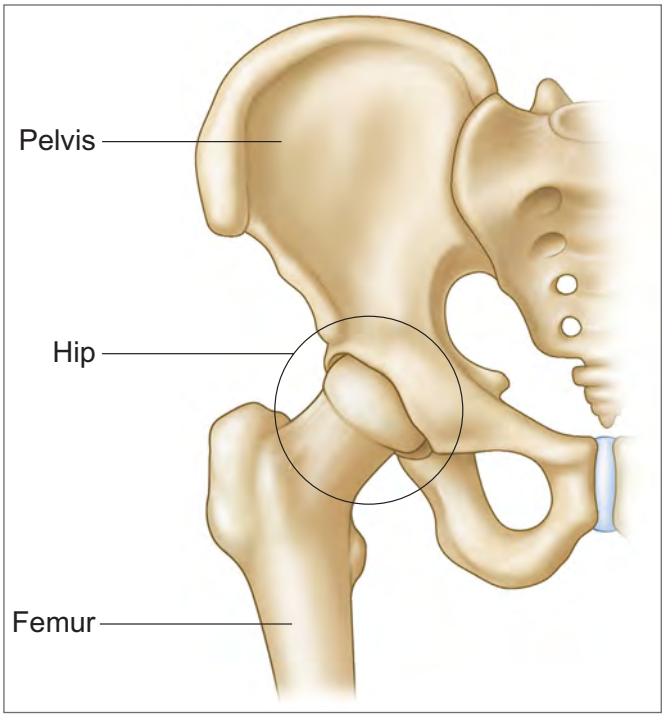

FIGURE 4-10 *Joints are the places where bones connect to each other.*

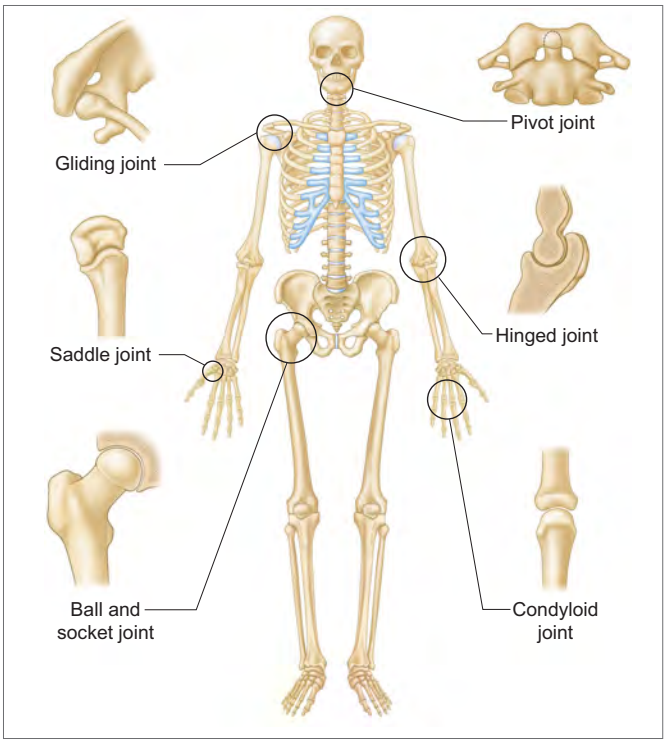

FIGURE 4-11 *Common types of movable joints*

The most common types of movable joints are the ball-and-socket joint, such as the hip and shoulder, and the hinged joint, such as the elbow, knee and finger joints. Different types of joints allow different degrees of flexibility and movement. Some other joint types include pivot joints (some vertebrae), gliding joints (some bones in the feet and hands), saddle joints (ankle) and condyloid joints (wrist) **(Figure 4-11)**.

The Respiratory System

The body can only store enough oxygen to last for a few minutes. The simple acts of inhalation and exhalation in a healthy person are sufficient to supply normal oxygen needs. If for some reason the oxygen supply is cut off, brain cells will begin to die in about 4 to 6 minutes. The ***respiratory system*** delivers oxygen to the body, and removes carbon dioxide from it, in a process called respiration.

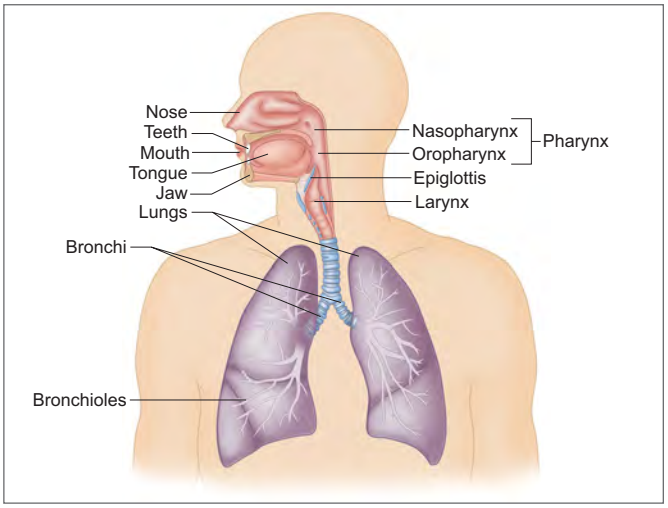

FIGURE 4-12 *The upper and lower airways*

Anatomy of the Respiratory System

Upper Airway

The upper airway includes the nose, mouth and teeth, tongue and jaw, pharynx (throat), larynx (voicebox) and epiglottis **(Figure 4-12)**. During inspiration (breathing in), air enters the body through the nose and mouth, where it is warmed and moistened.
Air entering through the nose passes through the nasopharynx (part of the throat posterior to the nose), and air entering by the mouth travels through the oropharynx. The air then continues down through the larynx, which houses the vocal cords. The epiglottis, a leaf-shaped structure, folds down over the top of the trachea during swallowing to prevent foreign objects from entering the trachea.

Lower Airway

The lower airway consists of the trachea (windpipe), bronchi, lungs, bronchioles and alveoli (see Figure 4-12). Once the air passes through the larynx, it travels down the trachea, the passageway to the lungs. The trachea is made up of rings of cartilage and is the part that can be felt at the front of the neck. Once air travels down the trachea, it reaches the two bronchi, which branch off, one to each lung. These two bronchi continue to branch off into smaller and smaller passages called bronchioles, like the branches of a tree.

At the ends of each bronchiole are tiny air sacs called alveoli, each surrounded by capillaries (tiny blood vessels). These are the site of carbon dioxide and oxygen exchange in the blood. The lungs are the principal organs of respiration and house millions of tiny alveolar sacs.

The structures involved in respiration in children and infants differ from those of adults **(Table 4-2)**. The structures are usually smaller or less developed in children and infants. Some of these differences are important when giving care. Because the structures, including the mouth and nose, are smaller, they are obstructed more easily by small objects, blood, fluids or swelling. It is important to pay special attention to a child or an infant to make sure the airway stays open.

Physiology of the Respiratory System

External respiration, or ventilation, is the mechanical process of moving air in and out of the lungs to exchange oxygen and carbon dioxide between body tissues and the environment. It is influenced primarily by changes in pressure inside the chest that cause air to flow into or out of the lungs. The body's chemical controls of breathing are dependent on the level of carbon dioxide in the blood. If carbon dioxide levels increase, the respiration rate increases automatically so that twice the amount of air is taken in until the carbon

Table 4-2 Pediatric Considerations in the Respiratory System

ANATOMICAL DIFFERENCES IN CHILDREN AND INFANTS AS COMPARED WITH ADULTS	PHYSIOLOGICAL DIFFERENCES AND IMPACT ON CARE
Structures are smaller.	Mouth and nose are more easily obstructed by small objects, blood or swelling.
Primarily breathe through nose (especially infants).	Airway is more easily blocked.
Tongue takes up proportionately more space in the pharynx.	Tongue can block airway more easily.
Presence of "baby teeth."	Teeth can be dislodged and enter airway.
Face shape and nose are flatter.	Can make it difficult to obtain a good seal of airway with resuscitation mask.
Trachea is narrower, softer and more flexible.	Trachea can close off if the head is tipped back too far or is allowed to fall forward.
Have more secretions.	Secretions can block airway.
Use abdominal muscles to breathe.	This makes it more difficult to assess breathing.
Chest wall is softer.	Tend to rely more heavily on diaphragm for breathing.
More flexible ribs.	Lungs are more susceptible to damage. Injuries may not be as obvious.
Breathe faster.	Can fatigue more quickly, leading to respiratory distress.

dioxide is eliminated. It is not the lack of oxygen but the excess carbon dioxide that causes this increase in respiratory rate. Hyperventilation may result from this condition. Internal respiration, or cellular respiration, refers to respiration at the cellular level. These metabolic processes at the cellular level, either within the cell or across the cell membrane, are carried out to obtain energy. This occurs by reacting oxygen with glucose to produce water, carbon dioxide and ATP (energy).

Structures That Support Ventilation

During inspiration, the thoracic muscles contract, and this moves the ribs outward and upward. At the same time, the diaphragm contracts and pushes down, allowing the chest cavity to expand and the lungs to fill with air. The intercostal muscles, the muscles between the ribs, then contract. During expiration (breathing out), the opposite occurs: the chest wall muscles relax, the ribs move inward, and the diaphragm relaxes and moves up. This compresses the lungs, causing the air to flow out. Accessory muscles are secondary muscles of ventilation and are used only when breathing requires increased effort. Limited use can occur during normal strenuous activity, such as exercising, but pronounced use of accessory muscles signals respiratory disease or distress. These muscles include the spinal and neck muscles. The abdominal muscles may also be used for more forceful exhalations. Use of abdominal muscles represents abnormal or labored breathing and is a sign of respiratory distress.

What if...

The person I am helping is having trouble breathing? Is it OK to loosen his or her clothing?

Yes, loosening restrictive clothing such as a belt, tie or shirt collar is an appropriate step that may aid in breathing. Essentially, breathing consists of two actions: inhalation and exhalation. During inhalation, the diaphragm contracts and is drawn downward, increasing the volume of the chest cavity. At the same time the muscles of the chest cavity move the ribs upward and outward, also causing the chest cavity and lungs to expand so air can rush into the lungs. Loosening restrictive clothing may aid in freeing up the movement of the chest cavity to assist in breathing.

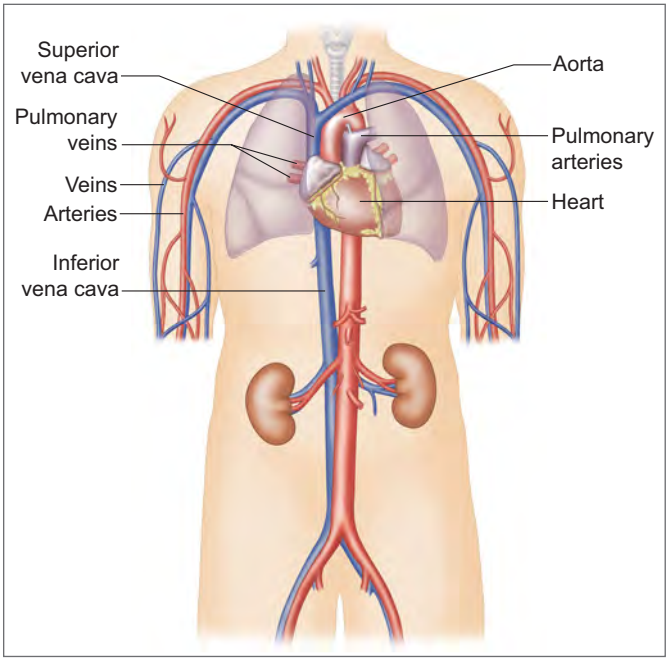

FIGURE 4-13 *The circulatory system consists of the heart, blood and blood vessels.*

Vascular Structures That Support Respiration

Oxygen and carbon dioxide are exchanged in the lungs through the walls of the alveoli and capillaries. In this exchange, oxygen-rich air enters the alveoli during each inspiration and passes through the capillary walls into the bloodstream. On each exhalation, carbon dioxide and other waste gases pass through the capillary walls into the alveoli to be exhaled.

The Circulatory System

The circulatory system consists of the heart, blood and blood vessels. It is responsible for delivering oxygen, nutrients and other essential chemical elements to the body's tissue cells, and removing carbon dioxide and other waste products via the bloodstream **(Figure 4-13)**.

Anatomy of the Circulatory System

The heart is a highly efficient, muscular organ that pumps blood through the body. It is about the size of a closed fist and is found in the thoracic cavity, between the two lungs, behind the sternum and slightly to the left of the midline.

The heart is divided into four chambers: right and left upper chambers called atria, and right and left lower chambers called ventricles **(Figure 4-14)**. The right atrium receives oxygen-depleted blood from the veins of the body and, through valves, delivers it to the right ventricle, which in turn pumps the blood to the lungs for oxygenation. The left atrium receives this oxygen-rich blood from the lungs and delivers it to the left ventricle, to be pumped to the body through the arteries. There are arteries throughout the body, including the blood vessels that supply the heart itself, which are the coronary arteries.

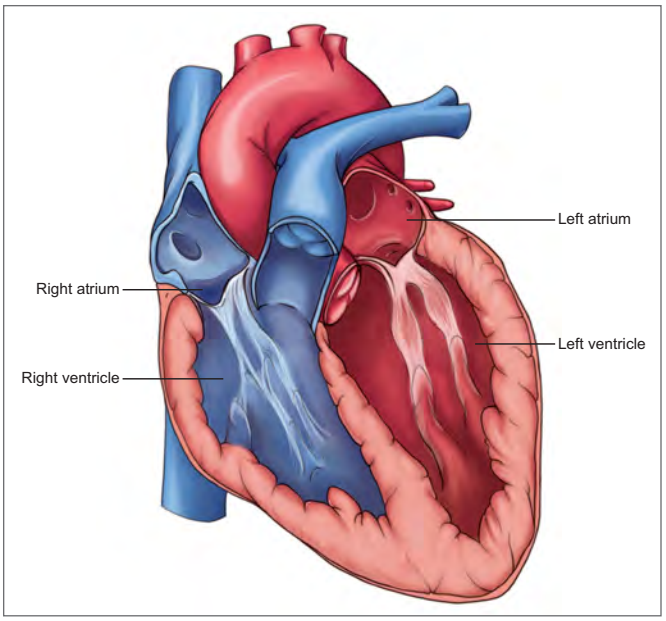

FIGURE 4-14 *The heart's four chambers*

There are four main components of blood: red blood cells, white blood cells, platelets and plasma. The red blood cells carry oxygen to the cells of the body and take carbon dioxide away. This is carried out by hemoglobin, on the surface of the cells. Red blood cells give blood its red color. White blood cells are part of the body's immune system and help to defend the body against infection. There are several types of white blood cells. Platelets are a solid component of blood used by the body to form blood clots when there is bleeding. Plasma is the straw-colored or clear liquid component of blood that carries the blood cells and nutrients to the tissues, as well as waste products away to the organs involved in excretion.

There are different types of blood vessels—arteries, veins and capillaries—that serve different purposes. Arteries carry blood away from the heart, mostly oxygenated blood. The exception is the arteries that carry blood to the lungs for oxygenation, the pulmonary arteries. The aorta is the major artery that leaves the heart. It supplies all other arteries with blood. As arteries travel farther from the heart, they branch into increasingly smaller vessels called arterioles. These narrow vessels carry blood from the arteries into capillaries **(Figure 4-15)**.

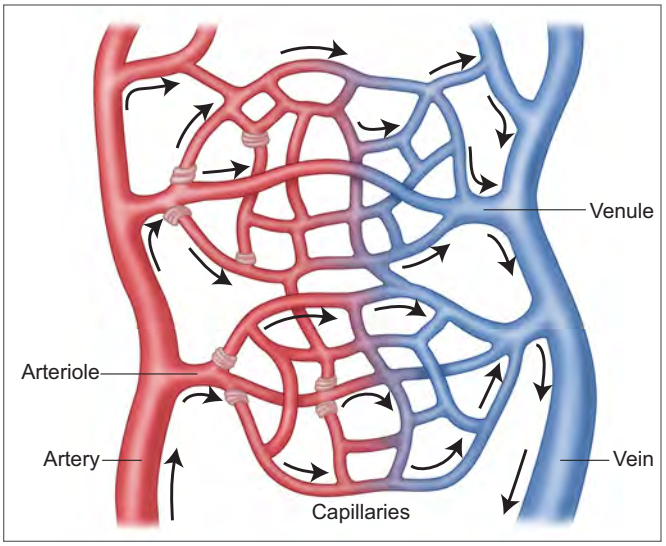

FIGURE 4-15 *As blood flows through the body, it moves through arteries, arterioles, capillaries, venules and veins.*

The venous system includes veins and venules. Veins carry deoxygenated blood back to the heart. The one exception is the pulmonary veins, which carry oxygenated blood away from the lungs. The superior and inferior vena cavae are the large veins that carry the oxygen-depleted blood back into the heart. Like arteries, veins also branch into smaller vessels the farther away they are from the heart. Venules are the smallest branches and are connected to capillaries. Unlike arterial blood, which is moved through the arteries by pressure from the pumping of the heart, veins have valves that prevent blood from flowing backward and help move it through the blood vessels.

Capillaries are the tiny blood vessels that connect the systems of arteries and veins. Capillary walls allow for the exchange of gases, nutrients and waste products between the two systems. In the lungs, there is exchange of carbon dioxide and oxygen in the pulmonary capillaries. Throughout the body, there is exchange of gases and nutrients and waste at the cellular level.

Physiology of the Circulatory System

As the heart pumps blood from the left ventricle to the body, this causes a wave of pressure we refer to as the pulse. We can feel this pulse at several points throughout the body. These "pulse points" occur where the arteries are close to the surface of the skin (e.g., carotid pulse point in the neck) and over a bone (e.g., brachial pulse point on the inside of the upper arm).

As the blood flows through the arteries, it exerts a certain force that we call blood pressure (BP). BP is described using two measures, the systolic pressure (when the left ventricle contracts) and the diastolic pressure (when the left ventricle is at rest). Oxygen and nutrients are delivered to cells throughout the body, and carbon dioxide and other wastes are taken away, all through the delivery of blood. This continuous process is called perfusion.

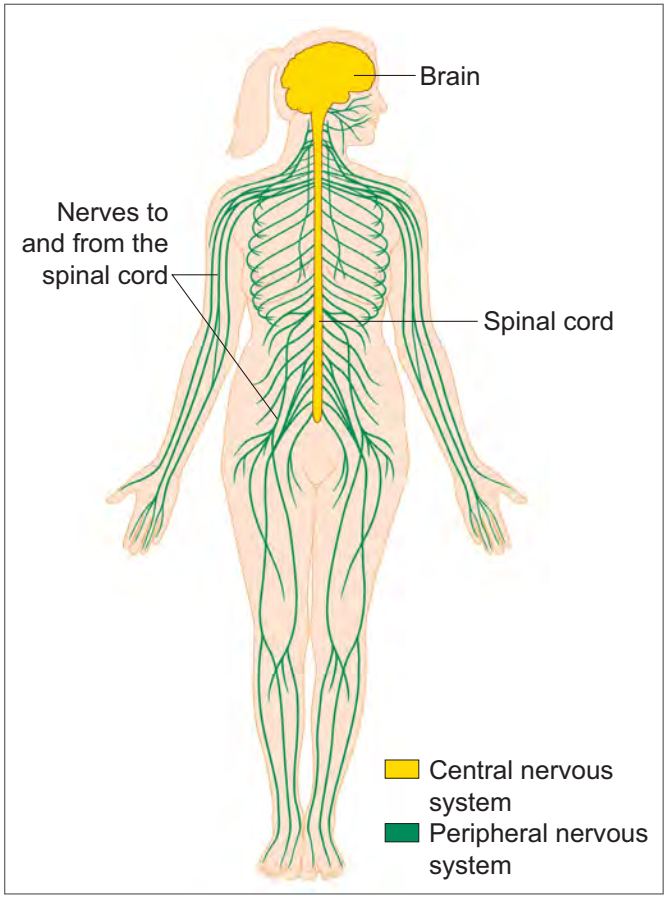

FIGURE 4-16 *The nervous system*

The primary gases exchanged in perfusion are oxygen and carbon dioxide. All cells require oxygen to function. Most of the oxygen is transported to the cells attached to the hemoglobin, but a tiny amount is also dissolved in the liquid component of the blood, the plasma. The major waste product in the blood, carbon dioxide, is transported mostly in the blood as bicarbonate and transported by the hemoglobin molecule. A tiny amount of carbon dioxide is dissolved in the plasma.

The Nervous System

The ***nervous system*** is the most complex and delicate of all the body systems. The center of the nervous system, the brain, is the master organ of the body and regulates all body functions. The primary functions of the brain are the sensory functions, motor functions and the integrated functions of consciousness, memory, emotions and language.

Anatomy of the Nervous System

The nervous system can be divided into two main anatomical systems: the central nervous system and the peripheral nervous system **(Figure 4-16)**. The central nervous system consists of the brain and spinal cord. Both are encased in bone (the brain within the cranium and the spinal cord within the spinal column), are covered in several protective layers called meninges and are surrounded by cerebrospinal fluid.

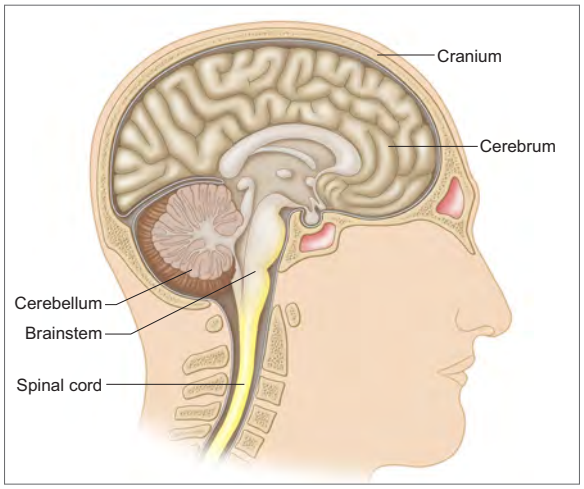

FIGURE 4-17 *The brain*

The brain itself can be further subdivided into the cerebrum, the largest and outermost structure; the cerebellum, also called "the small brain," which is responsible for coordinating movement; and the brainstem, which joins the rest of the brain with the spinal cord. The brainstem is the control center for several vital functions including respiration, cardiac function and vasomotor control (dilation and constriction of the blood vessels), and is the place of origin for most of the cranial nerves **(Figure 4-17)**.

The peripheral nervous system is the portion of the nervous system located outside the brain and spinal cord, which includes the nerves to and from the spinal cord. These nerves carry sensory information from the body to the spinal cord and brain, and motor information from the spinal cord and brain to the body.

Physiology of the Nervous System

The nervous system can also be divided into two functional systems, the voluntary and autonomic systems. The voluntary system controls movement of the muscles and sensation from the sensory organs. The autonomic system is involuntary and controls the involuntary muscles of the organs and glands. It can be divided into two systems: the sympathetic and parasympathetic systems. The sympathetic system controls the body's response to stressors such as pain, fear or a sudden loss of blood. These actions are sometimes referred to as the "fight-or-flight" response. The parasympathetic system works in balance with the sympathetic system by controlling the body's return to a normal state.

The Integumentary System

The ***integumentary system*** consists of the skin, hair, nails, sweat glands and oil glands. The skin separates our tissues, organs and other systems from the outside world.

The skin is the body's largest organ. It has three major layers, each consisting of other layers **(Figure 4-18)**. The epidermis, or outer layer, contains the skin's pigmentation, or melanin. The dermis, or second layer, contains the blood vessels that supply the skin, hair, glands and nerves, and is what contributes to the skin's elasticity and strength. The deepest layer, the subcutaneous layer, is made up of fatty tissue and may be of varying thicknesses depending on its positioning on the body.

The skin serves to protect the body from injury, and from invasion by bacteria and other disease-producing pathogens. It helps regulate fluid balance and body temperature. The skin also produces vitamin D and stores minerals. Blood supplies the skin with nutrients and helps provide its color. When blood vessels dilate (become wider), the blood circulates close to the skin's surface, making some people's skin appear flushed or red and making the skin feel warm. Reddening or flushing may not appear in darker skin. When blood vessels constrict (become narrower), not as much blood is close to the skin's surface, causing the skin to appear pale or ashen, and feel cool. This pallor can be found on the palms of the hands of darker-skinned people.

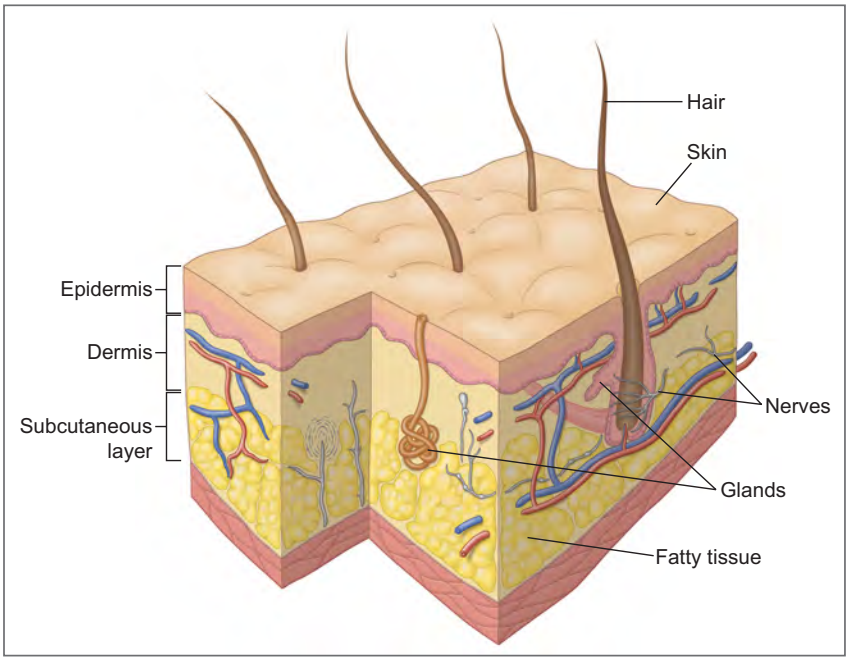

FIGURE 4-18 *The skin's major layers are the epidermis, the dermis and the subcutaneous layer.*

The Endocrine System

The ***endocrine system*** is one of the body's regulatory systems and is made up of ductless glands. These glands secrete hormones, which are chemical substances

that enter the bloodstream and influence activity in different parts of the body (e.g., strength, stature, hair growth and behavior).

Anatomy of the Endocrine System

There are several important glands within the body **(Figure 4-19)**. The hypothalamus and pituitary glands are in the brain. The pituitary gland, also referred to as the "master gland," regulates growth as well as many other glands. The hypothalamus secretes hormones that act on the pituitary gland. The thyroid gland is in the anterior neck, and regulates metabolism, growth and development. It also regulates nervous system activity. The adrenal glands are located on the top of the kidneys, and secrete several hormones, including epinephrine (adrenalin) and norepinephrine (noradrenaline). The gonads (ovaries and testes) produce hormones that control reproduction and sex characteristics. The pineal gland is a tiny gland in the brain that helps regulate wake/sleep patterns.

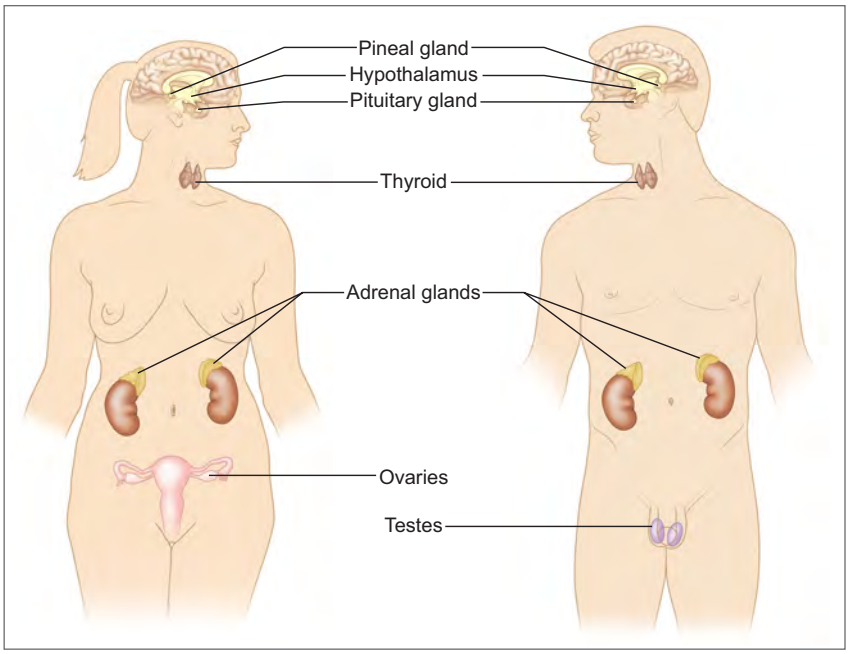

FIGURE 4-19 *The endocrine system in females and males*

Physiology of the Endocrine System

One of the critical functions controlled by the body's endocrine system is the control of blood glucose levels. The Islet of Langerhans cells, located in the pancreas, make and secrete insulin, which controls the level of glucose in the blood and permits cells to use glucose and glucagon (a pancreatic hormone), which raises the level of glucose in the blood.

The sympathetic nervous system is also regulated through the endocrine system. Adrenaline and noradrenaline, produced by the adrenal glands, cause multiple effects on the sympathetic nervous system. Effects include vasoconstriction (constricting of vessels), increased heart rate and dilation of smooth muscles, including those that control respiration.

The adrenal glands and pituitary gland are also involved in kidney function, and regulate water and salt balance. The body works to keep water and levels of electrolytes in the body in balance.

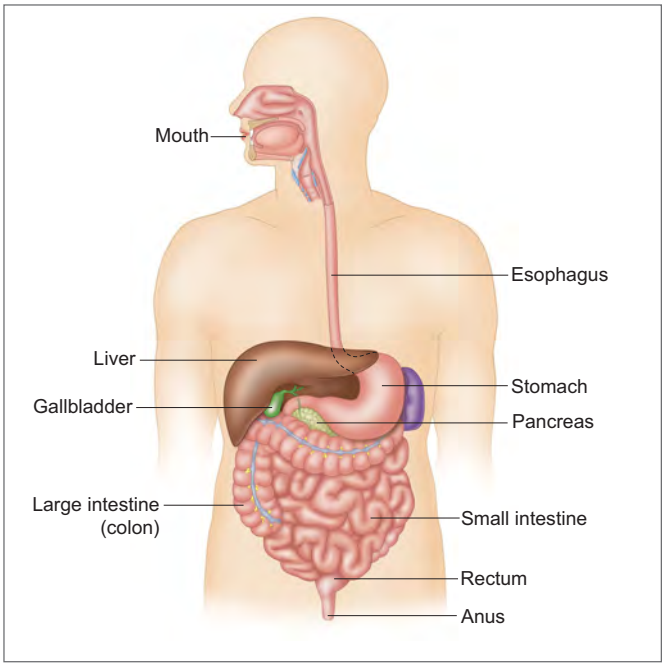

FIGURE 4-20 *The digestive system*

The Digestive System

The ***digestive system***, or gastrointestinal system, consists of the organs that work together to break down food, absorb nutrients and eliminate waste. It is composed of the alimentary tract (food passageway) and the accessory organs that help prepare food for the digestive process **(Figure 4-20)**.

Food enters the digestive system through the mouth and then the esophagus, the passageway to the stomach. The stomach and other major organs involved in this system are contained in the abdominal cavity. The stomach is the major organ of the digestive system, and the location where the majority of digestion, or breaking down, takes place. Food travels from the stomach into the small intestine, where further digestion takes place and nutrients are absorbed. The hepatic portal system collects blood from the small intestine, and transfers its nutrients and toxins to the liver for absorption and processing before continuing on to the heart. Waste products pass into the large intestine, or colon, where water is absorbed and the remaining waste is passed through the rectum and anus.

The liver is the largest solid organ in the abdomen and aids in the digestion of fat through the production of bile, among other processes. The gallbladder serves to store the bile. The pancreas secretes pancreatic juices that aid in the digestion of fats, starches and proteins. It is also the location of the Islet of Langerhans cells, where insulin and glucagon are produced.

Digestion occurs both mechanically and chemically. Mechanical digestion refers to the breaking down of food that begins with chewing, swallowing and moving the food through the alimentary tract, and ends in defecation. Chemical digestion refers to the chemical process involved when enzymes break foods down into components the body can absorb, such as fatty acids and amino acids.

The Genitourinary System

The Urinary System

Part of the ***genitourinary system***, the **urinary system** consists of organs involved in the elimination of waste products that are filtered and excreted from the blood. It consists of the kidneys, ureters, urethra and urinary bladder **(Figure 4-21)**.

The kidneys are located in the lumbar region behind the abdominal cavity just beneath the chest, one on each side. They filter wastes from the circulating blood to form urine. The ureters carry the urine from the kidneys to the bladder. The bladder is a small, muscular sac that stores the urine until it is ready to be excreted. The urethra carries the urine from the bladder and out of the body.

The urinary system removes wastes from the circulating blood, thereby filtering it. The system helps the body maintain fluid and electrolyte balance. This is achieved through buffers, which control the pH (amount of acid or alkaline) in the urine.

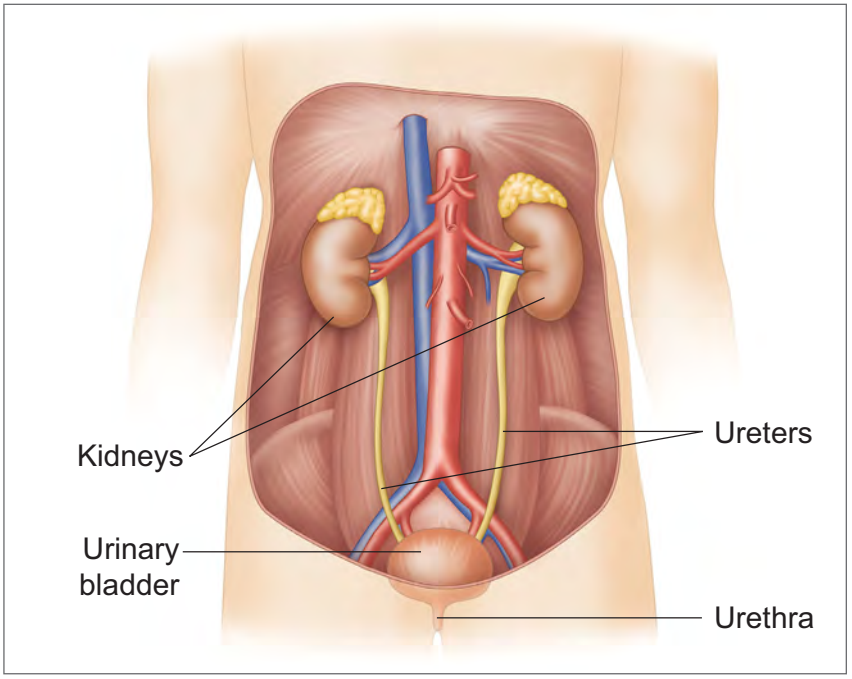

FIGURE 4-21 *The urinary system*

The Reproductive System

Part of the genitourinary system, the **reproductive system** of both men and women includes the organs for sexual reproduction.

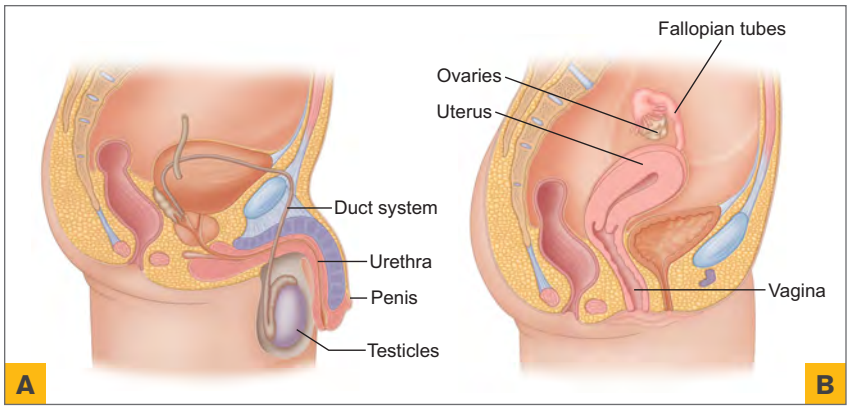

FIGURE 4-22, A–B **A,** *The male reproductive system;* **B,** *The female reproductive system*

The male reproductive organs are located outside of the pelvis and are more vulnerable to injury than those of the female. They include the testicles, a duct system and the penis **(Figure 4-22, A)**. Puberty usually begins between the ages of 10 and 14 and is controlled by hormones secreted by the pituitary gland in the brain. The testes produce sperm and testosterone, the primary male sex hormone. The urethra is part of the urinary system and transports urine from the bladder; it is also part of the reproductive system through which semen is ejaculated. The sperm contributes half the genetic material to an offspring.

The female reproductive system consists of the ovaries, fallopian tubes, uterus and vagina, and is protected by the pelvic bones **(Figure 4-22, B)**. Glands in the body, including the hypothalamus and pituitary glands in the brain, and the adrenal glands on the kidneys, interact with the reproductive system by releasing hormones that control and coordinate the development and functioning of the reproductive system. The menstrual cycle is approximately 28 days in length. Approximately midway through the cycle, usually a single egg is released; if united with a sperm, this egg will attach to the lining of the uterus, beginning pregnancy. The female's ovum contributes half the genetic material to the characteristics of a fetus.

INTERRELATIONSHIPS OF BODY SYSTEMS

Each body system plays a vital role in survival. All body systems work together to help the body maintain a constant healthy state. When the environment changes, body systems adapt to these new conditions. For example, the musculoskeletal system works harder during exercise; the respiratory and circulatory systems must also work harder to meet the body's increased oxygen demands. Body systems also react to the stresses caused by emotion, injury or illness.

Body systems do not work independently. The impact of an injury or a disease is rarely restricted to one body system. For example, a broken bone may result in nerve damage that will impair movement and feeling. Injuries to the ribs can make breathing difficult. If the heart stops beating for any reason, breathing will also stop.

In any significant injury or illness, body systems may be seriously affected. This may result in a progressive failure of body systems called shock. Shock results from the inability of the circulatory system to provide oxygenated blood to all parts of the body, especially the vital organs. Shock is covered in more detail in Chapter 9.

Generally, the more body systems involved in an emergency, the more serious the emergency is. Body systems depend on each other for survival. In serious injury or illness, the body may not be able to keep functioning. In these cases, regardless of your best efforts, the person may die.

SUMMARY

By having a fundamental understanding of body systems and how they function and interact, coupled with knowledge of basic anatomical terms, you will be more likely to accurately identify and describe injuries and illnesses. Fortunately, basic care is usually all you need to provide support for injured body systems until more advanced care is available. By learning the basic principles of care described in later chapters, you may be able to make the difference between life and death.

READY TO RESPOND?

Think back to Jim's injury in the opening scenario, and use what you have learned to respond to these questions:

1. Why did the call taker tell you to watch Jim's breathing?
2. Which body systems appear to have been affected by Jim's fall?

STUDY QUESTIONS

1. Complete the table with the correct system, structures or function(s).

SYSTEMS	STRUCTURES	FUNCTION
		Supplies the body with the oxygen it needs through breathing
	Heart, blood and blood vessels	
Integumentary		
Musculoskeletal		
		Regulates all body functions; a communication network

2. Match each term with the correct definition.

a. Anatomy
b. Organ
c. Cell
d. Body system
e. Tissue
f. Physiology
g. Vital organs

_____ Organs whose functions are essential to life, including the brain, heart and lungs

_____ A collection of similar cells that perform a specific function

_____ How living organisms function

_____ The basic unit of living tissue

_____ A group of organs and other structures that works together to carry out specific functions

_____ The study of body structures

_____ A collection of similar tissues acting together to perform a specific body function

In questions 3 through 9, circle the letter of the correct answer.

3. Which structure is not located in or part of the thoracic cavity?

a. The liver
b. The rib cage
c. The heart
d. The lungs

4. The two body systems that work together to provide oxygen to the body cells are—

   a. Musculoskeletal and integumentary.
   b. Circulatory and musculoskeletal.
   c. Respiratory and circulatory.
   d. Endocrine and nervous.

5. One of the main functions of the integumentary system is to—

   a. Transmit information to the brain.
   b. Produce blood cells.
   c. Prevent infection.
   d. Secrete hormones.

6. The function of the digestive system is to—

   a. Perform the process of reproduction.
   b. Transport nutrients and oxygen to body cells.
   c. Break down food into a form the body can use for energy.
   d. All of the above.

7. Which structure in the airway prevents food and liquid from entering the lungs?

   a. The trachea
   b. The epiglottis
   c. The esophagus
   d. The bronchi

8. If a person's use of language suddenly becomes impaired, which body system might be injured?

   a. The musculoskeletal system
   b. The nervous system
   c. The integumentary system
   d. The circulatory system

9. Which two body systems will react initially to alert a person to a severe cut?

   a. Circulatory, respiratory
   b. Respiratory, musculoskeletal
   c. Nervous, respiratory
   d. Circulatory, nervous

Answers are listed in Appendix B.

Checking the Person

5

You are riding along the bike trail on your way home. As you round a sharp curve, you abruptly swerve to avoid a person who is sprawled on the ground in front of you. You stop your bike and realize there is no one else around. You are going to have to figure out what kind of help the person needs, and fast.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Describe how to check for life-threatening conditions for an adult, child and infant.
- Identify and explain at least three questions you should ask the person or bystanders in an interview.
- Describe how to check for non-life-threatening conditions for an adult, child and infant.

After reading this chapter and completing the class activities, you should be able to:

- Demonstrate how to check an unconscious adult, child and infant.

KEY TERMS

Aspirate: Inhale blood, vomit, saliva or other foreign material into the lungs.

Head-tilt/chin-lift technique: Technique used to open a person's airway by pushing down on the forehead while pulling up on the bony part of the jaw.

Stoma: A surgical opening created in the front of the neck following surgery on the trachea to allow a person to breathe.

INTRODUCTION

In earlier chapters you learned that as a lay responder trained in first aid, you can make a difference in an emergency—you may even save a life. You learned how to recognize an emergency and to follow the emergency action steps: **CHECK—CALL—CARE**. More importantly, you learned that your decision to act can have a significant impact on the person's chance of survival. You can always do something to help, even if it is only calling 9-1-1 or the local emergency number.

In this chapter, you will learn more about how to check an injured or ill person for life-threatening conditions. You will also learn how to interview a conscious person and any bystanders, check for non-life-threatening conditions and give basic care in any emergency until emergency medical services (EMS) personnel arrive.

CHECKING FOR LIFE-THREATENING CONDITIONS

After checking the scene, you should check the person first for life-threatening conditions. Life-threatening conditions include:

- Unconsciousness.
- Trouble breathing.
- Absence of breathing.
- Severe bleeding.

The actions you will take depend on the conditions you find.

CHECKING FOR CONSCIOUSNESS

First, determine whether the person is conscious. Tap him or her on the shoulder and shout, "Are you okay?" Use the person's name if you know it. Speak loudly. For an infant, gently tap the infant's shoulder or flick the bottom of the foot. Do not jostle or move the person.

If the person is unconscious, the situation is urgent. Unconsciousness is *always* a life-threatening condition. Call 9-1-1 or the local emergency number immediately. Ideally, someone will be available to make the call while you care for the person.

As taught in Chapter 2, if you are in a situation in which you are the only person other than the injured or ill person, you should determine whether to call first or care first:

- *Call First,* that is, call 9-1-1 or the local emergency number before giving care for:
  - An unconscious adult or adolescent age 12 or older.
  - A witnessed sudden collapse of a child (1-12 years of age) or infant (<1 year of age).
  - An unconscious child or infant known to have heart (cardiac) problems.
- *Care First,* that is, give 2 minutes of care, then call 9-1-1 or the local emergency number for:
  - An unconscious person younger than 12 years of age who you did not see collapse.
  - Any person who had a drowning incident.

Refer to the section below on Placing an Unconscious Person in a H.A.IN.E.S Recovery Position for more information on what to do if you need to leave an unconscious person to call 9-1-1 or the local emergency number. For an unconscious or conscious person, after calling 9-1-1 or the local emergency number, return to the person, complete the check as described below and give care until EMS personnel arrive.

CHECKING AN UNCONSCIOUS PERSON

Once you or someone else has called 9-1-1 or the local emergency number, check for other life-threatening conditions. Always check to see if an unconscious person:

- Has an open airway.
- Is breathing normally.
- Is bleeding severely.

Airway

An open airway allows air to enter the lungs for the person to breathe. When someone is unconscious and lying on his or her back, the tongue may fall to the back of the throat and block the airway. If the airway is blocked, the person cannot breathe. A blocked airway is a life-threatening condition.

To open an unconscious person's airway:

- For an unconscious adult, push down on his or her forehead while pulling up on the bony part of the chin with two or three fingers of your other hand to lift the chin **(Figure 5-1, A–B)**. This procedure, known as the ***head-tilt/chin-lift technique***, moves the tongue away from the back of the throat, allowing air to enter the lungs.
- For an unconscious child, place one hand on the forehead and tilt the head slightly past a neutral position (the head and chin are neither flexed downward toward the chest nor extended backward) **(Figure 5-1, C)**.

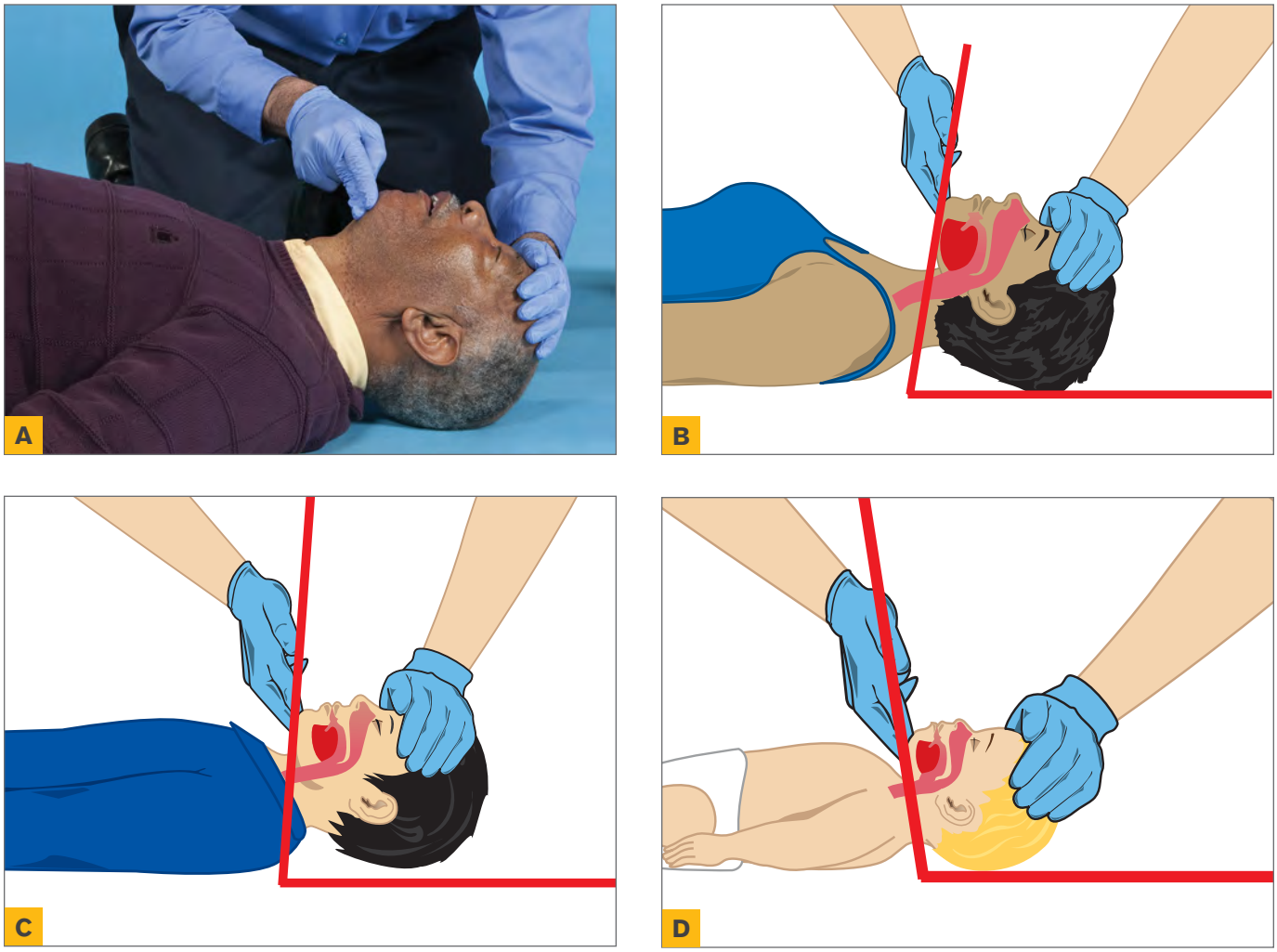

FIGURE 5-1, A–D **A,** *The head-tilt/chin-lift technique;* **B,** *Correct angle in an adult;* **C,** *Correct angle in a child;* **D,** *Correct angle in an infant.*

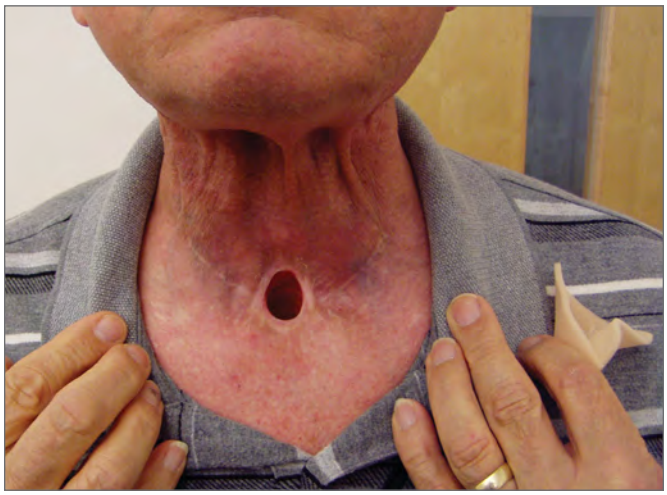

FIGURE 5-2 *A stoma is an opening in the neck that allows a person to breathe after certain surgeries on the airway.* Courtesy of the International Association of Laryngectomees.

- For an unconscious infant, place one hand on the forehead and tilt the head to a neutral position while pulling up on the bony part of the chin with two or three fingers of your other hand **(Figure 5-1, D)**.
- If you suspect that a person has a head, neck or spinal injury, carefully tilt the head and lift the chin just enough to open the airway.

Check the person's neck to see if he or she breathes through an opening. A person whose larynx was removed may breathe partially or entirely through a ***stoma*** instead of through the mouth **(Figure 5-2)**. It is important to recognize this difference in the way a person breathes. This will help you give proper care.

Most people with a stoma wear a medical ID tag or carry a card identifying this condition. You may not see the stoma immediately. You will probably notice the opening in the neck as you tilt the head back to check for breathing or move clothing. A stoma may be obscured by clothing, such as turtleneck, sweater or scarf.

Breathing

After opening the airway, you must check an unconscious person carefully for signals of breathing. Position yourself so that you can *look* to see if the person's chest clearly rises and falls. At the same time, *listen* for air escaping from the nose and mouth and *feel* for it against the side of your face. Look, listen and feel for breathing for no more than 10 seconds **(Figure 5-3)**.

FIGURE 5-3 *Check for breathing for no more than 10 seconds.*

Normal breathing is regular, quiet and effortless. A person does not appear to be working hard or struggling when breathing normally. This means that the person is not making noise when breathing, breaths are not fast (although it should be noted that normal breathing rates in children and infants are faster than normal breathing rates in adults) and breathing does not cause discomfort or pain.

In an unconscious adult, you may detect an irregular, gasping or shallow breath. This is known as an agonal breath. Do not confuse this for normal breathing. Care for the person as if there is no breathing at all. Agonal breaths do not occur frequently in children.

- If the person you are checking *is* breathing normally, his or her heart is beating and is circulating blood containing oxygen. In this case, maintain an open airway as you continue to look for other life-threatening conditions.
- If an unconscious adult is *not* breathing, or has irregular, gasping or shallow breaths (agonal breathing), assume a cardiac emergency. Start CPR chest compressions immediately. However, in the case of a known drowning or respiratory emergency, give two rescue breaths before starting chest compressions of CPR. You will learn about CPR in Chapter 6.
- If an unconscious child or infant is *not* breathing, and you did not witness the sudden collapse of the child or infant, give 2 rescue breaths. If, however, you witnessed the sudden collapse of a child, assume a cardiac emergency. Do not give 2 rescue breaths. Start CPR chest compressions immediately.
- Sometimes you may need to remove food, liquid or other objects that are blocking the person's airway. This may prevent the chest from rising when you attempt rescue breaths in the situations described above. You will learn how to recognize an obstructed airway and give care to the person in Chapter 7.

Giving Rescue Breaths to an Adult

To give rescue breaths to an adult who is not breathing as the result of a drowning or other respiratory cause, open the airway using the head-tilt/chin-lift technique and give 2 rescue breaths. Each rescue breath should last about 1 second and make the chest clearly rise. To give a rescue breath:

- Tilt the head back and lift the chin up to open the airway.
- Apply or utilize a breathing barrier if available (see Using CPR Breathing Barriers below).
- Pinch the nose shut then make a complete seal over the person's mouth.
- Blow in for about 1 second to make the chest clearly rise. Give 2 rescue breaths, one after the other, allowing the chest to clearly rise and then fall.

FIGURE 5-4, A–B **A,** *For a child, pinch the nose shut, then make a complete seal over the child's mouth as you would for an adult.* **B,** *For an infant, cover the mouth and nose.*

FIGURE 5-5 *CPR breathing barriers*

If the chest does not clearly rise after the first rescue breath, re-tilt the head and give another rescue breath to ensure the airway is open.

Giving Rescue Breaths to a Child or Infant

Giving rescue breaths to a child or an infant is performed in much the same way as giving a rescue breath to an adult **(Figure 5-4, A–B)**. However, there are some minor variations. These variations take into account the anatomical and physiological differences between an adult and a child or infant. For example, you will use less air in each breath than you would for an adult, and deliver breaths at a slightly faster rate. You also do not need to tilt a child's or infant's head as far back as an adult's to open the airway. Tipping the head back too far may obstruct the airway.

To give rescue breaths to a child or infant:

- Tilt the head back and lift the chin up.
- Apply or utilize a breathing barrier if available.
- For a child, pinch the nose shut, then make a complete seal over the child's mouth.
- For an infant, make a complete seal over the infant's mouth and nose.
- Blow in for about 1 second to make the chest clearly rise. Give two rescue breaths, one after the other, allowing the chest to clearly rise and then fall.

If the chest does not clearly rise after the first rescue breath, re-tilt the head and give another rescue breath to ensure the airway is open.

Using CPR Breathing Barriers

You might not feel comfortable with giving rescue breaths, especially to someone whom you do not know. Disease transmission is an understandable worry, even though the chance of getting a disease from giving rescue breaths is extremely small.

CPR breathing barriers, such as face shields and resuscitation masks, create a barrier between your mouth and nose and those of the injured or ill person **(Figure 5-5)**. This barrier can help to protect you from contact with blood and other body fluids, such as saliva, as you give rescue breaths. These devices also protect you from breathing the air that the person exhales.

Some devices are small enough to fit in your pocket or in the glove compartment of your car. You also can keep one in your first aid kit. If a face shield is used, switch to a resuscitation mask, if available, or when one becomes available. However, you should

not delay rescue breaths while searching for a CPR breathing barrier or by trying to learn how to use one.

Child and infant CPR breathing barriers are available and should be used to care for children and infants. Always use the appropriate equipment for the size of the injured or ill person. Stock your first aid kit accordingly so that you are always prepared.

Circulation

When an adult's heart stops beating, it is frequently from heart disease. In a child or infant, however, the heart is usually healthy. When a child's or an infant's heart stops, it usually is the result of a respiratory emergency. With a child or infant, it is very important to recognize breathing emergencies in order to act before the heart stops beating.

If an adult is not breathing, or has irregular, gasping or shallow breaths, and if the emergency is not the result of a nonfatal drowning or other respiratory cause such as a drug overdose, assume that the problem is a cardiac emergency. If an adult is not breathing, you must keep blood circulating in the person's body until emergency medical help arrives. To do this, you will have to begin CPR immediately.

After checking the airway and breathing, quickly check for severe bleeding by looking over the person's body from head to toe for signals such as blood-soaked clothing or blood spurting out of a wound **(Figure 5-6)**. Bleeding usually looks worse than it is. A small amount of blood on a slick surface or mixed with water usually looks like a large volume of blood. It is not always easy to recognize severe bleeding. Severe bleeding must be controlled as soon as possible. Make sure you protect yourself against disease transmission by keeping a barrier between you and the person's blood. You will learn more about controlling severe bleeding in Chapter 8.

What if...

I am giving care to an unresponsive adult who over the course of time becomes responsive and requests that I stop giving care?

As you learned in Chapter 3, an adult who is responsive and understands the implications of a decision he or she makes has the right to refuse all or part of the care given to him or her by another person during an emergency. If this happens, remain at the scene and try to make sure (either by yourself or via a family member or friend) the person understands the benefits of continued care and the risks of refusing care. If the person still chooses to refuse care, remember that failure to discontinue care would be considered battery or the unlawful touching of person without that person's permission, so you must stop giving care.

FIGURE 5-6 *Check for severe bleeding by scanning from head to toe.*

Special Considerations

Rescue Breaths

When giving rescue breaths while checking a person as described above, or while performing CPR, you may encounter certain special situations that affect how you give rescue breaths.

Air in the Stomach

When you are giving rescue breaths, be careful to avoid forcing air into the person's stomach instead of the lungs. Air in the stomach can cause **gastric distention**. Gastric distention can be serious because it can make the person vomit. If an unconscious person vomits, he or she may ***aspirate*** stomach contents or other material, such as saliva or

blood, which can hamper rescue breathing. Air in the stomach also makes it harder for the diaphragm—the large muscle that controls breathing—to move. This makes it harder for the lungs to fill with air.

Common causes of gastric distention include:

- Breathing into the person with too much force. This situation often occurs when the person's head is not tilted back far enough and the airway is not completely open.
- Breathing too quickly. This increases pressure in the airway, causing air to enter the stomach.
- Breathing into the person for longer than 1 second per breath.

To avoid forcing air into the person's stomach, keep the person's head tilted back. Take a normal breath and blow into the person's mouth, blowing just enough to make the chest clearly rise. Each rescue breath should last about 1 second for an adult, a child or an infant. Pause between breaths long enough for the air in the person to come out (watch for falling of the chest) and for you to take another breath.

FIGURE 5-7 *If the person vomits, roll him or her onto one side and wipe the mouth clean.*

FIGURE 5-8 *If you are unable to make a tight enough seal over the person's mouth, you can blow into the nose.*

Vomiting

When you give rescue breaths, the person may vomit, whether or not gastric distention occurs. If this happens, roll the person onto one side and wipe the mouth clean **(Figure 5-7)**. If possible, use a protective barrier, such as disposable gloves, gauze or even a handkerchief, when cleaning out the mouth. Then roll the person on his or her back again and continue giving care as necessary.

Mouth-to-Nose Breathing

Sometimes you may not be able to make an adequate seal over a person's mouth to perform a rescue breath. The person's jaw or mouth may be injured or your mouth may be too small to cover the person's. If so, give mouth-to-nose rescue breaths as follows:

- Maintain the head-tilt/chin-lift position with one hand on the forehead. Use your other hand to close the person's mouth, making sure to push on the chin and not on the throat.
- Seal your mouth tightly around the person's nose and breathe into the person's nose **(Figure 5-8)**.
- Open the person's mouth between breaths, if possible, to let air out.

Mouth-to-Stoma Breathing

To give rescue breaths to someone with a stoma, you must give breaths through the stoma instead of the mouth or nose **(Figure 5-9)**. Follow these steps:

- Expose his or her entire neck down to the breastbone. Remove anything covering the stoma that blocks the person's airway. Also, wipe away any secretions or blockages.

- Keep the airway in a neutral position; do not allow the chin or head to flex forward toward the chest or extend backward as you look, listen and feel for normal breathing with your ear over the stoma. To give rescue breaths, make an airtight seal with your lips (or breathing device) around the stoma or tracheostomy tube and blow in for about 1 second to make the chest clearly rise.
- Give rescue breaths into the stoma at the same rate you would breathe into the mouth when performing CPR. Your rescue breaths are successful if you see the chest rise and fall, and you hear and feel air escape from the stoma.
- If the chest does not rise and fall, the person's tracheostomy tube may be blocked. If this happens, remove the inner tube and give rescue breaths again.
- If you hear or feel air escaping from the person's mouth or nose, the person is a partial neck breather. In order to give rescue breaths to a partial neck breather, you must seal the person's mouth and nose with either your hand or a tight-fitting face mask so that air does not escape out of the mouth or nose when you give rescue breaths into the stoma or tracheostomy tube.

FIGURE 5-9 *To give rescue breaths into a stoma, make an airtight seal with your lips around the stoma, or use a round pediatric resuscitation mask and blow in to make the chest clearly rise.*

You might feel uncomfortable with the thought of giving mouth-to-stoma rescue breaths. An alternative method is to use a barrier device. For a neck breather or partial neck breather, a round pediatric mask may provide a better seal around a stoma or tracheostomy tube neck plate.

Suspected Head, Neck and Spinal Injuries

Be especially careful with a person who may have a head, neck or spinal injury. These kinds of injuries can result from such situations as a fall from a height greater than the person's height, an automobile collision or a diving mishap. If you suspect such an injury, try not to move the person's head, neck or spine. If a child is strapped into a car seat, do not remove him or her from it. To give rescue breaths to a person who you suspect has a head, neck or spinal injury:

- Minimize movement of the head and neck when opening the airway.
- Carefully tilt the head and lift the chin just enough to open the airway.

You will learn more about caring for head, neck and spinal injuries in Chapter 13.

Persons with Dentures

If you know or see that the person is wearing dentures, do not automatically remove them. Dentures help you give rescue breaths by supporting the person's mouth and cheeks during mouth-to-mouth breathing. If the dentures are loose, the head-tilt/chin-lift technique may help keep them in place. Remove the dentures only if they become so loose that they block the airway or make it difficult for you to give breaths.

Drowning Victims

Give 2 rescue breaths once you determine there is no breathing. If alone, you should give 2 minutes of care before calling 9-1-1 (Care First) for an unconscious person who has been submerged. Remember: *do not* enter the water unless you are specifically trained to perform in-water rescues. Get help from a trained responder, such as a lifeguard, to get the person out of the water as quickly and safely as possible. Chapter 20

FIGURE 5-10 *Place a person in a modified H.A.IN.E.S recovery position if you must leave to call 9-1-1 or cannot maintain an open and clear airway because of fluids or vomit.*

provides more information about safely responding to a drowning emergency.

Placing an Unconscious Person in a H.A.IN.E.S Recovery Position

In some cases, the person may be unconscious but breathing normally. Generally, that person should not be moved from a face-up position, especially if there is a suspected spinal injury. However, there are a few situations when you should move a person into a recovery position whether or not a spinal injury is suspected. Examples include situations where you are alone and have to leave the person (e.g., to call for help), or you cannot maintain an open and clear airway because of fluids or vomit. In these cases, you will need to carefully position the person in the modified High Arm in Endangered Spine (H.A.IN.E.S) recovery position to keep the airway open and clear **(Figure 5-10)**.

To place an adult or child in the modified H.A.IN.E.S recovery position:

- Kneel at the person's side.
- Reach across the body and lift the arm farthest from you up next to the head with the person's palm facing up.
- Take the person's arm closest to you and place it next to his or her side.
- Grasp the leg farthest from you and bend it up.
- Using your hand that is closest to the person's head, cup the base of the skull in the palm of your hand and carefully slide your forearm under the person's shoulder closest to you. Do not lift or push the head or neck.
- Place your other hand under the arm and hip closest to you.
- Using a smooth motion, roll the person away from you by lifting with your hand and forearm. Make sure the person's head remains in contact with the extended arm, and be sure to support the head and neck with your hand.
- Stop all movement when the person is on his or her side.
- Bend the knee closest to you and place it on top of the other knee so that both knees are in a bent position.
- Make sure the arm on top is in line with the upper body.
- If you must leave the person to get help, place the hand of the upper arm palm side down with the fingers under the head at the armpit of the extended lower arm.

FIGURE 5-11 *The infant recovery position*

An infant can be placed in a modified H.A.IN.E.S recovery position as would be done for an older child. You can also hold an infant in a recovery position by:

- Carefully positioning the infant face-down along your forearm.
- Supporting the infant's head and neck with your other hand while keeping the infant's mouth and nose clear.
- Keeping the head and neck slightly lower than the chest **(Figure 5-11)**.

CHECKING A CONSCIOUS PERSON

If the person you are checking is conscious and alert, you will proceed differently. Start by introducing yourself, getting the person's consent to give care and attempting to find out what happened. If at any time you must leave the person to call for help yourself, tell him or her that you are going to get help. Make the person as comfortable as possible.

Next, check the conscious person for life-threatening conditions, such as trouble breathing or severe bleeding, and give care as needed. Once you have determined that the person has no immediate life-threatening conditions, you can begin to check for other conditions that may need care.

Checking a conscious person with no immediate life-threatening conditions involves two basic steps:

- Interviewing the person and bystanders
- Checking the person from head to toe

Interviewing the Person and Bystanders

Ask the person and bystanders simple questions to learn more about what happened and to learn about the person's condition. These interviews should not take much time. Begin by asking the person's name. Using the person's name will make him or her feel more comfortable. Gather additional information by asking the person the following questions:

- What happened?
- Do you feel pain or discomfort anywhere?
- Do you have any allergies?
- Do you have any medical conditions, or are you taking any medication?

If the person feels pain, ask him or her where the pain is located and to describe it. You can often expect to get descriptions such as burning, crushing, throbbing, aching or sharp pain. Ask when the pain started and what he or she was doing when it began. Ask the person to rate his or her pain on a scale of 1 to 10 (1 being mild and 10 being severe).

Sometimes a person may not be able to provide you with the proper information. Children or infants may be frightened, the person may not speak your language, or the person may not be able to speak due to a medical condition or the use of a stoma. In these cases, ask family members, friends or bystanders what happened. They may be able to give you helpful information or help you communicate with the person **(Figure 5-12)**. You will learn more about communicating with people with special needs in Chapter 21.

FIGURE 5-12 *Bystanders may be able to give you helpful information about what happened if the injured or ill person is unable to communicate.*

What if...

I am trying to help a person who does not speak my same language? How can I get his or her consent or figure out what is wrong?

Good communication is necessary when assessing and giving care to a person of any age or ethnicity. When a language barrier exists, however, communication becomes challenging and can hamper care. When dealing with a person who does not speak your language, remember to be aware of your own cultural biases and preconceptions, and respect the person's cultural beliefs. Other strategies include trying to find a friend, family member or bystander who can serve as an interpreter; or when an interpreter is not present, speaking slowly and carefully in terms as simple as possible, using simple illustrations or gestures to allow the person to describe his or her situation, and using your own your own body to demonstrate the care you'd like to give. Keep in mind that certain gestures used in your own culture may have different meanings in other cultures.

Write down (or document) the information you learn during the interview so you do not forget it. If possible, have someone else write down the information or help you remember it. This information can be given to EMS personnel when they arrive. Providing this information may help EMS personnel to determine the type of medical care the person should receive.

Checking the Person from Head to Toe

Next you will need to thoroughly check the injured or ill person so that you do not overlook any problems. Visually check from head to toe. When checking a conscious person:

- Do not move any areas where there is pain or discomfort, or if you suspect a head, neck or spinal injury.
- Check the person's head by examining the scalp, face, ears, mouth and nose.
- Look for cuts, bruises, bumps or depressions.
- Watch for changes in consciousness. Notice if the person is drowsy or confused, or is not alert.
- Look for changes in the person's breathing. A healthy person breathes easily, quietly, regularly and without discomfort or pain. Young children and infants generally

FROM HORSES TO HELICOPTERS—A HISTORY OF EMERGENCY CARE

Emergency care originated during the French emperor Napoleon's campaigns in the late 1700s. The surgeon-in-chief for the Grand Army, Dominique Jean Larrey, became the first physician to try to save the wounded during battles instead of waiting until the fighting was over (Major R). Using horse-drawn litters, Larrey and his men dashed onto the battlefield in what became known as "flying ambulances."

By the 1860s, the wartime principles of emergency care were applied to emergencies in some U.S. cities. In 1878, a writer for *Harper's New Monthly Magazine* explained how accidents were reported to the police, who then notified a local hospital by a telegraph signal. He described an early hospital ambulance ride in New York City: "A well-kept horse was quickly harnessed to the ambulance; and as the surgeon took his seat behind, having first put on a jaunty uniform cap with gold lettering, the driver sprang to the box. . . . As we swept around corners and dashed over crossings, both doctor and driver kept up a sharp cry of warning to pedestrians" (Rideing WH). While booming industrial cities developed emergency transport systems, rural populations had only rudimentary services. In most small towns, the mortician had the only vehicle large enough to handle the litters, so emergency victims were just as likely to ride in a hearse to the hospital as in an ambulance (Division of Medical Sciences).

breathe faster than adults. Breathing that is not normal includes agonal breathing (irregular, gasping or shallow breaths); rasping, gurgling or whistling sounds; breathing that is unusually fast or slow; and breathing that is painful.

- Notice how the skin looks and feels. Skin can provide clues that a person is injured or ill. Feel the person's forehead with the back of your hand to determine if the skin feels unusually damp, dry, cool or hot. Note if it is red, pale or ashen.
- Look over the body. Think of how the body usually looks. If you are unsure if a body part or limb looks injured, check it against the other side of the body or the opposite limb. Ask again about any areas that hurt. Ask the person to move each part of the body that does not hurt. Ask the person to gently move his or her head from side to side. Check the shoulders by asking the person to shrug them. Check the chest and abdomen by asking the person to take a deep breath. Ask the person to move his or her fingers, hands and arms, and then the toes, legs and hips in the same way. Watch the person's face and listen for signals of discomfort or pain as you check for injuries.

What if...

I am checking a person who reports no pain, but is unwilling to move any of his or her joints?

A person who is unwilling to move a joint should not be forced to move the joint, regardless of whether he or she reports any pain. The person likely has a reason for not moving the joint even if he or she cannot express it. In this case consider the possibility of broken bones, and call 9-1-1 or the local emergency number.

Cars gave Americans a faster system of transport, but over the next 50 years, car collisions also created the need for more emergency vehicles. In 1966, a major report questioned the quality of emergency services (Division of Medical Sciences). Dismayed at the rising death toll on the nation's highways, the U.S. Congress passed laws in 1966 and 1973 ordering the improved training of ambulance workers and emergency department staffs, an improved communication network and the development of regional units with specialized care.

Today, the telegraph signal has been replaced by the telephone and mobile phone. More than 99 percent of the U. S. population has access to at least basic 9-1-1 services, with many connected to the enhanced 9-1-1 system that displays the caller's name, address and phone number, even if the caller cannot speak. Ambulance workers have changed from coachmen to trained medical professionals who can provide life-saving care at the scene. Horses have been replaced by ambulances and helicopters equipped to provide the most advanced prehospital care available.

The EMS system has also expanded in sheer numbers and in services. Today, there are more than 850,000 EMS providers delivering care. In addition, hospitals and regional specialty centers for such things as heart attack, stroke, burns, trauma and pediatric care have become more integrated with the EMS system to ensure quality care. In two centuries, the EMS system has evolved from horses to helicopters. Imagine what changes the next century will bring.

SOURCES: Division of Medical Sciences, National Academy of Sciences. National Research Council: Accidental Death and Disability: The Neglected Disease of Modern Society, Washington, D.C., September 1966.

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FIGURE 5-13 *Medical ID tags and bracelets can provide important information about the person.* Courtesy of the Canadian Red Cross.

- Look for a medical identification (ID) tag, bracelet or necklace on the person's wrist, neck or ankle **(Figure 5-13)**. A tag will provide medical information about the person, explain how to care for certain conditions and list whom to call for help. For example, a person with diabetes may have some form of medical ID tag, bracelet or necklace identifying this condition.

When you have finished checking, if the person can move without pain and there are no other signals of injury or illness, have him or her attempt to rest in a sitting position or other comfortable position. When the person feels ready, help him or her to stand up. Determine what additional care is needed and whether to call 9-1-1 or the local emergency number.

Special Considerations

Checking Children and Infants

Children (age 1 to 12) and infants (age 0 to 1) receive care that is slightly different from that given to adults. As discussed earlier, checking a child or infant for life-threatening conditions follows the same steps as for an adult.

If a parent or guardian is present, remember to get consent to give care. Ask a parent or guardian to help calm the child or infant. Communicate clearly with the parent or guardian and the child. Explain what you are going to do. Parents can also tell you if the child has a medical condition that you should be aware of.

FIGURE 5-14 *Check a child while the parent or guardian holds him or her.*

When checking a child for non-life-threatening conditions, observe the child before touching him or her. Look for signals that indicate changes in consciousness, any trouble breathing and any apparent injuries or conditions. All signals may change as soon as you touch the child because he or she may become anxious or upset.

Place yourself at eye level with the child. Talk slowly and in a friendly manner. Use simple words, and ask questions that the child can answer easily. Often a parent or guardian will be holding a crying child in his or her lap. Check the child while the parent or guardian holds him or her. When you begin the exam, begin at the toes instead of the head. This will be less emotionally threatening. Checking in this order gives the child the opportunity to get used to the process and allows him or her to see what is going on **(Figure 5-14)**. You will learn more about communicating with children and their parents in Chapter 21.

Checking Older Adults

When checking older adults (generally considered those older than 65 years of age), attempt to learn the person's name and use it when you speak to him or her. Consider using Mrs., Mr. or Ms. as a sign of respect. Place yourself at the person's eye level so that he or she

can see and hear you more clearly **(Figure 5-15)**. If the person seems confused, it may be the result of vision or hearing loss. Someone who needs glasses to see is likely to be very anxious without them. If he or she usually wears eyeglasses and cannot find them, try to locate them. Notice whether the person has a hearing aid. Speak a little more slowly and clearly, and look at the person's face while you talk. If the person is truly confused, try to find out if the confusion is the result of the injury or a condition he or she already has. Information from family members or bystanders is frequently helpful in this situation. The person may be afraid of falling, so if he or she is standing, offer an arm or hand. Remember that an older person may need to move very slowly.

FIGURE 5-15 *Speak to an older adult at eye level so that he or she can see and hear you more clearly.*

Try to find out what medications the person is taking and if he or she has any medical conditions so that you can tell EMS personnel. Look for a medical ID bracelet or necklace, which often provides you with the person's name and address as well as information about any specific condition the person has. Be aware that an older adult may not recognize the signals of a serious condition. He or she may also minimize any signals for fear of losing his or her independence or being placed in a nursing home. You will learn more about special considerations for older adults in Chapter 21.

Care for a Conscious Person

Once you complete the head-to-toe exam, give care for any specific injuries you find. To give care for the person until EMS personnel arrive, follow these general guidelines:

- *Do no* further harm.
- Monitor the person's level of consciousness and breathing. A change in the person's condition may be a signal of a more serious illness or injury. A condition that may not appear serious at first may become serious over time.
- Help the person rest in the most comfortable position.
- Keep the person from getting chilled or overheated.
- Comfort and reassure the person, but do not provide false hope.
- Give any specific care as needed.

CHECKING FOR SHOCK

When someone is injured or becomes suddenly ill, normal body functions may be interrupted. In cases of minor injury or illness, the interruption is brief and the body is able to compensate quickly. With more severe injuries or illness, however, the body is unable to meet its demand for oxygen. The condition in which the body fails to circulate oxygen-rich blood to all the parts of the body is known as shock. If left untreated, shock can lead to death. Always look for the signals of shock whenever you are giving care. These signals include:

- Restlessness or irritability.
- Altered level of consciousness.
- Nausea or vomiting.
- Pale, ashen or grayish, cool, moist skin.
- Rapid breathing and pulse.
- Excessive thirst.

Be aware that the early signals of shock may not be present in young children and infants. However, because children are smaller than adults, they are more susceptible to shock. You will learn more about how to recognize and treat a person for shock in Chapter 9.

SUMMARY

Many variables affect dealing with emergencies. By following the emergency action steps, **CHECK—CALL—CARE**, you can ensure that the person receives the best possible care.

Check the person in the position he or she is found, if possible. Determine whether the person has any life-threatening conditions. Life-threatening conditions include unconsciousness, trouble breathing, absence of breathing and severe bleeding. Call 9-1-1 or the local emergency number if the person appears to have any of these signals.

If you find no life-threatening conditions, interview the person and any bystanders and then perform a head-to-toe examination (toe-to-head for a child or infant) to find and care for any injuries or signals of illness. If you do not give care, these conditions could become life threatening.

READY TO RESPOND?

Think back to the accident encountered in the opening scenario, and use what you have learned to respond to these questions:

1. What might you do to make the scene safe for you to check the person?
2. If the person on the bike trail does not respond when you tap on his or her shoulder, what would your next step be?
3. If the person on the trail is conscious, breathing and has no severe bleeding, what should you do next?

STUDY QUESTIONS

1. Label each situation listed as either.

    a. Call first b. Care first

_____ Any person who has experienced a non-fatal drowning

_____ A witnessed sudden collapse of a child or infant

_____ An unconscious adult person age 12 or older

_____ An unwitnessed collapse of an unconscious person younger than 12 years old

_____ An unconscious child or infant known to be at a high risk for heart problems

2. List four life-threatening conditions.

Use the following scenario to answer questions 3 and 4.

Several people are clustered in the middle of a street. A car is stopped in the right lane. As you approach the group, you can see a mangled bicycle lying on the pavement. You see your neighbor sitting next to it. No one seems to be doing anything. You approach your neighbor and kneel next to him.

3. What type of dangers could be present at the scene? What could you do to make the scene safer?

4. You determine that your neighbor has no life-threatening emergencies. What should you do next?

Use the following scenario to answer question 5.

You walk into your boss's office for a meeting. You see a cup of coffee spilled on the desk. You find him lying on the floor, motionless.

5. Based on the scenario above, number the following actions in order:

_____ Open the airway.

_____ Check the scene.

_____ Check for breathing and severe bleeding.

_____ Check for consciousness.

_____ Call 9-1-1 or the local emergency number.

In questions 6 through 10, circle the letter of the correct answer.

6. What is the purpose of your initial check of the person?

    a. To check for minor injuries
    b. To determine whether any life-threatening conditions are present
    c. To get consent from the person before giving care
    d. To ask for information about the cause of the injury or illness

7. Once you determine the person has no life-threatening conditions, you should—
   a. Call 9-1-1 or the local emergency number.
   b. Transport the person to the nearest hospital.
   c. Check for other injuries or conditions that could become life threatening if not cared for.
   d. Check for consciousness.
8. Before beginning a check for life-threatening conditions, you should first—
   a. Move the person to a convenient location for care.
   b. Check the scene.
   c. Call 9-1-1 or the local emergency number.
   d. a and b
9. After checking for consciousness, you determine that the person is unconscious. What should you do next?
   a. Have a bystander call 9-1-1 or the local emergency number.
   b. Give 2 rescue breaths.
   c. Check for breathing and severe bleeding.
   d. Begin a check for non-life-threatening conditions.
10. When you give rescue breaths, how much air should you breathe into the person?
   a. Enough to make the stomach clearly rise
   b. Enough to make the chest clearly rise
   c. Enough to fill the person's cheeks
   d. As much as you can breathe in 2 seconds

Answers are listed in Appendix B.

CHECKING AN INJURED OR ILL ADULT

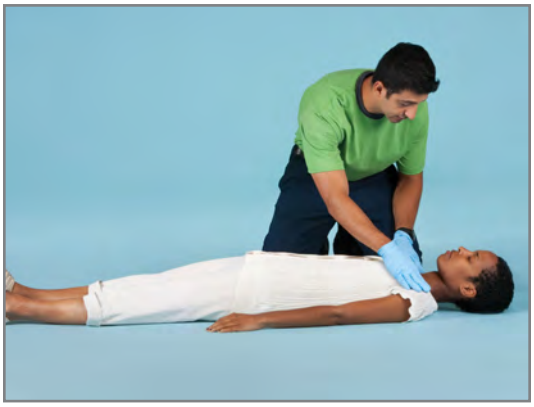
APPEARS TO BE UNCONSCIOUS

TIP: *Use disposable gloves and other PPE.*

AFTER CHECKING THE SCENE FOR SAFETY, CHECK THE PERSON.

1 CHECK FOR RESPONSIVENESS

Tap the shoulder and shout, "Are you okay?"



2 CALL 9-1-1

If no response, **CALL** 9-1-1 or the local emergency number.

- If an unconscious person is face-down, roll him or her face-up keeping the head, neck and back in a straight line.

If the person responds, obtain consent and **CALL** 9-1-1 or the local emergency number for any life-threatening conditions.

CHECK the person from head to toe and ask questions to find out what happened.

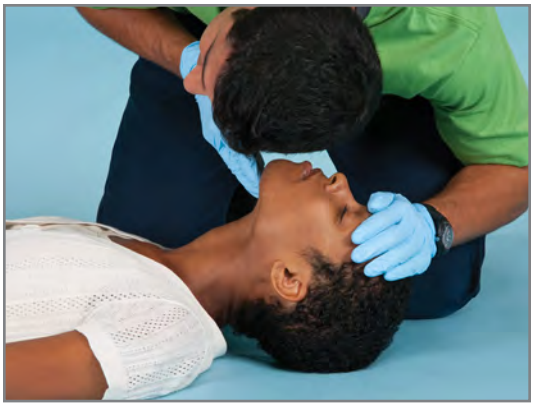
3 OPEN THE AIRWAY

Tilt head, lift chin.

4 CHECK FOR BREATHING

CHECK for no more than **10** seconds.

- Occasional gasps are not breathing.



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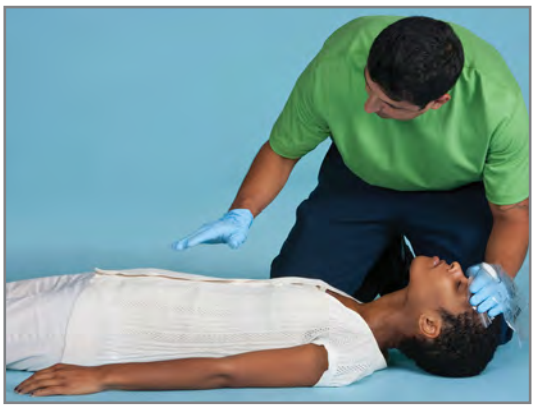
5 QUICKLY SCAN FOR SEVERE BLEEDING



WHAT TO DO NEXT

- IF THERE IS NO BREATHING—Perform CPR or use an AED (if AED is immediately available).
- IF BREATHING—Maintain an open airway, and monitor breathing and for any changes in condition.

CHECKING AN INJURED OR ILL CHILD OR INFANT

APPEARS TO BE UNCONSCIOUS

TIP: *Use disposable gloves and other PPE. Get consent from a parent or guardian, if present.*

AFTER CHECKING THE SCENE FOR SAFETY, CHECK THE CHILD OR INFANT.

1 CHECK FOR RESPONSIVENESS

Tap the shoulder and shout, "Are you okay?"
For an infant, you may flick the bottom of the foot.

2 CALL 9-1-1

If no response, **CALL** 9-1-1 or the local emergency number.

- If an unconscious infant is face-down, roll him or her face-up supporting the head, neck and back in a straight line.

If ALONE, give about 2 minutes of CARE, then **CALL** 9-1-1.

If the child or infant responds, **CALL** 9-1-1 or the local emergency number for any life-threatening conditions and obtain consent to give **CARE**.

CHECK the child from head to toe and ask questions to find out what happened.

3 OPEN THE AIRWAY

Tilt head back slightly, lift chin.

Continued on next page

Continued

4 CHECK FOR BREATHING

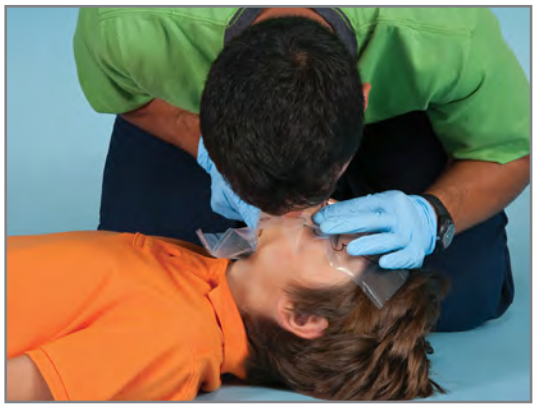
CHECK for no more than **10** seconds.

- Occasional gasps are not breathing.
- Infants have periodic breathing, so changes in breathing pattern are normal for infants.

5 GIVE 2 RESCUE BREATHS

If no breathing, give 2 rescue breaths.

- Tilt the head back and lift the chin up.
- Child: pinch the nose shut, then make a complete seal over child's mouth.
- Infant: Make complete seal over infant's mouth and nose.
- Blow in for about 1 second to make the chest clearly rise.
- Give rescue breaths, one after the other.



TIPS:

- *If you witnessed the child or infant suddenly collapse, skip rescue breaths and start CPR.*
- *If the chest does not rise with rescue breaths, retilt the head and give another rescue breath.*

6 QUICKLY SCAN FOR SEVERE BLEEDING

WHAT TO DO NEXT

- IF THE CHEST DOES NOT RISE AFTER RETILTING THE HEAD—Give **CARE** for unconscious choking.
- IF THERE IS NO BREATHING—Perform CPR or use an AED (if AED is immediately available).
- IF BREATHING—Maintain an open airway. Monitor breathing and for any changes in condition.

Part Three

Life-Threatening Emergencies

6

Cardiac Emergencies

As you come out of your house to run a quick errand one hot summer afternoon, you see your neighbor, Mr. Getz, cheerfully mowing his lawn. He has been ill lately, so you are glad to see him out and about. When you return a half-hour later, however, you notice Mr. Getz sprawled face-down on the grass. You run over to help.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- List the signals of a heart attack for both men and women.
- Describe the care for a person having a heart attack.
- Identify the links in the Cardiac Chain of Survival.
- Describe the role of CPR in cardiac arrest.
- Describe defibrillation and how it works.
- Describe the general steps for the use of an AED.
- List the precautions for the use of an AED.

After reading this chapter and completing the class activities, you should be able to:

- Demonstrate how to perform CPR for an adult, child and infant.
- Demonstrate how to use an AED to care for an adult, child and infant in cardiac arrest.

KEY TERMS

Angina pectoris: Pain in the chest that comes and goes at different times; caused by a lack of oxygen reaching the heart.

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

Atherosclerosis: A condition in which deposits of plaque, including cholesterol (a fatty substance made by the liver and found in foods containing animal or animal products) build up on the inner walls of the arteries, causing them to harden and narrow, reducing the amount of blood that can flow through; develops gradually and can go undetected for many years.

Cardiac arrest: A condition in which the heart has stopped beating or beats too irregularly or weakly to pump blood effectively.

Cardiopulmonary resuscitation (CPR): A technique that combines chest compressions and rescue breaths to circulate blood containing oxygen to the brain and other vital organs for a person whose heart and breathing have stopped.

Cholesterol: A fatty substance made by the liver and found in foods containing animal or animal products; diets high in cholesterol contribute to the risk of heart disease.

Coronary arteries: Blood vessels that supply the heart muscle with oxygen-rich blood.

Coronary heart disease (CHD): A disease in which cholesterol and plaque build up on the inner walls of the arteries that supply blood to the heart; also called *coronary artery disease* (CAD).

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

Heart attack: A sudden illness involving the death of heart muscle tissue when it does not receive oxygen-rich blood; also known as *myocardial infarction*.

Risk factors: Conditions or behaviors that increase the chance that a person will develop a disease.

Ventricular fibrillation (V-fib): A life-threatening heart rhythm in which the heart is in a state of totally disorganized electrical activity, and does not pump blood effectively.

Ventricular tachycardia (V-tach): A life-threatening heart rhythm in which there is very rapid contraction of the ventricles, and the heart does not pump blood at all.

INTRODUCTION

In this chapter, you will learn how to recognize and give care for a person who is having a heart attack or who is experiencing cardiac arrest, which are among the most common cardiac emergencies. This chapter also discusses risk factors for cardiovascular disease—the leading cause of cardiac emergencies—and what you can do to control those risks.

CARDIOVASCULAR DISEASE

Cardiovascular disease is an abnormal condition that affects the heart and blood vessels. An estimated 80 million Americans suffer from some form of cardiovascular disease. It remains the number one killer in the United States and is a major cause of disability. Cardiovascular disease causes ***coronary heart disease (CHD)***, also known as coronary artery disease. People with cardiovascular disease are likely also to have disease of other blood vessels, which can cause strokes, also called brain attacks. More about stroke is included in Chapter 15.

CHD occurs when the ***coronary arteries*** that supply blood to the heart muscle harden and narrow in a process is called ***atherosclerosis***. The damage occurs gradually, as ***cholesterol*** and fatty deposits called plaque build up on the inner artery walls. As this build-up worsens, the arteries become narrower. This reduces the amount of blood that can flow through the arteries, and prevents the heart from getting the blood and oxygen it needs **(Figure 6-1)**. If the heart does not get blood containing oxygen, it will not work properly. CHD accounts for about half of the more than 800,000 cardiovascular-disease-related deaths in adult Americans each year. Because atherosclerosis develops gradually, it can remain undetected for many years. Most people with atherosclerosis are unaware they have it. Fortunately, atherosclerosis can be slowed or stopped by taking steps to reduce ***risk factors*** and adopting a healthy lifestyle. See Risk Factors for Coronary Heart Disease and Appendix A for more information on the benefits of a healthy lifestyle.

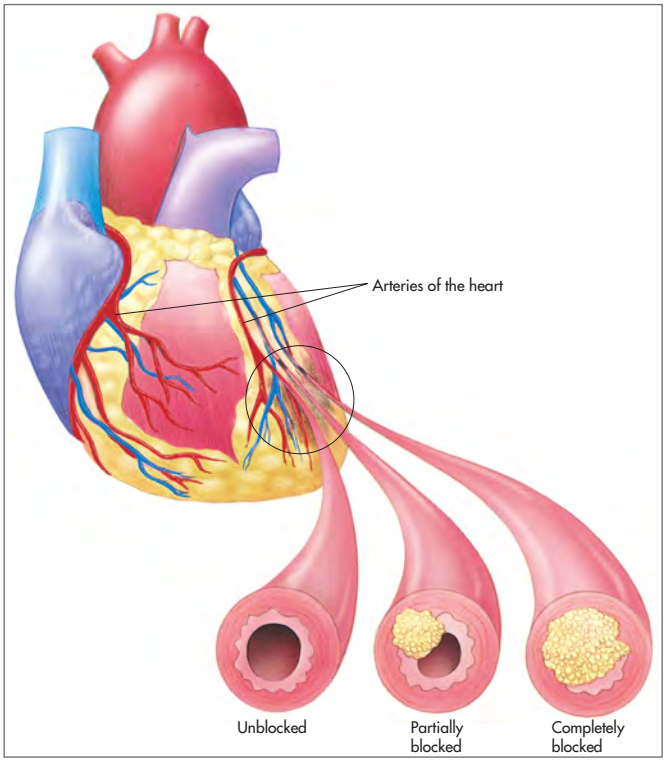


FIGURE 6-1 *Build-up of fatty materials on the inner walls of the arteries reduces blood flow to the heart muscle and may cause a heart attack.*

HEART ATTACK

When blood flow to the heart muscle is reduced, people experience chest pain. This reduced blood flow usually is caused by CHD. When the blood and oxygen supply to the heart is reduced, a ***heart attack*** may result.

Signals of a Heart Attack

Some people having a heart attack delay seeking care and deny that they are having a heart attack. Studies have shown that women in particular may deny the signals of a

RISK FACTORS FOR CORONARY HEART DISEASE

Many things increase a person's chances of developing CHD. These are called risk factors. Some risk factors cannot be changed. For instance, although more women than men die each year from CHD in the United States, heart disease generally affects men at younger ages than it does women. Ethnicity also plays a role in determining the risk for heart disease. African Americans and Native Americans have higher rates of heart disease than do other U.S. populations. A family history of heart disease also increases your risk.

The good news is that some risk factors for CHD can be reduced. Cigarette smoking, a poor diet, uncontrolled high blood cholesterol or high blood pressure, being overweight and lack of regular exercise all increase your risk of heart disease. When you combine one risk factor, such as smoking, with others, such as high blood pressure and lack of exercise, your risk of heart attack is much greater. But you can take steps to control these risk factors—quitting smoking, eating healthier, exercising regularly and following care prescribed by your health care provider—and improve your chances for living a long and healthy life.

heart attack. In addition, some people having a heart attack have relatively mild signals and often mistake those signals for indigestion. By knowing how to recognize the signals of a heart attack, you can ensure a person gets prompt and proper care. These signals include:

- Persistent chest pain, discomfort or pressure that lasts longer than 3 to 5 minutes or goes away and comes back. While this is the most common signal, it can be difficult to distinguish heart attack pain from the pain of indigestion, muscle spasms or other conditions. Brief, stabbing pain or pain that gets worse when the person bends or breathes deeply usually is not caused by a heart problem. Heart attack pain:
  - Can range from discomfort to an unbearable crushing sensation in the chest.
  - May be described by the person as pressure, squeezing, tightness, aching or heaviness in the chest.
  - May start slowly as mild pain or discomfort.
  - Is often felt in the center of the chest behind the sternum **(Figure 6-2)**.
  - Becomes constant and is usually not relieved by resting, changing position or taking medication.
  - Some individuals show *no* signals at all.
- Discomfort in other areas of the upper body in addition to the chest. Discomfort, pain or pressure may also be felt in or spread to the shoulder, arm, neck, jaw, stomach or back.
- Trouble breathing. The person may be breathing faster than normal because the body is trying to get much-needed oxygen to the heart. The person may have noisy breathing or shortness of breath.
- Other signals. The person's skin may be pale or ashen (gray), particularly around the face. The skin may be damp with sweat, or the person may sweat heavily, feel dizzy, become nauseous or vomit. The person may be fatigued or lightheaded, or lose consciousness. These signals result from the stress the body experiences when the heart does not work effectively.

FIGURE 6-2 *Heart attack pain is most often felt in the center of the chest. It may spread to the shoulder, arm, neck or jaw.*

Heart Attack Signals in Women

Both men and women experience the most common signal for a heart attack: chest pain or discomfort. However, it is important to note that women are somewhat more likely than men to experience some of the other warning signals, particularly:

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

Additionally, when women do experience chest pain, they may have a greater tendency to have atypical chest pain: sudden, sharp but short-lived pain outside the breastbone.

Care for a Heart Attack

The most important first aid measure is to be able to recognize the signals of a heart attack and take action. Remember, the key signal of a heart attack is persistent chest pain or discomfort that lasts more than 3 to 5 minutes or goes away and comes back. A person having a heart attack may deny the seriousness of the signals he or she is experiencing, or believe the signals are just muscle soreness, indigestion or heartburn. Do not let this denial influence you. If you think that the person might be having a heart attack, you must act. Call 9-1-1 or the local emergency number *immediately*.

Any heart attack might lead to cardiac arrest, but prompt action may prevent further damage to the heart. A person suffering from a heart attack has a far better chance of living than does a person whose heart has stopped. Most people who die of a heart attack die within 2 hours of the first signal. Many could have been saved if people on the scene or the person having the heart attack had been aware of the signals and acted promptly.

Early treatment with certain medications—including aspirin—can help minimize damage to the heart after a heart attack. To be most effective, these medications need to be given within 1 hour of the start of heart attack signals.

If you suspect that someone might be having a heart attack, steps to take in addition to calling 9-1-1 or the local emergency number include:

- Have the person stop what he or she is doing and rest comfortably. This will ease the heart's need for oxygen. Many people find it easier to breathe while sitting **(Figure 6-3)**.
- Monitor the person closely until emergency medical services (EMS) personnel arrive. Note any changes in the person's appearance (i.e., loss of consciousness) or behavior.
- Be prepared to perform CPR and use an AED if the person loses consciousness and stops breathing.
- Ask the person if he or she has a history of heart disease. Some people who have heart disease take prescribed medications for chest pain. You can help by getting the medication for the person and assisting him or her with taking it. See the section on Angina Pectoris on the next page.

FIGURE 6-3 *Tell a person with signals of a heart attack to stop and rest. Many people find breathing easier while sitting.*

- Offer aspirin, if medically appropriate. See the section on Giving Aspirin to Lessen Heart Attack Damage below to learn more.
- Keep a calm and reassuring manner. Comforting the person helps reduce anxiety and ease some of the discomfort.
- Loosen any restrictive or uncomfortable clothing.
- Talk to bystanders and, if possible, interview the person to get more information prior to the arrival of EMS personnel.
- Do not try to drive the person to the hospital yourself. The person's condition could quickly deteriorate while you are en route to the hospital.

Giving Aspirin to Lessen Heart Attack Damage

You may be able to help a conscious person who is showing early signals of a heart attack by offering him or her an appropriate dose of aspirin when the signals first begin. Aspirin acts to thin the blood and prevent further clot formation. However, you should never delay calling 9-1-1 or the local emergency number to do this. Always call 9-1-1 or the local emergency number as soon as you recognize the signals of a heart attack, and then help the person to be comfortable before you give the aspirin.

If the person is able to take medicine by mouth, ask if he or she:

- Is allergic to aspirin.
- Has a stomach ulcer or stomach disease.
- Is taking any blood thinners, such as warfarin (Coumadin®). When aspirin is taken with blood thinners, the blood may become too thin and bleeding risks increase.
- Has been told by a doctor not to take aspirin.

If the person answers *no* to all of these questions, you may offer him or her two chewable (81 mg each) baby aspirins, or one 5-grain (325 mg) adult aspirin tablet with a small amount of water. You may also offer these doses of aspirin if the person regains consciousness while you are giving care and is able to take the aspirin by mouth.

Be sure that you only offer aspirin and not acetaminophen (Tylenol®) or ibuprofen (Motrin®, Advil®), which are painkillers. Likewise, do not use coated aspirin products or products meant for multiple uses such as cold, fever and headache (this information can be located on the medication's packaging).

ANGINA PECTORIS

Some people with narrowed arteries may experience chest pain or pressure that comes and goes at different times (i.e., intermittent chest pain or pressure). This type of pain is called ***angina pectoris***, which is a medical term for pain in the chest. Angina pectoris, often referred to simply as angina, develops when the heart needs more oxygen than it is getting. When the coronary arteries are narrow and the heart needs more oxygen, such as during physical activity or emotional stress, heart muscle tissue may not get enough oxygen. This lack of oxygen can cause a constricting chest pain that may spread to the neck, jaw and arms. Pain associated with angina seldom lasts longer than 3 to 5 minutes.

A person who knows that he or she has a history of angina may tell you he or she has a prescribed medication, such as nitroglycerin, that will temporarily widen (i.e., vasodilate) the arteries and therefore help relieve the pain. **Nitroglycerin** is commonly prescribed

as a small tablet that dissolves under the tongue. It is also available in a spray. Sometimes nitroglycerin patches are placed on the chest and the medication is absorbed transdermally (i.e., through the skin) into the bloodstream. Once absorbed into the body, nitroglycerin dilates the blood vessels to make it easier for blood to reach heart muscle tissue, thus relieving the chest pain.

Most people with angina pectoris are advised by their doctors to take three nitroglycerin doses over a 10-minute period if they are experiencing pain or discomfort; however, it is important to remember that some doctors may prescribe nitroglycerin differently. Since these areas of narrowing can be the focus for clot formation and heart attack, if a person's typical pain of angina lasts longer than usual, 9-1-1 or the local emergency number should be called. It may be that the angina has progressed to a heart attack.

CARDIAC ARREST

Cardiac arrest occurs when the heart stops beating or beats too ineffectively and blood cannot be circulated to the brain and other vital organs. Cardiac arrest is a life-threatening emergency because the body's vital organs are no longer receiving oxygen-rich blood. Without oxygen, brain damage can begin in about 4 to 6 minutes, and the damage can become irreversible after about 10 minutes.

Cardiovascular disease is the most common cause of cardiac arrest in adults. In addition, drowning, choking and certain drugs can cause breathing to stop, which will soon lead to cardiac arrest. Severe injuries to the chest or severe blood loss can cause the heart to stop beating. Electrocution disrupts the heart's electrical activity and can cause the heart to stop beating. Stroke or other types of brain damage can also stop the heart.

Cardiac arrest is fatal without emergency care and can happen suddenly, without any of the warning signals usually seen in heart attack. It accounts for over 300,000 deaths annually in the United States. Sudden cardiac arrest is often caused by abnormal, chaotic electrical activity of the heart (known as arrhythmias). The most common life-threatening abnormal arrhythmia is ventricular fibrillation (see the section When the Heart Fails on page 108).

Unlike adults, children do not often initially suffer a cardiac emergency. In general, a child or infant suffers a respiratory emergency; then a cardiac emergency develops. Most cardiac arrest in children is not sudden, although sudden death can occur in children of all ages. The most common causes of cardiac arrest in children and infants are airway and breathing problems (such as airway obstruction, smoke inhalation, asthma attack and severe **epiglottitis**) and trauma (such as an automobile crash or a hard blow to the chest, drowning, electrocution, poisoning, firearm injuries and falls). Occasionally, the source of cardiac arrest in children is congenital in nature (i.e., resulting from a condition that has existed since birth).

Signals of Cardiac Arrest

A person in cardiac arrest will be unconscious and will not be breathing. These are the primary signals of cardiac arrest. In addition, the person's skin may be pale, ashen or bluish, particularly around the face. The skin may also be moist from perspiration.

The Cardiac Chain of Survival

The cells of the brain and other vital organs in a person who is not breathing and is unconscious will continue to live for a short period of time until oxygen is depleted. However, without immediate emergency intervention, a person will not survive. A person in cardiac arrest needs ***cardiopulmonary resuscitation (CPR)***, which is a combination of chest

FIGURE 6-4 *The Cardiac Chain of Survival*

compressions and rescue breaths. (The term "cardio" refers to the heart, and "pulmonary" refers to the lungs.) Performed together, chest compressions and rescue breaths artificially take over the functions of the lungs and heart, increasing the person's chance of survival by keeping the brain supplied with oxygen until advanced medical care can be provided.

However, even under the best of conditions, CPR only generates about one-third of the normal blood flow to the brain. Therefore, CPR alone may not be enough to help someone survive cardiac arrest. Early CPR given by citizen responders or bystanders, combined with early ***defibrillation*** (use of an AED) and **advanced cardiac life support** by EMS personnel, give the person with cardiac arrest the best chance for survival. This concept is known as the Cardiac Chain of Survival.

The greatest chance of survival from cardiac arrest occurs when you follow the four links in the Cardiac Chain of Survival as rapidly as possible **(Figure 6-4)**:

1. **Early recognition and early access to the EMS system**. The sooner 9-1-1 or the local emergency number is called, the sooner early advanced medical care arrives to take over.
2. **Early CPR**. Early CPR helps circulate blood that contains oxygen to the vital organs until an AED is ready to use or advanced medical personnel arrive.
3. **Early defibrillation**. An electrical shock, called defibrillation, may help to restore an effective heart rhythm.
4. **Early advanced medical care**. This is given by trained medical personnel, such as paramedics, who provide further care and transport the person to the hospital.

For each minute that CPR and defibrillation are delayed, the chance for survival is reduced by about 10 percent. Each link in the Cardiac Chain of Survival depends on, and is connected to, the other links. Taking quick action by calling 9-1-1 or the local emergency number, starting CPR immediately and using an AED, if one is available, make it more likely that a person in cardiac arrest will survive. Remember, you are the first link in the Cardiac Chain of Survival. By acting quickly, you can make a positive difference for someone experiencing a cardiac emergency.

GIVING CPR

CPR for an Adult

Follow the emergency action steps, **CHECK—CALL—CARE**, to determine whether an unconscious adult needs CPR.

- **CHECK** the scene and the injured or ill person.
- If the person is unconscious, send someone or **CALL** 9-1-1 or the local emergency number.
- **CHECK** for breathing for no more than 10 seconds.
- Quickly **CHECK** for severe bleeding.
- If the person is not breathing, give **CARE** by beginning CPR with 30 chest compressions followed by 2 rescue breaths.

For chest compressions to be effective, the person should be on his or her back on a firm, flat surface. CPR is not effective if the person is on a soft surface, like a sofa or mattress, or if the person is sitting up in a chair. If necessary, quickly move the person to a firm, flat surface before you begin.

To perform CPR on an adult:

- Locate the correct hand position. The correct hand position allows you to give the most effective compressions without further injuring the person. To find the correct hand position:
  - Place the heel of one hand on the person's sternum (breastbone), at the center of his or her chest **(Figure 6-5)**.
  - Place your other hand directly on top of the first hand and try to keep your fingers off the chest by interlacing them or holding them upward **(Figure 6-6)**. Applying pressure with your fingers can lead to inefficient chest compressions or unnecessary damage to the chest.
  - If you feel the notch at the end of the sternum, move your hands slightly toward the person's head.
  - If you have arthritis or a similar condition, you may use an alternate hand position, grasping the wrist of the hand on the chest with your other hand **(Figure 6-7)**. You will find the correct hand position in the same way.
  - In most cases, the person's clothing will not interfere with your ability to correctly position your hands on his or her chest. Sometimes a layer of thin clothing will help keep your hands from slipping, because the person's chest may be

FIGURE 6-5 *Locate the correct hand position by placing the heel of one hand on the person's sternum (breastbone) in the center of his or her chest.*

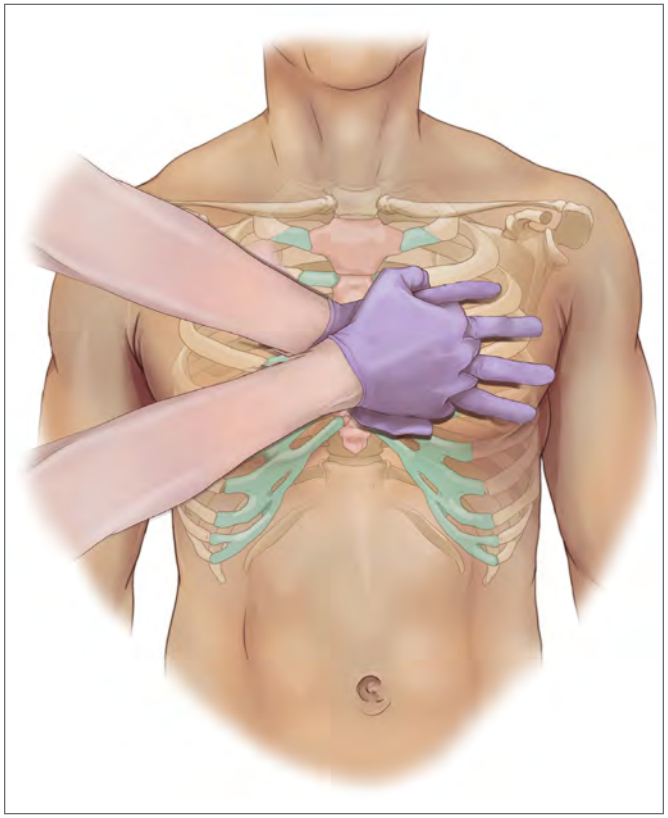


FIGURE 6-6 *Place your other hand directly on top of the first hand. Interlace your fingers and hold them upward to keep them off the chest.*

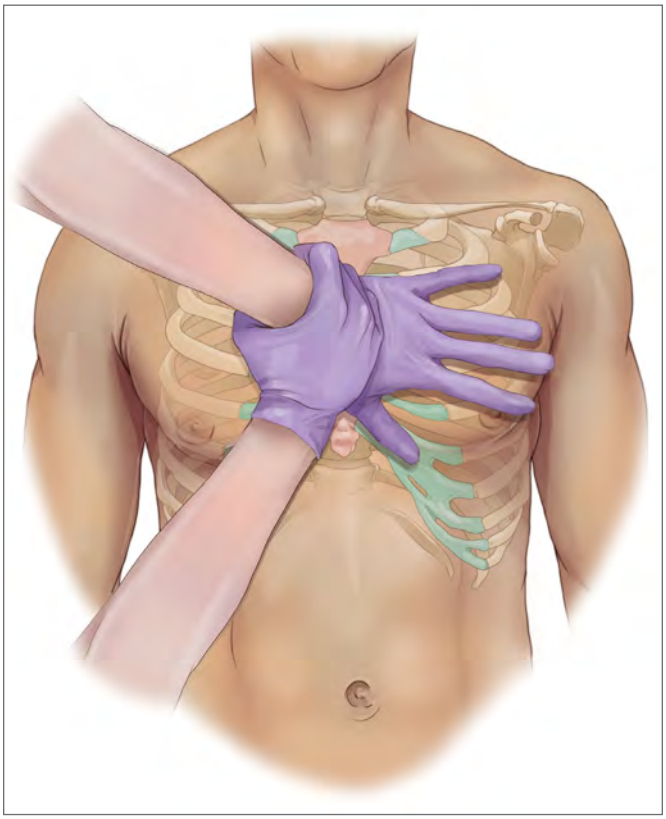


FIGURE 6-7 *Grasping the wrist of the hand positioned on the chest with your other hand is an alternate hand position for giving chest compressions.*

FIGURE 6-8 *Position yourself so that your shoulders are directly over your hands.*

What if...

I am giving chest compressions to a person in cardiac arrest and I hear a rib crack?

In the adult population, particularly among older adults, rib and sternal (breastbone) fractures can be a complication of CPR. Making sure you use proper hand placement can minimize this risk. If you do hear a cracking sound and begin to feel crepitus (grinding) while compressing the chest, stop, reassess your hand position, and correct it as needed. Try to also remember that the potential benefits of CPR—namely, saving a life—outweigh the unpleasantness of a broken rib, which in most cases is not a life-threatening injury.

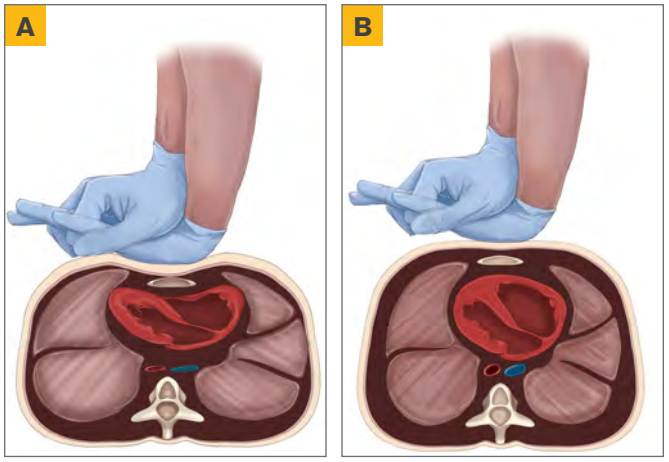


FIGURE 6-9, A–B *To give chest compressions:* **A,** *Push straight down with the weight of your body.* **B,** *Release, allowing the chest to return to its normal position.*

moist with sweat. If you cannot find the correct hand position, bare the person's chest. You should not be overly concerned that you may not be able to find the correct hand position if the person is obese, because fat does not accumulate as much over the sternum as it does elsewhere in the body.

- Locate the correct body position. Compressing the person's chest straight down provides the best blood flow. The correct body position is also less tiring for you as it requires less effort. When you press down, the weight of your upper body creates the force needed to compress the chest. To find the correct body position:
  - Kneel beside the person with your hands in the correct position described above.
  - Straighten your arms and lock your elbows so that your shoulders are directly over your hands **(Figure 6-8)**. When you press down in this position, you will be pushing straight down onto the sternum. Locking your elbows keeps your arms straight and prevents you from tiring quickly.
- Give 30 chest compressions, using the techniques that follow:
  - "Push hard, push fast" at a rate of at least 100 compressions per minute. Note that the term "100 compressions per minute" refers to the speed of compressions, not the number of compressions given in a minute. As you give compressions, count out loud, "One and two and three and four and five and six and..." up to 30. Push down as you say the number and come up as you say "and." This will help you to keep a steady, even rhythm.
  - Give compressions by pushing the sternum down at least 2 inches **(Figure 6-9, A)**. The downward and upward movement should be smooth, not jerky. Push straight down with the weight of your upper body, not with your arm muscles. This way, the weight of your upper body will create the force needed to compress the chest. Do not rock back and forth. Rocking results in less-effective compressions and wastes much-needed energy. If your arms and shoulders tire quickly, you are not using the correct body position.
  - After each compression, release the pressure on the chest without removing your hands or changing hand position **(Figure 6-9, B)**.

Allow the chest to return to its normal position before starting the next compression. Maintain a steady down-and-up rhythm, and do not pause between compressions. Spend half of the time pushing down and half of the time coming up. When you press down, the walls of the heart squeeze together and blood is ejected from the heart. When you come up, you should release all pressure on the chest, but do not take your hands off the chest. This allows the heart's chambers to fill with blood between compressions.

- Remember: *It is important to focus on the quality of chest compressions, not just the quantity of compressions.*

What if...

During CPR I lose count of the number of chest compressions I am performing and do more or less than the recommended 30 compressions?

While 30 compressions is the recommended amount, performing 28 chest compressions in one cycle and 32 chest compressions in another cycle is not going to hurt the person's chances of survival. Rather, what is important are the chest compression rate, which should be at least 100 compressions per minute, and the proportion of time that chest compressions are delivered without interruption. So do your best to follow your training.

- Once you have given 30 compressions, open the airway using the head-tilt/chin-lift technique and give 2 rescue breaths. Be sure to apply your CPR breathing barrier if available before giving breaths. Each rescue breath should last about 1 second and make the chest clearly rise. To give rescue breaths:
  - Tilt the head back and lift the chin up to open the airway.
  - Pinch the nose shut, then make a complete seal over the person's mouth.
  - Give rescue breaths, one after the other, blowing in for about 1 second to make the chest clearly rise.
- Continue cycles of chest compressions and rescue breaths. For each cycle, give 30 chest compressions, then open the airway with the head-tilt/chin-lift technique and give 2 rescue breaths. For each new cycle of compressions and rescue breaths, find the correct hand position in the middle of the chest. Each cycle of chest compressions and rescue breaths should take about 24 seconds. Minimize the interruption of chest compressions. When to Stop CPR is covered later in this chapter.

CPR for a Child or Infant

Follow the emergency action steps, **CHECK—CALL—CARE**, to determine whether an unconscious child or infant needs CPR.

- **CHECK** the scene and the injured or ill child or infant.
- If the child or infant is unconscious, send someone or **CALL** 9-1-1 or the local emergency number (if you are alone and did not witness a collapse, wait to call until you have first given 2 minutes of care).
- **CHECK** for breathing for no more than 10 seconds. If a child or infant is not breathing, and there was not a witnessed sudden collapse, give 2 rescue breaths.
- Quickly **CHECK** for severe bleeding.
- If the child or infant is not breathing (and the rescue breaths, if given, make the child or infant's chest clearly rise), give **CARE** by beginning CPR with 30 chest compressions followed by 2 rescue breaths.

Because infants and children have smaller bodies and faster breathing and heart rates, the CPR techniques you use will be slightly different than those used for an adult.

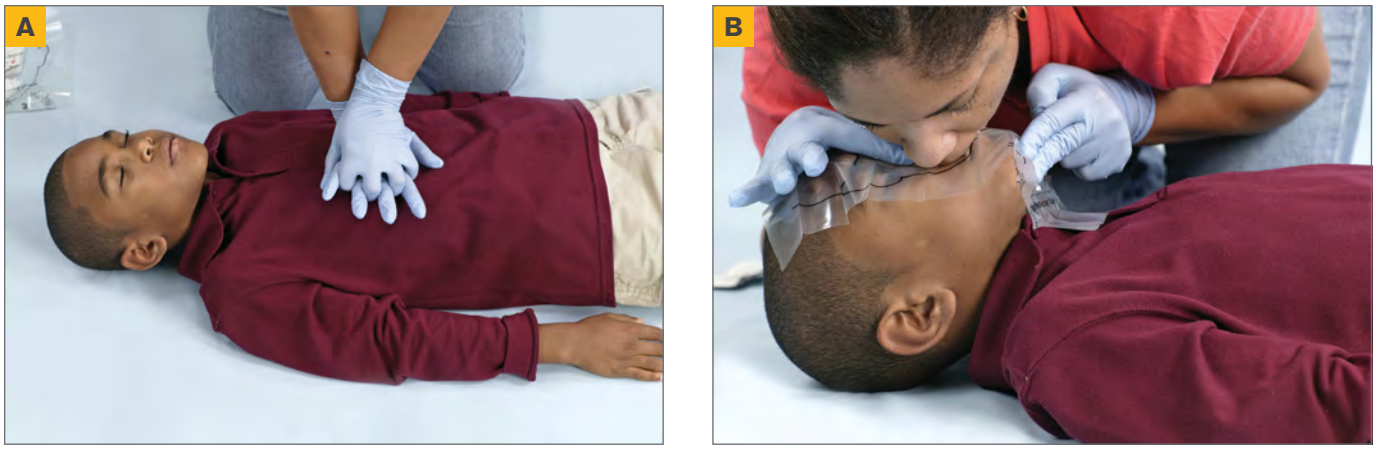


FIGURE 6-10, A–B *To perform CPR on a child:* **A,** *Locate the proper hand position in the center of the child's chest.* **B,** *After giving 30 compressions, open the airway and give 2 rescue breaths.*

CPR for a Child

To begin CPR for a child, make sure that the child is lying face-up on a firm, flat surface, then:

- Locate the proper hand position on the middle of the breastbone as you would for an adult **(Figure 6-10, A)**. If you feel the notch at the end of the sternum, move your hands slightly toward the child's head.
- Position your body as you would for an adult, kneeling next to the child's upper chest, positioning your shoulders over your hands, and keeping your arms and elbows as straight as possible.
- Give 30 chest compressions. "Push hard and push fast" to a depth of about 2 inches and at a rate of at least 100 compressions per minute. Allow the chest to fully return to its normal position, but keep contact with the chest.
  - Remember*: It is important to focus on the quality of chest compressions, not just the quantity of compressions.*
- After giving 30 chest compressions, open the airway and give 2 rescue breaths as you would for an adult **(Figure 6-10, B)**. Each rescue breath should last about 1 second and make the chest clearly rise. Use the head-tilt/chin-lift technique to ensure that the child's airway is open.
- Continue cycles of chest compressions and rescue breaths (see When to Stop CPR later in this chapter).

CPR for an Infant

As with an adult or child, if the infant you are checking is not breathing, position the infant face-up on a firm, flat surface and give CPR as follows:

- Find the correct location for compressions. Keep one hand on the infant's forehead to maintain an open airway. Use the pads of two or three fingers of your other hand to give chest compressions on the center of the chest, just below the nipple line (toward the infant's feet). If you feel the notch at the end of the infant's sternum, move your fingers slightly toward the infant's head.
- Give 30 chest compressions using the pads of these fingers to compress the chest. Compress the chest about 1½ inches. Push hard and fast **(Figure 6-11, A)**. Your compressions should be smooth, not jerky. Keep a steady rhythm. Do not pause between compressions. When your fingers are coming up, release pressure on the

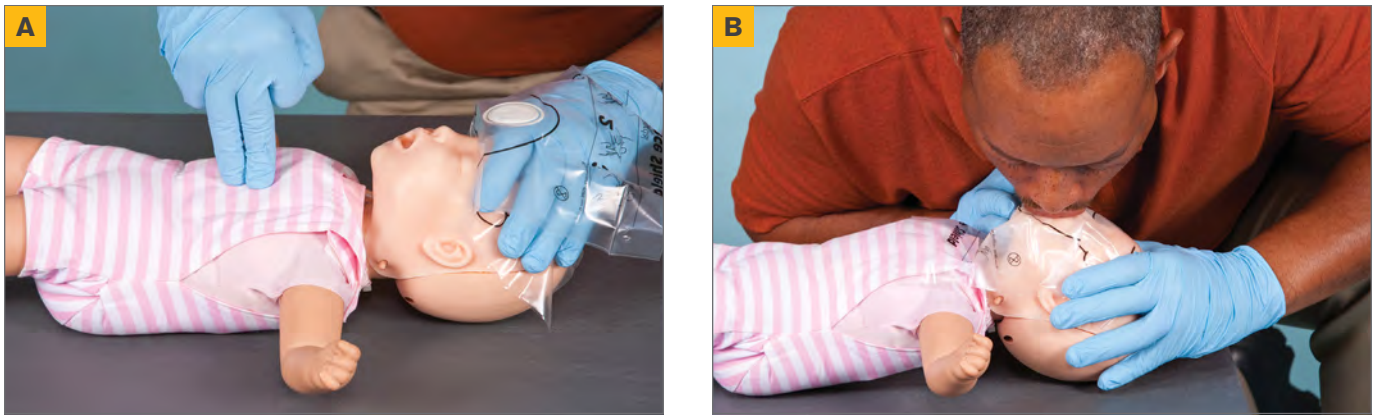


FIGURE 6-11, A–B *To perform CPR on an infant:* **A,** *Place the pads of two or three fingers in the middle of the chest and compress about 1½ inches.* **B,** *Give 2 rescue breaths, covering the infant's mouth and nose with your mouth.*

infant's chest completely but do not let your fingers lose contact with the chest. Compress at a rate of at least 100 compressions per minute.

- Remember*: It is important to focus on the quality of chest compressions, not just the quantity of compressions.*

- After giving 30 chest compressions, give 2 rescue breaths, covering the infant's mouth and nose with your mouth **(Figure 6-11, B)**. Each rescue breath should last about 1 second and make the chest clearly rise.
- Continue cycles of 30 chest compressions and 2 rescue breaths (see below for When to Stop CPR).

Table 6-1 provides a CPR skill comparison for adults, children and infants.

When to Stop CPR

Once you begin CPR on an adult, child or infant, do not stop except in one of these situations:

- You notice an obvious sign of life, such as breathing.
- An AED becomes available and is ready to use.
- Another trained responder or EMS personnel arrive and take over.
- You are too exhausted to continue.
- The scene becomes unsafe.

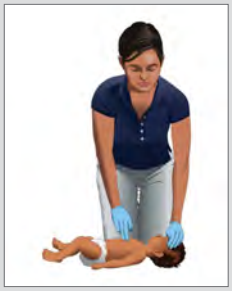
If at any time the adult, child or infant begins to breathe or show another sign of life, stop CPR, keep the airway open, and closely monitor breathing and any changes in the person's condition until EMS personnel take over.

Special Considerations

Multiple Responders

If two responders trained in CPR are at the scene, you should both identify yourselves as CPR-trained responders. One of you should then call 9-1-1 or the local emergency number for help (if this has not been done) and get an AED, while the other begins CPR. If the first responder is tired and needs help, the first responder should tell the second responder to take over. The second responder should immediately begin CPR, starting with chest compressions.

TABLE 6-1 CPR Skill Comparison

SKILL COMPONENTS	ADULT	CHILD	INFANT
Hand position	Two hands in center of chest (on lower half of sternum)	Two hands in center of chest (on lower half of sternum)	Two or three fingers in center of chest (on lower half of sternum, just below nipple line)
Chest compressions Rescue breaths	At least 2 inches Until the chest clearly rises (about 1 second per breath)	About 2 inches Until the chest clearly rises (about 1 second per breath)	About 1½ inches Until the chest clearly rises (about 1 second per breath)
Cycle	30 chest compressions and 2 rescue breaths	30 chest compressions and 2 rescue breaths	30 chest compressions and 2 rescue breaths
Rate	30 chest compressions in about 18 seconds (at least 100 compressions per minute) 	30 chest compressions in about 18 seconds (at least 100 compressions per minute) 	30 chest compressions in about 18 seconds (at least 100 compressions per minute) 

Hands-Only CPR (Continuous Chest Compressions)

If you are unable or unwilling for any reason to perform full CPR (with rescue breaths), give continuous chest compressions. Steps include:

- **CHECK** the scene for safety and then see if the person responds when prompted.
- Briefly **CHECK** for breathing.
- If the person doesn't respond, send someone or **CALL** 9-1-1 or the local emergency number.
- Prepare to give chest compressions using the techniques described earlier in the chapter.
- Give continuous chest compressions, pushing hard and fast at the proper depth and speed.

Continue giving chest compressions until you notice an obvious sign of life, such as breathing, an AED is ready to use, another trained responder or EMS personnel arrive and take over, you are too exhausted to continue or the scene becomes unsafe.

AUTOMATED EXTERNAL DEFIBRILLATORS

As stated earlier, most people in sudden cardiac arrest need an electrical shock called defibrillation. Each minute that CPR and defibrillation are delayed reduces the chance of survival by about 10 percent. Therefore, the sooner the shock is administered, the greater the likelihood of the person's survival. By learning how to use an **automated external defibrillator (AED)**, you can make a difference before EMS personnel arrive.

A MATTER OF CHOICE

Instructions that describe a person's wishes about medical treatment are called advance directives. These instructions are used when a person can no longer make his or her own health care decisions. If a person is able to make decisions about medical treatment, advance directives do not interfere with his or her right to do so.

The Patient Self-Determination Act of 1990 provides that adults who are admitted to a hospital or a health care facility, or who receive assistance from certain organizations that receive funds from Medicare or Medicaid, have the right to make fundamental choices about their own care. They must be told about their right to make decisions and about the level of life support that would be provided in an emergency situation. They should be offered the opportunity to make these choices at the time of admission.

Conversations with relatives, friends or physicians, while the person is still capable of making decisions, are the most common form of advance directive. However, because conversations may not be recalled accurately, the courts consider written directives more credible.

Two examples of written advance directives are living wills and durable powers of attorney for health care. The types of health care decisions covered by these documents vary depending on the state where you live. Talking with a legal professional can help determine which advance directive options are recognized in your state and what they do and do not cover.

The instructions that are permitted in a living will vary from state to state. A living will generally allows a person to refuse only medical care that "merely prolongs the process of dying," as in the case of a terminal illness.

A person uses a durable power of attorney for health care to authorize someone to make medical decisions for him or her in any situation in which he or she can no longer make them. This authorized person is called a health care surrogate or proxy. This surrogate, with the information given by the person's physician, may consent to or refuse medical treatment on the person's behalf. In this case, he or she would support the person's needs and wishes around the health care decisions and the advance directives.

"Do not resuscitate" (DNR) orders mean that if a person has determined that if his or her heartbeat or breathing stops, he or she should not be resuscitated. The choice of DNR orders may be covered in a living will or in the durable power of attorney for health care.

Appointing someone to act as a health care surrogate, along with writing down your instructions, are the best ways to formalize your wishes about medical care. Some of these documents can be obtained through a personal physician, an attorney or various state and health care organizations. A lawyer is not always needed to execute advance directives. However, if you have any questions concerning advance directives, it is wise to obtain legal advice.

Copies of your advance directives should be provided to all personal physicians, family members and the person chosen as your health care surrogate. Tell them what documents have been prepared and where the original and copies are located. Discuss the document with all parties so that they understand the intent of all the requests. Keep these documents updated.

Keep in mind that advance directives are not limited to elderly persons or people with terminal illnesses. Advance directives should be considered by anyone who has decided on the care he or she would like to have provided. An unexpected illness or injury could create a need for decisions at any time.

Knowing about living wills, durable powers of attorney for health care and DNR orders can help you and your loved ones prepare for difficult decisions. If you are interested in learning more about your rights and the options available to you in your state, contact a legal professional.

SOURCES: Hospital Shared Services of Colorado, Stockard Inventory Program: *Your right to make health care decisions,* Denver, 1991.2.

Title 42 United States Code, Section 1395 cc(a)(1)(Q)(A) Patient Self-Determination Act.

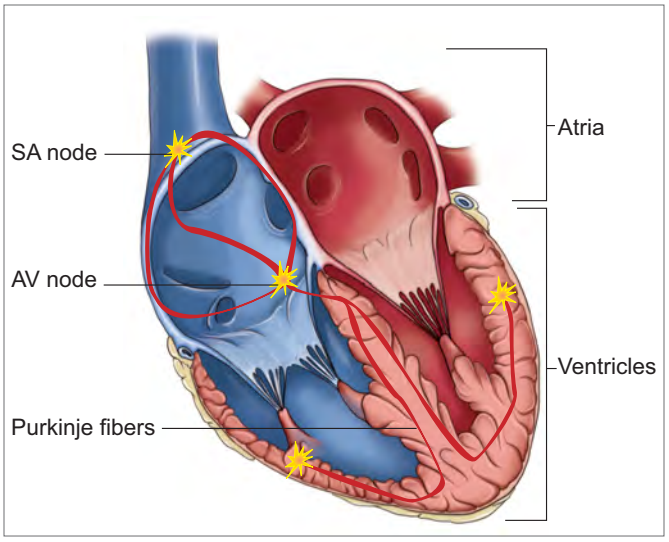


FIGURE 6-12 *The heart's electrical system*

The Heart's Electrical System

The heart's electrical system controls its pumping action. In normal conditions, specialized cells of the heart initiate and transmit electrical impulses. These cells make up the conduction system. Electrical impulses travel through the upper chambers of the heart, called the atria, to the lower chambers of the heart, called the ventricles **(Figure 6-12)**.

The normal point of origin of the electrical impulse is the sinoatrial (SA) node above the atria. This impulse travels to a point midway between the atria and ventricles called the atrioventricular (AV) node. The pathway divides after the AV node into two branches, the right and left ventricles. These right and left branches become a network of fibers, called Purkinje fibers, which spread electrical impulses across the heart. Under normal conditions, this impulse reaches the muscular walls of the ventricles and causes the ventricles to contract. This contraction forces blood out of the heart to circulate through the body. The contraction of the left ventricle results in a pulse. The pauses between the pulse beats are the periods between contractions. When the heart muscles relax, blood refills the chambers.

Electrical activity of the heart can be evaluated with a cardiac monitor or electrocardiograph. Electrodes attached to an electrocardiograph pick up electrical impulses and transmit them to a monitor. This graphic record is referred to as an electrocardiogram (EKG). Heart rhythms appear on an EKG as a series of peaks and valleys.

When the Heart Fails

Any damage to the heart from disease or injury can disrupt the heart's electrical system. This disruption can result in an abnormal heart rhythm that can stop circulation. The two most common abnormal rhythms leading to cardiac arrest are ***ventricular fibrillation (V-fib)*** and ***ventricular tachycardia (V-tach)***.

V-fib is a state of totally disorganized electrical activity in the heart. It results in fibrillation, or quivering, of the ventricles. In V-fib, the electrical impulses fire at random, creating chaos and preventing the heart from pumping and circulating blood. A person with V-fib will suddenly collapse unconscious and stop breathing.

V-tach refers to a very rapid contraction of the ventricles. Although there is electrical activity resulting in a regular rhythm, the rate is often so fast that the heart is unable to pump blood properly. As with V-fib, the person with V-tach may collapse, become unconscious and stop breathing.

Defibrillation

In many cases, V-fib and V-tach rhythms can be corrected by early defibrillation. Delivering an electrical shock with an AED disrupts the electrical activity of V-fib and V-tach long enough to allow the heart to spontaneously develop an effective rhythm on its own. If V-fib or V-tach is not interrupted, all electrical activity will eventually cease, a condition called ***asystole.*** Asystole cannot be corrected by defibrillation. Remember that you cannot tell what rhythm, if any, the heart has by checking for signs of life. CPR, started immediately

and continued until defibrillation, helps maintain a low level of circulation in the body until the abnormal rhythm can be corrected by defibrillation.

Using an AED—Adult

With cardiac arrest, an AED should be used as soon as it is available and safe to do so. Be sure to call 9-1-1 or the local emergency number and start CPR immediately. CPR in progress is stopped only when the AED is ready to use. Different types of AEDs are available, but all are similar to operate and have some common features, such as electrode (AED or defibrillation) pads, voice prompts, visual displays and/or lighted buttons to guide the responder through the steps of the AED operation.

THE AMAZING HEART

Too often, we take our hearts for granted. The heart beats about 70 times each minute or more than 100,000 times a day. During an average lifetime, the heart will beat nearly 3 billion times. The heart circulates about a gallon of blood per minute or about 40 million gallons in an average lifetime. The heart circulates blood through about 60,000 miles of blood vessels.

Most AEDs can be operated by following these simple steps:

- Turn on the AED.
- Expose the person's chest and wipe the bare chest dry with a small towel or gauze pads. This ensures that the AED pads will stick to the chest properly.
- Apply the pads to the person's *bare, dry* chest. (Make sure to peel the backing off each pad, one at a time, to expose the adhesive surface of the pad before applying it to the person's bare chest.) Place one pad on the person's upper right chest and the other pad on the left side of the chest **(Figure 6-13, A)**.
- Plug the connector into the AED, if necessary.
- Let the AED analyze the heart rhythm (or push the button marked "analyze," if prompted by the AED). Advise all responders and bystanders to "stand clear." No one should touch the person while the AED is analyzing because this could result in faulty readings **(Figure 6-13, B)**.
- If the AED advises that a shock is needed:
  - Ensure that no one, including you, is touching the person.
  - Say, "EVERYONE, STAND CLEAR."
  - Deliver a shock by pushing the shock button, if necessary. (Some models can deliver the shock automatically, while others have a "shock" button that must be pushed manually to deliver the shock.)

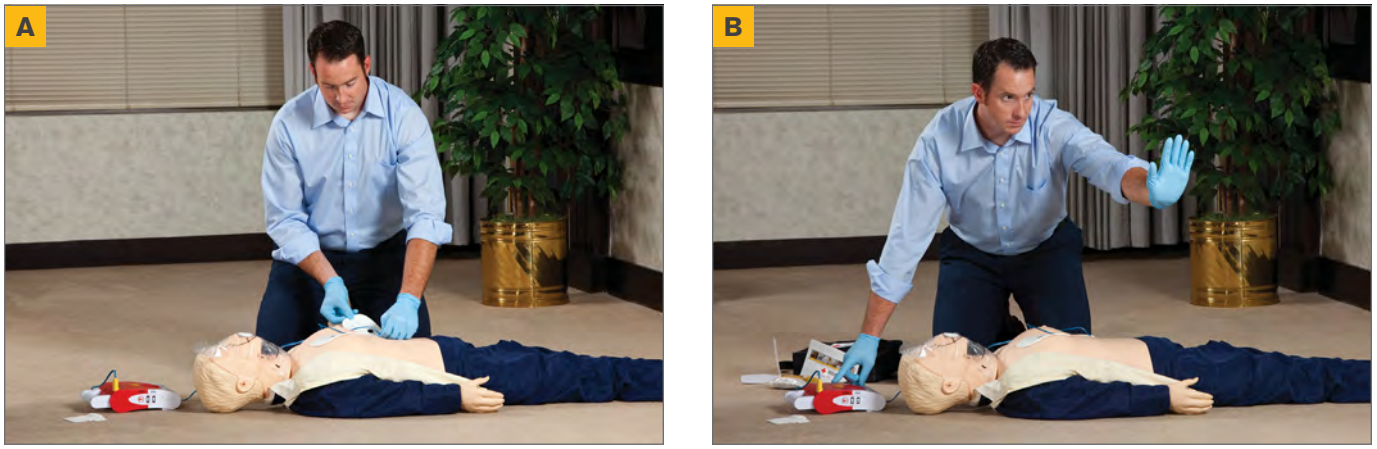


FIGURE 6-13, A–B *When using an AED:* **A,** *Apply the pads to the person's bare, dry chest.* **B,** *Advise everyone to "stand clear" while the AED analyzes the heart rhythm or delivers a shock.*

What if...

I accidentally deliver an unnecessary shock while using an AED?

An AED is designed to allow the operator to deliver a shock *only* when the AED has detected the presence of a life-threatening arrhythmia (e.g., V-fib or V-tach). If the device does not detect a shockable rhythm, it will instruct you to perform chest compressions and rescue breaths as needed. Some AEDs will detect the need to provide a shock and then proceed to administer it.

- After delivering the shock, or if no shock is advised:
  - Perform about 2 minutes (or 5 cycles) of CPR.
  - Continue to follow the prompts of the AED.

If at any time you notice an obvious sign of life, such as breathing, stop performing CPR and monitor the person's breathing and any changes in his or her condition.

Using an AED—Child and Infant

AEDs equipped with pediatric AED pads are capable of delivering lower levels of energy considered appropriate for children or infants up to 8 years of age or weighing less than 55 pounds. Use pediatric AED pads and/or equipment if available. If pediatric-specific equipment is not available, use an AED designed for adults on children and infants. Always follow local protocols or guidelines if established (i.e., by the medical director at your place of employment, or an EMS dispatcher who is providing guidance when you call) and the manufacturer's instructions. Follow the same general steps and precautions that you would when using an AED on an adult in cardiac arrest:

- Turn on the AED.
- Expose the child's or infant's chest and wipe it dry.
- Apply the pediatric pads to the child's or infant's *bare, dry* chest.
  - Place one pad on the child's or infant's upper right chest and the other pad on the child's or infant's left side **(Figure 6-14, A)**.
  - Make sure the pads are not touching. If the pads are at risk of touching each other, such as with a small child or infant, place one pad in the middle of the child's or infant's chest and the other pad on his or her back, between the shoulder blades **(Figure 6-14, B)**.
- Plug the connector into the AED, if necessary.
- Let the AED analyze the heart rhythm (or push the "analyze" button if indicated and prompted by the AED). Advise all responders and bystanders to "stand clear." No one should touch the child or infant while the AED is analyzing because this could result in faulty readings.

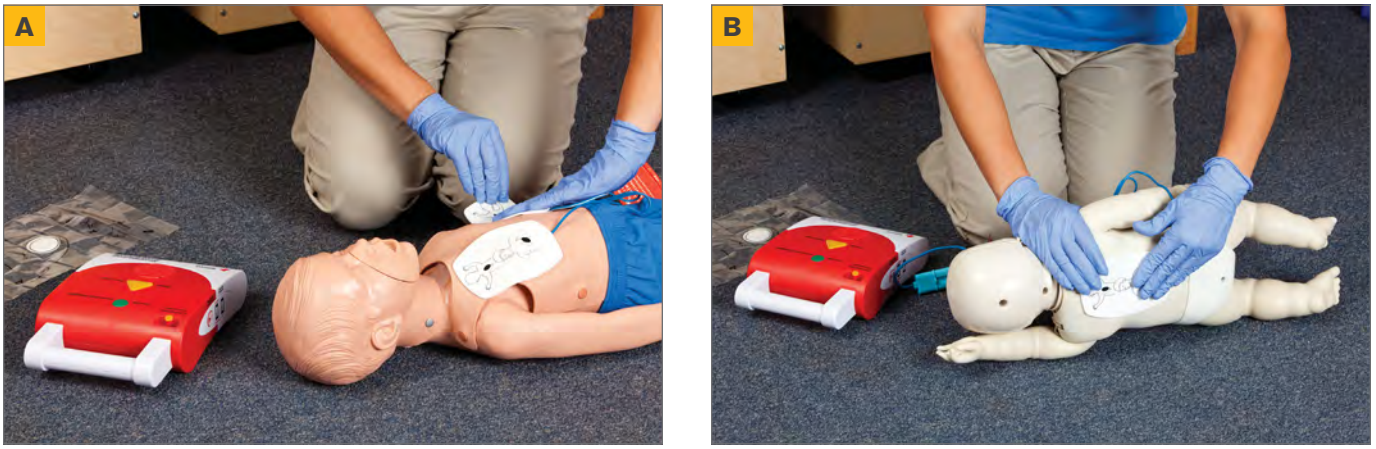


FIGURE 6-14, A–B **A,** *When placing pads on a child or infant, make sure they do not touch.* **B,** *If the pads risk touching each other, place one on the chest and the other on the back of the child or infant.*

- If the AED advises that a shock is needed:
  - Ensure that no one, including you, is touching the child or infant.
  - Say, "EVERYONE, STAND CLEAR."
  - Deliver a shock by pushing the "shock" button, if necessary.
- After delivering the shock or if the AED indicates "no shock advised":
  - Perform about 2 minutes (or 5 cycles) of CPR.
  - Continue to follow the prompts of the AED.
- If at any time you notice an obvious sign of life, such as breathing, stop performing CPR and monitor the person's breathing and any changes in his or her condition.

AED Precautions

When operating an AED, you should avoid certain actions and situations that could harm you, other responders or bystanders and the person. The following precautions should be taken when operating an AED:

- Do *not* use alcohol to wipe the person's chest dry. Alcohol is flammable.
- Do *not* use incorrect size pads, unless there are no other pads available. Persons older than 8 years of age or weighing more than 55 pounds should have adult AED pads. Children under age 8 or less than 55 pounds should have pediatric pads, which provide a lower dose of electricity. If there are no correctly sized pads available, then you may use the other sized pads.
- Do *not* touch the person while the AED is analyzing. Touching or moving the person may affect analysis.
- Before shocking a person with an AED, make sure that *no one* is touching or is in contact with the person or any resuscitation equipment.
- Do *not* touch the person while the AED is defibrillating. You or others could be shocked.
- Do *not* defibrillate someone when around flammable or combustible materials, such as gasoline or free-flowing oxygen.
- Do *not* use an AED in a moving vehicle. Movement may affect the analysis.
- Do *not* use an AED on a person who is in contact with water. Move the person and AED away from puddles of water or out of the rain before defibrillating (see the section on the next page on AEDs Around Water for more information).
- Do *not* use an AED on a person wearing a nitroglycerin patch or other medical patch on the chest. With a gloved hand, remove any patches from the chest before attaching the device (see the section on the next page on AEDs and Transdermal Medication Patches for more information).
- Do *not* use a mobile phone or radio within 6 feet of the AED. Radiofrequency interference, electromagnetic interference and infrared interference, generated by radio signals, can disrupt analysis.

Special Considerations

Some situations require you to pay special attention when using an AED. Be familiar with these situations and know how to respond appropriately. Always use common sense when using an AED and follow the manufacturer's recommendations.

AEDs Around Water

If a person is in water, remove him or her from the water before defibrillation. A shock delivered in water could harm responders or bystanders. Once you have removed the person from the water, be sure there are no puddles of water around you, the person or the AED. Remove wet clothing to place the pads properly, if necessary. Dry the person's chest and attach the AED pads.

If it is raining, take steps to ensure that the person is as dry as possible and sheltered from the rain. Ensure that the person's chest is wiped dry. Minimize delaying defibrillation, though, when taking steps to provide for a dry environment. The electrical current of an AED is very directional between the electrode pads. AEDs are very safe, even in rain and snow, when all precautions and manufacturer's operating instructions are followed. Avoid getting the AED or defibrillation pads wet.

AEDs and Implantable Devices

Some people whose hearts are weak and unable to generate electrical impulse may have had a pacemaker implanted. These small implantable devices are usually located in the area below the person's left collarbone, although they can be placed elsewhere. There may be a small lump that can be felt under the skin. Other individuals may have an implantable cardioverter-defibrillator (ICD), a miniature version of an AED, which acts to automatically recognize and defibrillate or terminate abnormal heart rhythms.

If an implanted device is visible or you know that the person has one, do not place the defibrillation pads directly over the device. This may interfere with the delivery of the shock. Adjust pad placement if necessary, and continue to follow the AED instructions. If you are not sure whether the person has an implanted device, use the AED if needed. It will not harm the person or responder.

The responder should be aware that it is possible to receive a mild shock if an implantable ICD delivers a shock to the person during CPR. However, this risk of injury to responders is minimal, and the amount of electrical energy involved is low. Follow any special precautions associated with ICDs, but do not delay performing CPR and using an AED.

AEDs and Transdermal Medication Patches

Some people have a patch on their skin that automatically delivers medication through the skin, called a transdermal medication patch. A common medication patch is the nitroglycerin patch, which is used by people with a history of cardiac problems. Because a responder can absorb medication through the skin, remove patches with a gloved hand before defibrillation. Nicotine patches used to stop smoking look similar to nitroglycerin patches. Do not waste time trying to identify patches. Instead remove any patch that you see on the person's chest with a gloved hand. *Never* place AED electrode pads directly on top of medication patches.

AEDs and Hypothermia

Hypothermia is a life-threatening condition in which the entire body cools because its ability to keep warm fails. Some people who have experienced hypothermia have been resuscitated successfully, even after prolonged exposure to the cold. If the person is not breathing, begin CPR until an AED becomes readily available. If the person is wet, remove his or her wet clothing and dry the chest, then attach the AED pads. If a shock is indicated, deliver a shock. If the person is still not breathing, continue CPR and protect the person from further heat loss. CPR or defibrillation should not be withheld to

re-warm the person. Take care not to shake a person with hypothermia unnecessarily as this could result in V-fib.

AEDs and Trauma

If a person is in cardiac arrest resulting from traumatic injuries, an AED may still be used. Defibrillation should be administered according to local protocols.

AEDs and Chest Hair

Some men have excessive chest hair that may interfere with AED pad-to-skin contact, although this is a rare occurrence. Since time is critical in a cardiac arrest situation, and chest hair rarely interferes with pad adhesion, attach the pads and analyze the heart's rhythm as soon as possible. Press firmly on the pads to attach them to the person's chest.

If you get a "check pads" or similar message from the AED, remove the pads and replace them with new ones. The pad adhesive may pull out some of the chest hair, which may solve the problem. If you continue to get the "check pads" message, remove the pads, shave the person's chest where the pads will be placed, and attach new pads to the person's chest. (Spare defibrillation pads and a safety razor should be included in the AED kit.) Try not to cut the person while shaving the chest.

AEDs and Metal Surfaces

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

AEDs and Jewelry and Body Piercings

You do not need to remove jewelry and body piercings when using an AED. Leaving them on the person will do no harm. Taking time to remove them will delay giving the first shock. Therefore, do *not* delay the use of an AED to remove jewelry or body piercings. However, do *not* place the AED pads directly over metallic jewelry or body piercings. Adjust AED pad placement if necessary.

Other AED Protocols

Other AED protocols, such as delivering three shocks and then performing CPR, are neither wrong nor harmful to the person. However, improved methods, based on scientific evidence, make it easier to coordinate performing CPR and using the AED. Follow the instructions of the AED device you are using.

AED Maintenance

For defibrillators to perform optimally, they must be maintained like any other machine. The AEDs that are available today require minimal maintenance and have various self-testing features. However, it is important that operators are familiar with any visual or audible prompts the AED may have to warn of malfunction or a low battery. It is important that you read the operator's manual thoroughly and check with the manufacturer to obtain all necessary information regarding maintenance.

In most instances, if the machine detects any malfunction, you should contact the manufacturer. The device may need to be returned to the manufacturer for service. While AEDs require minimal maintenance, it is important to remember the following:

- Follow the manufacturer's specific recommendations for periodic equipment checks, including checking the batteries and defibrillation pads.
- Make sure that the batteries have enough energy for one complete rescue (a fully charged backup battery should be readily available).
- Make sure that the correct defibrillator pads are in the package and are properly sealed.
- Check any expiration dates on defibrillation pads and batteries and replace as necessary.
- After use, make sure that all accessories are replaced and that the machine is in proper working order.
- If at any time the machine fails to work properly or warning indicators are recognized, discontinue use and contact the manufacturer immediately. If the AED stops working during an emergency, continue performing CPR until EMS personnel take over.

SUMMARY

Cardiac emergencies present a major health threat to our communities. Heart attack and cardiac arrest are the two most common cardiac emergencies. Learning to recognize the signals of a heart attack and responding immediately can reduce the risk of cardiac arrest occurring. If a person experiences cardiac arrest, the greatest chance of survival occurs when the Cardiac Chain of Survival **(early recognition and early access, early CPR, early defibrillation and early advanced medical care)** happens as rapidly as possible. By learning to recognize the signals of cardiac emergencies and how to give care, you can make a difference.

READY TO RESPOND?

Think back to Mr. Getz in the opening scenario, and use what you have learned to respond to these questions:

1. Could atherosclerosis have led to Mr. Getz's collapse?
2. If Mr. Getz had experienced chest pain, how might stopping and resting have prevented his collapse?
3. Why is it important to know whether Mr. Getz may be suffering cardiac arrest?
4. If Mr. Getz is in cardiac arrest, why will CPR alone not sustain his life?

STUDY QUESTIONS

1. Match each term with the correct definition.

a. Cardiac arrest	d. Coronary arteries
b. CPR	e. Heart attack
c. Cholesterol	f. Angina pectoris

_____ A fatty substance that contributes to the risk for heart disease

_____ Temporary chest pain caused by a lack of oxygen to the heart

_____ Blood vessels that supply the heart with oxygen-rich blood

_____ A combination of chest compressions and rescue breaths

_____ Condition that results when the heart stops beating or beats too irregularly or weakly to circulate blood

_____ A sudden illness involving the death of heart muscle tissue caused when it does not receive oxygen-rich blood

2. Identify the signals of cardiac arrest.

3. List the situations in which a lay responder may stop CPR.

4. Describe the conditions that most often cause cardiac arrest in children and infants.

In questions 5 through 12, circle the letter of the correct answer.

5. Which is the most common signal of a heart attack?

   a. Profuse sweating
   b. Persistent chest pain, discomfort or pressure
   c. Pale skin
   d. Trouble breathing

6. Which of the following best describes the chest pain associated with heart attack?

   a. An uncomfortable pressure
   b. Persistent pain that may spread to the shoulder, arm, neck, jaw, stomach or spine
   c. Throbbing pain in the legs
   d. a and b

7. What may happen as a result of a heart attack?

   a. The heart functions inadequately.
   b. The heart may stop.
   c. Some heart muscle tissue may die from lack of oxygen.
   d. All of the above

8. Which should you do first to care effectively for a person having a heart attack?

    a. Position the person for CPR.
    b. Begin giving rescue breaths.
    c. Call 9-1-1 or the local emergency number.
    d. Call the person's physician.

9. How can you know whether a person's heart is beating?

    a. The person is breathing.
    b. The person shows another sign of life.
    c. The person is conscious.
    d. Any or all of the above

10. When is CPR needed for an adult?

    a. When the person is conscious
    b. For every person having a heart attack
    c. When the person is unconscious and is not breathing
    d. When the person who is having a heart attack loses consciousness

11. Which is the purpose of CPR?

    a. To keep a person's airway open
    b. To identify any immediate threats to life
    c. To supply the vital organs with blood containing oxygen
    d. All of the above

12. CPR artificially takes over the functions of which two body systems?

    a. Nervous and respiratory systems
    b. Respiratory and circulatory systems
    c. Circulatory and nervous systems
    d. Circulatory and musculoskeletal systems

Use the following scenario to answer questions 13 and 14:

It is Saturday afternoon. You and your mother are at home watching a tennis match on television. At the commercial break, your mother mumbles something about indigestion and heads to the medicine cabinet to get an antacid. Twenty minutes later, you notice that your mom does not respond to a great play made by her favorite player. You ask what is wrong, and she complains that the antacid has not worked. She states that her chest and shoulder hurt. She is sweating heavily. You notice that she is breathing fast and she looks ill.

13. List the signals of a heart attack that you find in this scenario.

14. Your mother suddenly seems to lose consciousness. Number in order the following actions you would now take.

_____ Open the airway and check for signs of life. *(There are none.)*

_____ Call 9-1-1 or the local emergency number.

_____ Check for responsiveness. *(She does not respond)*

_____ Correctly position your hands.

_____ Give cycles of 30 compressions and 2 rescue breaths.

In questions 15 through 17, circle the letter of the correct answer.

15. If during an analysis an AED prompts, "no shock advised," you should—

    a. Check pad placement on the person's chest.
    b. Reset the AED by turning it off for 10 seconds.
    c. Resume CPR until the AED reanalyzes or you notice an obvious sign of life.
    d. Unplug the connector from the machine.

16. Before the AED analyzes the heart rhythm, you should—

    a. Ensure that no one, including you, is touching the person.
    b. Make sure that the person's airway is maintained.
    c. Finish a cycle of CPR.
    d. None of the above

17. If the AED pads risk touching each other, such as with a small child or infant, you should—

    a. Place the pads as usual. It does not matter if they touch each other.
    b. Place one pad on the stomach and one pad on the chest.
    c. Reverse the position of the pads on the chest.
    d. Place one pad in the middle of the chest, and the other on the back, between the shoulder blades.

Answers are listed in Appendix B.

CPR—ADULT

NO BREATHING

AFTER CHECKING THE SCENE AND THE INJURED OR ILL PERSON:

1 GIVE 30 CHEST COMPRESSIONS

Push hard, push fast in the center of the chest at least **2** inches deep and at least **100** compressions per minute.

TIP: *The person must be on a firm, flat surface.*

2 GIVE 2 RESCUE BREATHS

- Tilt the head back and lift the chin up.
- Pinch the nose shut then make a complete seal over the person's mouth.
- Blow in for about **1** second to make the chest clearly rise.
- Give rescue breaths, one after the other.
- If chest does not rise with the first rescue breath, retilt the head and give another rescue breath.

3 DO NOT STOP

Continue cycles of CPR. Do not stop except in one of these situations:

- You find an obvious sign of life, such as breathing.
- An AED is ready to use.
- Another trained responder or EMS personnel take over.
- You are too exhausted to continue.
- The scene becomes unsafe.

TIP: *If at any time you notice an obvious sign of life, stop CPR and monitor breathing and for any changes in condition.*

WHAT TO DO NEXT

- USE AN AED AS SOON AS ONE IS AVAILABLE.
- IF BREATHS DO NOT MAKE CHEST RISE—Give **CARE** for unconscious choking.

CPR—CHILD

NO BREATHING

AFTER CHECKING THE SCENE AND THE INJURED OR ILL CHILD:

1 GIVE 30 CHEST COMPRESSIONS

Push hard, push fast in the center of the chest about **2** inches deep and at least **100** compressions per minute.

TIP: *The child must be on a firm, flat surface.*

2 GIVE 2 RESCUE BREATHS

- Tilt the head back and lift the chin up.
- Pinch the nose shut then make a complete seal over the child's mouth.
- Blow in for about **1** second to make the chest clearly rise.
- Give rescue breaths, one after the other.
- If chest does not rise with the first rescue breath, retilt the head and give another rescue breath.

3 DO NOT STOP

Continue cycles of CPR. Do not stop except in one of these situations:

- You find an obvious sign of life, such as breathing.
- An AED is ready to use.
- Another trained responder or EMS personnel take over.
- You are too exhausted to continue.
- The scene becomes unsafe.

TIP: *If at any time you notice an obvious sign of life, stop CPR and monitor breathing and for any changes in condition.*

WHAT TO DO NEXT

- USE AN AED AS SOON AS ONE IS AVAILABLE.
- IF BREATHS DO NOT MAKE CHEST RISE—Give **CARE** for unconscious choking.

CPR—INFANT

NO BREATHING

AFTER CHECKING THE SCENE AND THE INJURED OR ILL INFANT:

1 GIVE 30 CHEST COMPRESSIONS

Push hard, push fast in the center of the chest about **1½** inches deep and at least **100** compressions per minute.

TIP: *The infant must be on a firm, flat surface.*

2 GIVE 2 RESCUE BREATHS

- Tilt the head back and lift the chin up.
- Make a complete seal over the infant's mouth and nose.
- Blow in for about **1** second to make the chest clearly rise.
- Give rescue breaths, one after the other.
- If chest does not rise with the first rescue breath, retilt the head and give another rescue breath.

3 DO NOT STOP

Continue cycles of CPR. Do not stop except in one of these situations:

- You find an obvious sign of life, such as breathing.
- An AED is ready to use.
- Another trained responder or EMS personnel take over.
- You are too exhausted to continue.
- The scene becomes unsafe.

TIP: *If at any time you notice an obvious sign of life, stop CPR and monitor breathing and for any changes in condition.*

WHAT TO DO NEXT

- USE AN AED AS SOON AS ONE IS AVAILABLE.
- IF BREATHS DO NOT MAKE CHEST RISE—Give **CARE** for unconscious choking.

AED—ADULT OR CHILD

OLDER THAN 8 YEARS OR WEIGHING MORE THAN 55 POUNDS

NO BREATHING

TIP: *Do not use pediatric AED pads or equipment on an adult or on a child older than 8 years or weighing more than 55 pounds.*

AFTER CHECKING THE SCENE AND THE INJURED OR ILL PERSON:

1 TURN ON AED

Follow the voice and/or visual prompts.

2 WIPE BARE CHEST DRY

TIP: *Remove any medication patches with a gloved hand.*

3 ATTACH PADS

4 PLUG IN CONNECTOR, IF NECESSARY

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5 STAND CLEAR

Make sure no one, including you, is touching the person.

- Say, "EVERYONE STAND CLEAR."

6 ANALYZE HEART RHYTHM

Push the "analyze" button, if necessary. Let the AED analyze the heart rhythm.

7 DELIVER SHOCK

IF A SHOCK IS ADVISED:

- Make sure no one, including you, is touching the person.
- Say, "EVERYONE STAND CLEAR."
- Push the "shock" button, if necessary.

8 PERFORM CPR

After delivering the shock, or if no shock is advised:

- Perform about **2** minutes (or **5** cycles) of CPR.
- Continue to follow the prompts of the AED.

TIPS:

- *If at any time you notice an obvious sign of life, stop CPR and monitor breathing and for any changes in condition.*
- *If two trained responders are present, one should perform CPR while the second responder operates the AED.*

AED—CHILD AND INFANT

YOUNGER THAN 8 YEARS OR WEIGHING LESS THAN 55 POUNDS

NO BREATHING

TIP: *When available, use pediatric settings or pads when caring for children and infants. If pediatric equipment is not available, rescuers may use AEDs configured for adults.*

AFTER CHECKING THE SCENE AND THE INJURED OR ILL CHILD OR INFANT:

1 TURN ON AED

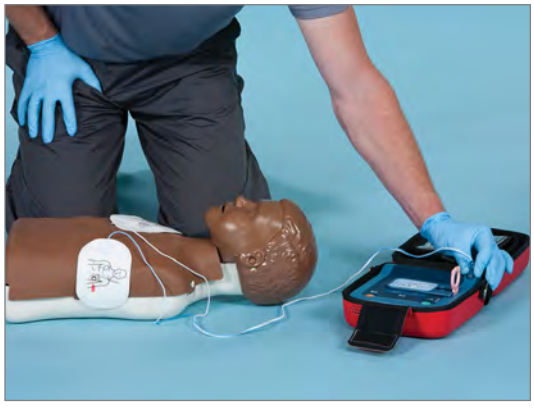
Follow the voice and/or visual prompts.

2 WIPE BARE CHEST DRY

3 ATTACH PADS

If the pads risk touching each other, use the front-to-back pad placement.

4 PLUG IN CONNECTOR, IF NECESSARY



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5 STAND CLEAR

Make sure no one, including you, is touching the child or infant.

- Say, "EVERYONE STAND CLEAR."

6 ANALYZE HEART RHYTHM

Push the "analyze" button, if necessary. Let the AED analyze the heart rhythm.

7 DELIVER SHOCK

IF A SHOCK IS ADVISED:

- Make sure no one, including you, is touching the child or infant.
- Say, "EVERYONE STAND CLEAR."
- Push the "shock" button.

8 PERFORM CPR

After delivering the shock, or if no shock is advised:

- Perform about **2** minutes (or **5** cycles) of CPR.
- Continue to follow the prompts of the AED.

TIPS:

- *If at any time you notice an obvious sign of life, stop CPR and monitor breathing and for any changes in condition.*
- *If two trained responders are present, one should perform CPR while the second responder operates the AED.*

7

Breathing Emergencies

You and your friends are at a local coffee shop, having a late-morning snack and catching up. Someone relates a funny story about what happened in one of his classes and you are all laughing hard. Suddenly, one of your friends, James, jumps up in a panic. He seems to be choking on a piece of his bagel.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Identify the causes of breathing emergencies.
- Identify conditions that cause respiratory distress and respiratory arrest.
- Identify signals of respiratory distress and respiratory arrest.
- Describe the care for a person in respiratory distress and respiratory arrest.
- Identify signals of asthma.
- Describe the care for a person having an asthma attack.
- Identify common causes of choking for adults, children and infants.
- Describe the care for a conscious choking adult, child and infant.
- Describe the care for an unconscious choking adult, child and infant.

After reading this chapter and completing the class activities, you should be able to:

- Demonstrate how to assist a person with an asthma inhaler.
- Demonstrate how to give care for a conscious choking adult, child and infant.
- Demonstrate how to give care for an unconscious choking adult, child and infant.

KEY TERMS

Airway obstruction: Complete or partial blockage of the airway, which prevents air from reaching a person's lungs; the most common cause of respiratory emergencies.

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

Cyanotic: Bluish discoloration of the skin around the mouth or the fingertips resulting from a lack of oxygen in the blood.

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

Respiratory arrest: A condition in which breathing has stopped.

Respiratory distress: A condition in which a person is having trouble breathing or requires extra effort to breath.

INTRODUCTION

A **breathing emergency** is any respiratory problem that can threaten a person's life. Breathing emergencies happen when air cannot travel freely and easily into the lungs. Respiratory distress and respiratory arrest are examples of breathing emergencies, and can have a variety of causes including asthma and other illnesses.

Airway obstruction is one of the most common causes of breathing emergencies. There are two types of airway obstruction. An ***anatomical airway obstruction*** occurs when the airway is blocked by the tongue or swollen tissues of the mouth and throat. This type of obstruction may result from injury to the neck or a medical emergency, such as anaphylaxis. A ***mechanical airway obstruction*** occurs when the airway is partially or completely blocked by a foreign object, such as a piece of food or a small toy, by fluids, such as vomit or blood, or by mucous. A person with a mechanical airway obstruction is choking.

It is important to recognize breathing emergencies in children and infants and act before the heart stops beating. Frequently, an adult's heart stops working (known as *cardiac arrest*) because of heart disease. However, children and infants usually have healthy hearts. When the heart stops in a child or infant, it usually is the result of a breathing emergency.

No matter what the age of the person, trouble breathing can be the first signal of a more serious emergency, such as a heart problem. Recognizing the signals of breathing problems and giving care often are the keys to preventing these problems from becoming more serious emergencies.

If the injured or ill person is conscious, he or she may be able to indicate what is wrong by speaking or gesturing to you and may be able to answer questions. However, if you are unable to communicate with the person, it can be difficult to determine what is wrong. Therefore, it is important to recognize the signals of breathing emergencies, know when to call 9-1-1 or the local emergency number, and know what to do until help arrives and takes over.

In any breathing emergency, seconds count, so you must react at once. This chapter discusses how to recognize and care for breathing emergencies.

THE BREATHING PROCESS

The human body needs a constant supply of oxygen to survive. When you breathe through your mouth and nose, air travels down your throat, through your windpipe and into your lungs. This pathway from the mouth and nose to the lungs is called the airway.

As you might imagine, the airway, mouth and nose are smaller in children and infants than they are in adults **(Figure 7-1, A–B)**. As a result, they can be blocked more easily by small objects, blood, fluids or swelling.

The goal in a breathing emergency is for air to reach the lungs. For any person, regardless of age, it is important to keep the airway open when giving care. Once air reaches the lungs,

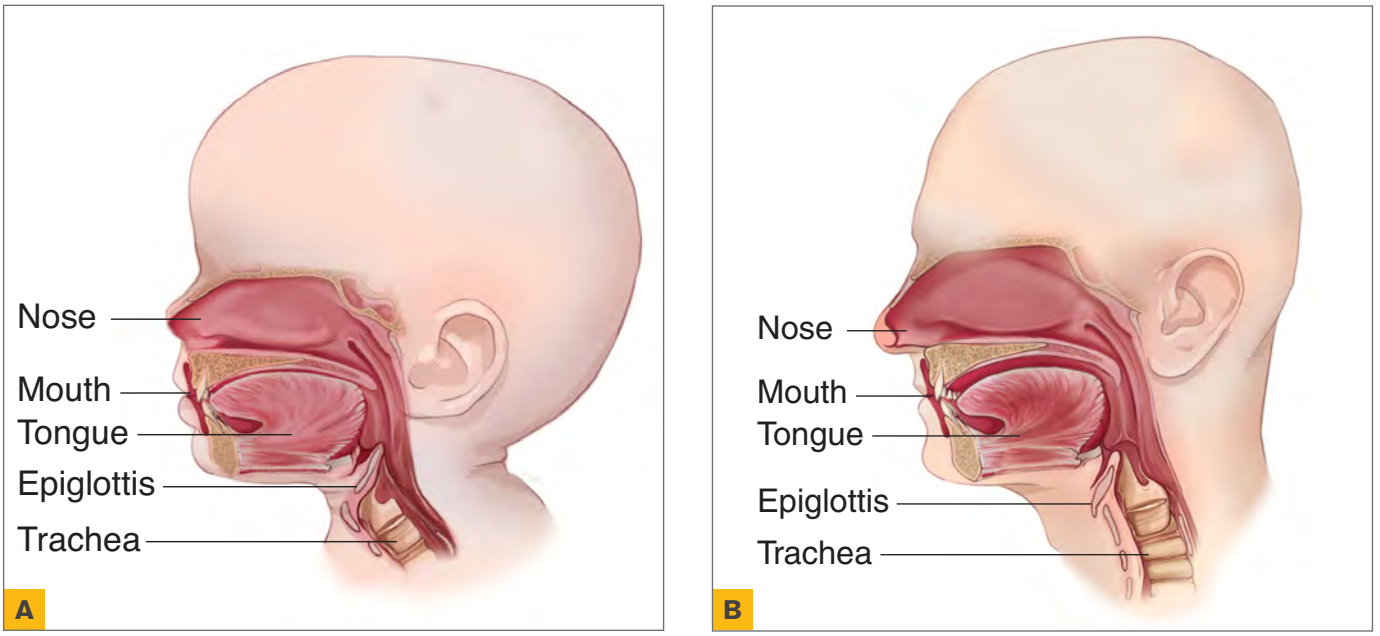


FIGURE 7-1, A–B **A,** *A child's airway.* **B,** *An adult's airway*

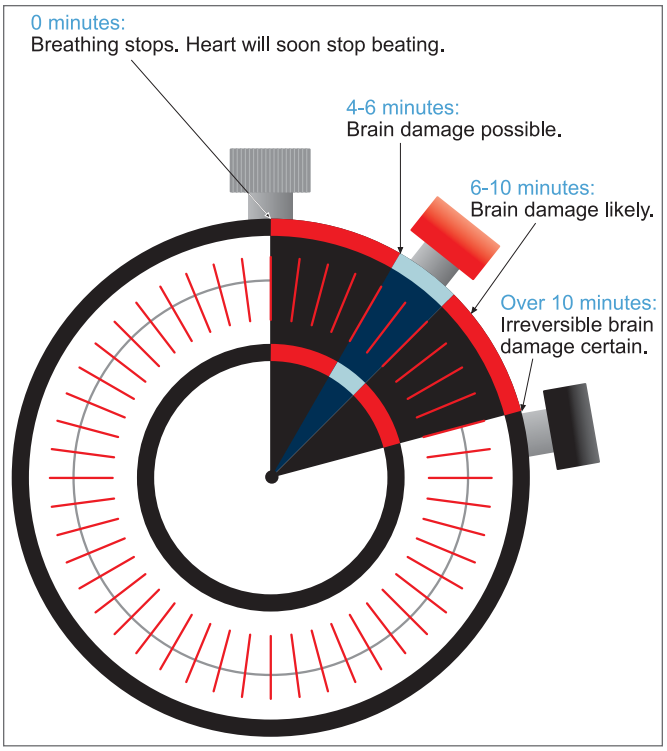


FIGURE 7-2 *Time is critical in life-threatening emergencies. Unless the brain gets oxygen within minutes of when breathing stops, brain damage or death will occur.*

oxygen in the air is transferred to the blood. The heart pumps the blood throughout the body. The blood flows through the blood vessels, delivering oxygen to the brain, heart and all other parts of the body.

In some breathing emergencies the oxygen supply to the body is greatly reduced, whereas in others the oxygen supply is cut off entirely. As a result, the heart soon stops beating and blood no longer moves through the body. Without oxygen, brain cells can begin to die within 4 to 6 minutes **(Figure 7-2)**. Unless the brain receives oxygen within minutes, permanent brain damage or death will result.

RESPIRATORY DISTRESS AND RESPIRATORY ARREST

Respiratory distress is a condition in which breathing becomes difficult or requires extra effort. It is the most common breathing emergency. Respiratory distress can lead to ***respiratory arrest***, which occurs when breathing has stopped.

Normal breathing is regular, quiet and effortless. A person does not appear to be working hard or struggling when breathing normally. This means that the person is not making noise when breathing, breaths are not fast and breathing does not cause discomfort or pain. However, it should be noted that normal breathing rates in children and infants are faster than normal breathing rates in adults. Infants have periodic breathing, so changes in breathing patterns are normal for infants.

You usually can identify a breathing problem by watching and listening to the person's breathing and by asking the person how he or she feels.

Causes of Respiratory Distress and Respiratory Arrest

Respiratory distress and respiratory arrest can be caused by a variety of conditions, including:

- Choking (a partially or completely obstructed airway).
- Illness.
- Chronic respiratory conditions such as emphysema or asthma.
- Electrocution.
- Irregular heartbeat.
- Heart attack.
- Congestive heart failure.
- Injury to the head or brain stem, chest, lungs or abdomen.
- Severe allergic reactions.
- Drug overdose (especially alcohol, narcotic painkillers, barbiturates, anesthetics and other depressants).
- Poisoning.

- Emotional distress.
- Drowning.

Infections of the respiratory system are more common in children and infants than in adults. These can range from minor infections, such as the common cold, to life-threatening infections that block the airway. Respiratory distress in children is often caused by respiratory infections, such as croup and epiglottitis.

Some of the specific causes of respiratory distress and respiratory arrest are covered in more detail in the sections that follow.

Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease (COPD) is a long-term lung disease encompassing both chronic bronchitis and emphysema. COPD causes a person to have trouble breathing because of damage to the lungs. In a person with COPD, the airways become partly blocked and the air sacs in the lungs lose their ability to fill with air. This makes it hard to breathe in and out. There is no cure for COPD, and it worsens over time.

The most common cause of COPD is cigarette smoking, but breathing in other types of lung irritants, pollution, dust or chemicals over a long period also can cause COPD. It usually is diagnosed when a person is middle aged or older. It is the fourth-ranking cause of death in the United States and a major cause of illness.

Common signals of COPD include:

- Coughing up a large volume of mucus.
- Tendency to tire easily.
- Loss of appetite.
- Bent posture with shoulders raised and lips pursed to make breathing easier.
- A fast pulse.
- Round, barrel-shaped chest.
- Confusion (caused by lack of oxygen to the brain).

Emphysema

A type of COPD, **emphysema** is a disease that involves damage to the air sacs in the lungs. It is a chronic (long-lasting or frequently recurring) disease that worsens over time. The most common signal of emphysema is shortness of breath. Exhaling is extremely difficult. In advanced cases, the affected person may feel restless, confused and weak, and may even go into respiratory or cardiac arrest.

Bronchitis

Bronchitis is an inflammation of the main air passages to the lungs. It can be acute (short lasting) or chronic. Chronic bronchitis is a type of COPD. To be diagnosed with chronic bronchitis, a person must have a cough with mucus on most days of the month for at least 3 months.

Acute bronchitis is *not* a type of COPD; it develops after a person has had a viral respiratory infection. Acute bronchitis first affects the nose, sinuses and throat, and then spreads to the lungs. Those most at risk for acute bronchitis include children, infants, older adults, people with heart or lung disease and smokers.

Signals of both types of bronchitis include:

- Chest discomfort.
- Cough that produces mucus.
- Fatigue.
- Fever (usually low).
- Shortness of breath that worsens with activity.
- Wheezing.

Additional signals of chronic bronchitis include:

- Ankle, feet and leg swelling.
- Blue lips.
- Frequent respiratory infections, such as colds or the flu.

Hyperventilation

Hyperventilation occurs when a person's breathing is faster and deeper than normal. When this happens, the body does not take in enough oxygen to meet its demands. People who are hyperventilating feel as if they cannot get enough air. Often they are afraid and anxious or seem confused. They may say that they feel dizzy or that their fingers and toes feel numb and tingly.

Hyperventilation often results from fear or anxiety and usually occurs in people who are tense and nervous. However, it also can be caused by head injuries, severe bleeding or illnesses, such as high fever, heart failure, lung disease and diabetic emergencies. Asthma and exercise also can trigger hyperventilation.

Allergic Reactions

An allergic reaction is the response of the immune system to a foreign substance that enters the body. Common **allergens** include bee or insect venom, antibiotics, pollen, animal dander, sulfa and some foods such as nuts, peanuts, shellfish, strawberries and coconut oils.

Allergic reactions can cause breathing problems. At first the reaction may appear to be just a rash and a feeling of tightness in the chest and throat, but this condition can become life threatening. The person's face, neck and tongue may swell, closing the airway.

A severe allergic reaction can cause a condition called **anaphylaxis**, also known as anaphylactic shock. During anaphylaxis, air passages swell and restrict a person's breathing. Anaphylaxis can be brought on when a person with an allergy comes in contact with allergens via insect stings, food, certain medications or other substances. Signals of anaphylaxis include a rash, tightness in the chest and throat, and swelling of the face, neck and tongue. The person also may feel dizzy or confused. Anaphylaxis is a life-threatening emergency. You will learn more about the signals and care of anaphylaxis in Chapter 16.

Some people know that they are allergic to certain substances or to insect stings. They may have learned to avoid these things and may carry medication, such as an epinephrine auto-injector, to reverse the allergic reaction. People who have severe allergic reactions may wear a medical identification (ID) tag, bracelet or necklace.

Croup

Croup is a common upper airway virus marked by a harsh, repetitive cough that most commonly affects children younger than 5 years. The airway constricts, limiting the passage of air, which causes the child to produce an unusual-sounding cough that can range from

a high-pitched wheeze to a barking cough. The cough associated with croup mostly occurs during the evening and nighttime.

Most children with croup can be cared for at home using mist treatment or cool air. However, in some cases, a child with croup can progress quickly from respiratory distress to respiratory arrest.

Epiglottitis

Epiglottitis, a far less common infection than croup, causes severe swelling of the epiglottis. The epiglottis is a piece of cartilage at the back of the tongue. When it swells, it can block the windpipe and lead to severe breathing problems. Epiglottitis usually is caused by infection with *Haemophilus influenzae* bacteria.

The signals of epiglottitis may be similar to those of croup, but epiglottitis is a more serious illness and can result in death if the airway becomes blocked completely.

In the past, epiglottitis was a common illness in children between 2 and 6 years of age. However, the incidence of epiglottitis in children has decreased dramatically in the United States since the 1980s, when children began routinely receiving the H. influenzae type B (Hib) vaccine.

For children and adults, epiglottitis begins with a high fever and sore throat. A person with epiglottitis may need to sit up and lean forward, perhaps with the chin thrust out, in order to breathe. Other signals include drooling, trouble swallowing, voice changes, chills, shaking and fever.

Seek medical care immediately for a person who may have epiglottitis. This condition is a medical emergency.

Signals of Respiratory Distress and Respiratory Arrest

Although breathing problems have many causes, you do not need to know the exact cause of a breathing emergency to care for it. You do need to be able to recognize when a person is having trouble breathing or is not breathing at all.

Signals of respiratory distress in adults include:

- Trouble breathing.
- Slow or rapid breathing.
- Unusually deep or shallow breathing.
- Gasping for breath.
- Trouble speaking or trouble speaking in complete sentences.
- **Wheezing**, gurgling or making high-pitched noises.
- Snoring or grunting sounds when breathing.
- Unusually moist or cool skin.
- Flushed, pale, ashen or bluish skin.
- Shortness of breath.
- Dizziness or light-headedness.
- Pain in the chest or tingling in the hands, feet or lips.
- Apprehensive or fearful feelings.

Signals of respiratory distress in children and infants include:

- Agitation.
- Unusually fast or slow breathing.
- Drowsiness.
- Noisy breathing.
- Nasal flaring.
- Chest appears to sink in with each breath (intercostal retractions).
- Pale, ashen, flushed or bluish skin color.
- Trouble breathing.
- Altered level of consciousness.
- Increased heart rate.

Signals for a person in respiratory arrest include:

- Unresponsiveness.
- Absence of breathing.
- Ashen or ***cyanotic*** skin color.

Care for Respiratory Distress and Respiratory Arrest

Use the emergency action steps to decide how to care for a person having a breathing emergency.

- **CHECK** the scene to ensure your own safety before you approach the person. The person's condition may have been caused by an unsafe environmental condition, such as the presence of toxic fumes.
- **CHECK** the person for consciousness. If the person is conscious, you know that he or she is breathing and that his or her heart is beating.
- **CALL** 9-1-1 or the local emergency number if breathing is too fast, too slow, noisy, painful, or if the person is not breathing at all. Even if the person is conscious, respiratory distress is a life-threatening emergency and requires immediate care from emergency medical services (EMS) personnel.
- Continue to **CHECK** for other life-threatening conditions, such as severe bleeding.
- **CARE** for the conditions you find.

Specific care for an adult, child or infant who is having *trouble* breathing includes:

FIGURE 7-3 *A person who is having trouble breathing may breathe more easily in a sitting position.*

- Help the person rest in a comfortable position. Usually, sitting is more comfortable than lying down because it is easier for the person to breathe in a sitting position **(Figure 7-3)**.
- If the person is conscious, check for other conditions.
- Remember that a person who has trouble breathing may have trouble talking. If the person cannot talk, ask him or her to nod or to shake his or her head to answer yes-or-no questions. If bystanders are present, they may be able to help answer questions about the person's condition.
- Try to reassure the person to reduce anxiety. This may make breathing easier.

- Continue to monitor the person. Watch for additional signals of respiratory distress.
- Keep the person from getting chilled or overheated.
- Assist a person with asthma with the use of prescribed, quick-relief asthma medication if needed (see the section on Asthma below). Also assist the person in taking any other prescribed medication (e.g., oxygen or an inhalant [bronchodilator]) for his or her condition, if trained and if state or local regulations allow.
- Assist a person experiencing anaphylaxis with his or her epinephrine auto-injector if needed. You may need to assist with a second dose in a situation where signals of anaphylaxis persist after several minutes, or return, and EMS is delayed. You will learn more about giving care for anaphylaxis in Chapter 16.
- If the person is hyperventilating and you are sure that it is caused by emotion, such as excitement, tell him or her to relax and breathe slowly. You can also suggest that the person breathe through pursed lips (as if whistling) or pinch one nostril and breathe through his or her nose. Reassurance is often enough to correct hyperventilation. If the breathing still does not slow down, the person could have a serious problem.
- Be aware that a person's airway may become completely blocked as a result of epiglottitis. A blocked airway is a life-threatening emergency and needs immediate medical help.

If an adult is unconscious and *not* breathing, the cause is most likely a cardiac emergency. Immediately begin CPR, starting with chest compressions. If an adult is not breathing because of a known respiratory cause, such as drowning, give 2 rescue breaths after checking for breathing and before quickly scanning for severe bleeding and beginning CPR or modified CPR (as taught later in this chapter).

If a child or infant is unconscious and *not* breathing, and you did not witness a sudden collapse, give 2 rescue breaths after checking for breathing and before quickly scanning for severe bleeding and beginning CPR or modified CPR.

ASTHMA

Asthma is a life-long lung disease in which certain substances or conditions, called "triggers," cause inflammation and constriction of the airways (small tubes in the lungs through which we breathe), making breathing difficult. Triggers of an asthma attack include exercise, cold air, allergens or irritants, such as perfume.

In 2008, the Centers for Disease Control and Prevention (CDC) estimated that over 23 million Americans were affected by asthma. Asthma is more common in children and young adults. However, its frequency and severity are increasing in all age groups in the United States. Asthma is the third-ranking cause of hospitalization among those younger than 15 years.

People diagnosed with asthma can reduce the risk of an attack by controlling environmental variables when possible. This helps to limit exposure to the triggers that can start an asthma attack.

When an attack does occur, people with asthma can use medications and other forms of treatment. Asthma medications stop the muscle spasm and open the airway, which makes breathing easier.

Asthma Triggers

A trigger is anything that sets off or starts an asthma attack. A trigger for one person is not necessarily a trigger for another. Asthma triggers include the following:

- Dust and smoke
- Air pollution
- Respiratory infections
- Fear or anxiety
- Perfume
- Exercise
- Plants and molds
- Medications, such as aspirin
- Animal dander
- Temperature extremes
- Changes in weather

These are only a few of the things that can trigger asthma in people.

Medications to Control Asthma

People who have been diagnosed with asthma will have a personalized medication plan. They should take all medications exactly as prescribed by their health care provider. Asthma medications are available in two forms: long-term control and quick relief.

Long-Term Control Medications

Long-term control medications prevent or reverse inflammation (swelling) in the airway. They also help to decrease sensitivity, which helps to keep the airways from reacting to asthma triggers. The long-term control medicines work slowly, helping to control asthma over many hours. They should be taken every day whether or not signals of asthma are present.

Quick-Relief Medications

Quick-relief or rescue medications are used to stop an asthma attack. These medications work quickly to relieve the sudden swelling. They lessen wheezing, coughing and chest tightness. This allows the person to breathe easier. They also are called short-acting bronchodilators.

FIGURE 7-4 *Long-term and quick-release medications are inhaled using an MDI, a DPI or a small-volume nebulizer.*

Methods of Delivery

The most common way to take long-term control and quick-relief asthma medications is by inhaling them. Inhalation allows the medication to reach the airways faster and work quickly. There also are fewer side effects.

Medications are inhaled using a metered-dose inhaler (MDI), a dry powder inhaler (DPI) or a small-volume nebulizer **(Figure 7-4)**. Both long-term and quick-relief medications also are available in pill and liquid form. In addition, long-term medications are available in the form of an injection given just under the skin.

MDI Medications

An MDI sends a measured dose of medicine in mist form directly into the person's mouth. The person gently presses down the top of the inhaler. This causes a small amount of pressurized gas to push the medicine out quickly. Sometimes a "spacer" is used to control the amount of medication that is inhaled. The medicine goes into the spacer and then the person inhales the medication through the mouthpiece on the spacer.

DPI Medications

A DPI is similar to an MDI. It is a hand-held device that delivers a dry powder form of the medication. Some dry powders are tasteless. Others are mixed with lactose to give them a sweet taste. The DPI is administered by breathing in quickly to activate the inhaler. The person does not have to press down the top of the inhaler. DPIs may be difficult for some people to use because of the need to take in a quick, strong breath.

What if...

A person is suffering from what appears to be an acute asthma attack but he or she does not have a prescribed bronchodilator inhaler, and I have mine? Should I let the person use it?

No! Sharing prescribed medication is never recommended, nor is it advisable. When a bronchodilator inhaler is unavailable, make sure that someone has called 9-1-1 or the local emergency number, or call yourself, then help the person rest in a comfortable position, calm and reassure the person, and continue to monitor the person for signals of respiratory distress or arrest.

Small-Volume Nebulizers

Small-volume nebulizers deliver medication in the form of a mist. The mist is delivered over several minutes. This is especially helpful when the person is unable to take deep breaths. Nebulizers are commonly used for children younger than 5 years and the elderly. They also are used for people who have trouble using inhalers and for those with severe asthma.

Signals of an Asthma Attack

You often can tell when a person is having an asthma attack by the hoarse whistling sound made while the person is inhaling and/or exhaling. This sound, known as wheezing, occurs because air becomes trapped in the lungs. Coughing after exercise, crying or laughing are other signals that an asthma attack could begin.

Signals of an asthma attack include:

- Trouble breathing or shortness of breath.
- Rapid, shallow breathing.
- Sweating.
- Tightness in the chest.
- Inability to talk without stopping for a breath.
- Feelings of fear or confusion.

Care for an Asthma Attack

If a person is having an asthma attack, call 9-1-1 or the local emergency number if the person's breathing trouble does not improve in a few minutes after using the quick-relief medication. While waiting for help to arrive:

- Remain calm. This will help the person to also remain calm and ease his or her breathing troubles.
- Help the person to sit comfortably.

- Loosen any tight clothing around the neck and abdomen.
- Assist the person with his or her prescribed quick-relief medication if requested and if permitted by state or local regulations.

See the Skill Sheet for Assisting with an Asthma Inhaler for more information on how to help. See also Smart Moves: Preventing Asthma Attacks for steps you can take to limit the effect of asthma triggers.

Remember: *The instructions for administering asthma medication found in this chapter should not be substituted for those given by a medical professional to an individual person. Nor should these instructions be substituted for directions given by a medical professional in consultation with a site where asthma medication will be administered. Consult a health care professional for specific advice on the use of asthma inhalers and nebulizers.*

SMART MOVES: PREVENTING ASTHMA ATTACKS

When it comes to asthma, prevention is key. Following these measures can help reduce a person's risk of an attack.

Limit Triggers in the Home

To reduce triggers in your home:

- Keep plants outside.
- Wash bedclothes and pajamas weekly in hot water.
- Use hypoallergenic covers on mattresses and pillows.
- Eliminate or reduce the number of carpets and rugs.
- Regularly steam clean all carpets, rugs and upholstery.
- Keep the home clean and free of dust and pests—wet dusting can be more effective than dry dusting.
- Do not allow, or be around, smoke.
- Regularly change the air filter in the central air conditioning or heating unit.
- Eliminate or minimize the number of stuffed toys.
- Use hypoallergenic health and beauty products.
- Wash pets weekly.
- Keep pets outside the house.

Control Emotions

Certain strong emotions can trigger an asthma attack. When you feel a strong emotion, such as anger or fear, the following suggestions can reduce the chances that an asthma attack will be triggered:

- Take a long deep breath in through the nose, and slowly let it out through the mouth.
- Count to 10.
- Talk with a family member, trusted friend or health care provider.
- Do a relaxing activity.

Prevent Infections

Colds and other respiratory infections can make an asthma condition worse. One of the most common ways to catch colds is by rubbing the nose or eyes with hands contaminated with a cold virus. Contamination often occurs by touching surfaces (such as doorknobs) or objects that other people have touched. Some ways to reduce the chances of getting a cold or other respiratory infection include:

- Wash hands regularly, especially after using the restroom or shaking hands with other people and before eating.
- Clean environmental surfaces, such as telephones and counters, with a virus-killing disinfectant. The viruses that cause colds can survive up to 3 hours on objects such as telephones, counters and stair railings. Disinfecting these objects regularly can help to prevent the spread of colds and viruses.
- Get vaccinated for illnesses when a vaccine is available, such as for influenza and whooping cough (pertussis).
- Your health care provider might have other suggestions based on your medical history.

(*continued*)

SMART MOVES: PREVENTING ASTHMA ATTACKS (*continued*)

Reduce Environmental Triggers

Sudden changes in the weather, heavy mold or pollen content in the air and pollution can trigger an asthma attack. To avoid attacks brought on by triggers in the environment:

- Wear the right clothing for the weather conditions.
- Stay indoors on days when there is a high risk of respiratory trouble.
- Take preventative medications, as prescribed by your health care provider.
- Stay away from places with high amounts of dirt, smoke and other irritants.
- Know how the weather affects your condition.
- Talk to your health care provider about other prevention strategies.

Exercise Carefully

Exercise-induced asthma happens during or shortly after exercise. Having this type of asthma does not mean one cannot or should not exercise or play sports. It is, however, important to know what to do to prevent an asthma attack. Things to keep in mind when you have exercise-induced asthma include the following:

- Take prescribed medications 30 to 60 minutes before exercising.
- Slowly warm up before exercising. Cool down gently after exercising.
- Make sure that you drink plenty of fluids during exercise.
- Seek and follow the advice of your health care provider.
- If participating in organized sports, notify the coach of your condition.

CHOKING

Choking is a common breathing emergency. It occurs when the person's airway is partially or completely blocked. If a conscious person is choking, his or her airway has been blocked by a foreign object, such as a piece of food or a small toy; by swelling in the mouth or throat; or by fluids, such as vomit or blood. With a partially blocked airway, the person usually can breathe with some trouble. A person whose airway is completely blocked cannot cough, speak, cry or breathe at all.

Causes of Choking in Adults

Common causes of choking in adults include:

- Trying to swallow large pieces of poorly chewed food.
- Drinking alcohol before or during meals. Alcohol dulls the nerves that aid swallowing, making choking on food more likely.
- Dentures. Dentures make it difficult for the wearer to sense whether food is fully chewed before swallowing.
- Eating while talking excitedly or laughing, or eating too fast.
- Walking, playing or running with food or objects in the mouth.

Causes of Choking in Children and Infants

Choking is a common cause of injury and death in children younger than 5 years. Because young children put nearly everything in their mouths, small, nonfood items, such as safety pins, small parts from toys and coins, often cause choking. However, food is responsible for most of the choking incidents in children. The American Academy of Pediatrics (AAP) recommends that young children not be given hard, smooth foods such as raw vegetables.

These foods must be chewed with a grinding motion, which is a skill that children do not master until 4 years of age; therefore, children may attempt to swallow these foods whole. For this same reason, the AAP recommends not giving children peanuts until they are 7 years of age or older. The AAP also recommends that young children not be given round, firm foods, such as hot dogs and carrot sticks, unless the foods are chopped into small pieces no larger than ½ inch.

Since choking remains a significant danger to children younger than 5 years of age, the AAP further recommends keeping the following foods and other items meant to be chewed or swallowed away from young children:

- Hard, gooey or sticky candy
- Grapes
- Popcorn
- Chewing gum
- Vitamins

Although food items cause most of the choking injuries in children, toys and household items also can be hazardous. Balloons, when broken or un-inflated, can choke or suffocate young children who try to swallow them. According to the Consumer Product Safety Commission (CPSC), more children have suffocated on non-inflated balloons and pieces of broken balloons than any other type of toy. Other nonfood items that can cause choking include:

- Baby powder.
- Objects from the trash, such as eggshells and pop-tops from beverage cans.
- Safety pins.
- Coins.
- Marbles.
- Pen and marker caps.
- Small button-type batteries.

See Smart Moves: Preventing Choking in Children and Infants for additional ways to prevent choking emergencies from happening.

Signals of Choking

An obstructed airway is a life-threatening emergency, therefore you must be able to recognize that the airway is obstructed and immediately give care. A person who is choking may have either a complete or partial airway obstruction.

SMART MOVES: PREVENTING CHOKING IN CHILDREN AND INFANTS

- Supervise mealtimes for young children and infants.
- Do not let children eat while playing or running.
- Teach children to chew and swallow food before talking or laughing.
- Do not give chewing gum to young children.
- Make sure that toys are too large to be swallowed.
- Make sure that toys have no small parts that could be pulled off.
- If you are unsure whether an object is safe for young children, test it by trying to pass it through a toilet paper roll. If it fits through the 1¾-inch diameter roll, it is not safe for young children.

Partial Airway Obstruction

A person with a partial airway obstruction can still move air to and from the lungs. In the case of choking, this air allows the person to cough, in an attempt to dislodge the object. The person may also be able to move air past the vocal cords to speak. The person may clutch at his or her throat with one or both hands as a natural reaction to choking. This action is the universal distress signal for choking **(Figure 7-5)**.

FIGURE 7-5 *Clutching the throat with one or both hands is universally recognized as a distress signal for choking.*

Complete Airway Obstruction

A partial airway obstruction can quickly become a complete airway obstruction. A person with a completely blocked airway is choking and is unable to cough, speak, cry or breathe, or else can only cough weakly and ineffectively or make high-pitched noises. The person may have a bluish skin color. All of these signals tell you the person is not getting enough air to sustain life. Act immediately! If a bystander is available, have him or her call 9-1-1 or the local emergency number while you begin to give care.

Care for Choking—Conscious Adult and Child

If the person is coughing forcefully or wheezing, do not interfere with attempts to cough up the object. A person who is getting enough air to cough or speak also has enough air entering the lungs to breathe. Stay with the person and encourage him or her to continue coughing to clear the obstruction. If the person continues to cough without coughing up the object, call 9-1-1 or the local emergency number.

If a person's airway is completely blocked, act at once! If a bystander is available, have him or her call 9-1-1 or the local emergency number while you begin care. Using more than one technique often is necessary to dislodge an object and clear a person's airway.

A combination of 5 back blows followed by 5 abdominal thrusts provides an effective way to clear the airway obstruction **(Figure 7-6, A–B)**. Back blows are helpful in dislodging the object that is in the airway. Abdominal thrusts compress the abdomen and create pressure that forces the diaphragm higher into the thoracic cavity, thus increasing pressure within the lungs and airway. This pressure simulates a cough, forcing air trapped in the lungs to push the object out of the airway, like a cork from a bottle of champagne.

FIGURE 7-6, A–B *If a conscious person has a completely blocked airway:* **A,** *Give 5 back blows.* **B,** *Then give 5 abdominal thrusts.*

To give back blows to an adult or child:

- Acquire consent from the person (adult) or parent/guardian (child).
- Position yourself slightly behind and to the side of the person.
- Provide support by placing one arm diagonally across the chest and lean the person forward until the upper airway is at least parallel to the ground.
- Firmly strike the person between the shoulder blades with the heel of your other hand.

If the back blows do not clear the obstruction, give abdominal thrusts.

To give abdominal thrusts:

- Stand or kneel behind the person, and wrap your arms around his or her waist.
- Locate the navel with one or two fingers of one hand. Make a fist with the other hand and place the thumb side against the middle of the person's abdomen, just above the navel and well below the lower tip of the breastbone.
- Grab your fist with your other hand and give quick, upward thrusts into the abdomen.

Each back blow and abdominal thrust should be a separate and distinct attempt to dislodge the obstruction. Continue to give 5 back blows and 5 abdominal thrusts until the object is dislodged; the person can cough forcefully, speak or breathe; or the person becomes unconscious. For a conscious child, use less force when giving back blows and abdominal thrusts, and be sure to get down to his or her level. Using too much force may cause internal injuries.

What if...

I am trying to help a conscious choking person who is much taller than me and I am having trouble finding the correct landmarks for back blows and abdominal thrusts?

If the person to whom you are trying to give back blows and abdominal thrusts is much taller than you are, and he or she has consented to care, in a calm and reassuring voice have the person kneel down. You can then begin giving 5 back blows followed by 5 abdominal thrusts until the airway obstruction is dislodged.

Care for Choking—Conscious Infant

If you determine that a conscious infant cannot cough, cry or breathe, perform 5 back blows followed by 5 chest thrusts.

To give back blows:

- Position the infant face-up on your forearm, supporting the head.
- Place one hand and forearm on the child's back, cradling the back of the head, and one hand and forearm on the front of the infant. Use your thumb and fingers to hold the infant's jaw while sandwiching the infant between your forearms.
- Turn the infant over so that he or she is face-down on your forearm **(Figure 7-7, A)**.
- Lower your arm onto your thigh so that the infant's head is lower than his or her chest, then give 5 firm back blows with the heel of your hand between the infant's shoulder blades **(Figure 7-7, B)**. Maintain support of the infant's head and neck by firmly holding his or her jaw between your thumb and forefinger. Each blow should be a separate and distinct attempt to dislodge the object.

If the back blows do not clear the obstruction, give chest thrusts. To give chest thrusts, you will need to place the infant in a face-up position as follows:

- Place one hand and forearm on the child's back, cradling the back of the head, while keeping your other hand and forearm on the front of the infant. Use your thumb and fingers to hold the infant's jaw while sandwiching the infant between your forearms.
- Turn the infant onto his or her back.

FIGURE 7-7, A–B *To give back blows to an infant:* **A,** *Position the infant so that he or she is face-down along your forearm, and lower your arm onto your thigh for support.* **B,** *Give 5 firm back blows with the heel of your hand.*

FIGURE 7-8, A–B *To give chest thrusts to an infant:* **A,** *Sandwich the infant between your forearms, while continuing to support the infant's head. Turn the infant onto his or her back, and support your arm on your thigh. The infant's head should be lower than his or her chest.* **B,** *Give 5 chest thrusts.*

- Lower your arm that is supporting the infant's back onto your opposite thigh. The infant's head should be lower than his or her chest, which will assist in dislodging the object **(Figure 7-8, A)**.
- Place the pads of two or three fingers in the center of the infant's chest just below the nipple line (toward the infant's feet).
- Use the pads of these fingers to compress the breastbone. Compress the breastbone 5 times about 1½ inches and then let the breastbone return to its normal position. Keep your fingers in contact with the infant's breastbone **(Figure 7-8, B)**.

Continue giving sets of 5 back blows and 5 chest thrusts until the object is forced out; the infant begins to cough forcefully, cry or breathe on his or her own; or the infant becomes unconscious.

You can give back blows and chest thrusts effectively whether you stand, kneel or sit, as long as the infant is supported on your thigh and the infant's head is lower than the chest. If the infant is large or your hands are too small to adequately support the infant, you may prefer to sit.

FIGURE 7-9 *Give chest thrusts rather than abdominal thrusts to a person who is obviously pregnant or known to be pregnant, or is too large for you to reach around.*

Use less force when giving back blows and chest thrusts to an infant than for a child or an adult. Using too much force may cause internal injuries.

Special Considerations

Using Chest Thrusts—Adult and Child

In some instances, abdominal thrusts are not the best method of care for a conscious choking adult or child. For example, if you cannot reach far enough around the person to give effective abdominal thrusts, you should give chest thrusts. You should also give chest thrusts instead of abdominal thrusts to choking persons who are obviously pregnant or known to be pregnant **(Figure 7-9)**.

To give chest thrusts to a conscious adult or child:

- Stand behind the person and place your arms under the person's armpits and around the chest.
- As with abdominal thrusts, make a fist with one hand and place the thumb side against the center of the person's breastbone. Be sure that your fist is centered on the breastbone, not on the ribs. Also make sure that your fist is not near the lower tip of the breastbone.
- Grab your fist with your other hand and thrust inward. Repeat these thrusts until the person can cough, speak or breathe or until the person becomes unconscious.

If You Are Alone

If you are alone and choking and no one is around who can help, you can give yourself abdominal thrusts in one of two ways.

FIGURE 7-10, A–B *To give abdominal thrusts to yourself:* **A,** *Bend over and press your abdomen against any firm object, such as the back of a chair.* **B,** *Or, give yourself abdominal thrusts by using your hands, just as you would do to another person.*

- Lean forward and press your abdomen over any firm object, such as the back of a chair, a railing or a sink. Be careful not to lean over anything with a sharp edge or a corner that might injure you **(Figure 7-10, A)**.
- Make a fist with one hand and place the thumb side on the middle of your abdomen slightly above your navel and well below the tip of your breastbone. Grasp your fist with your other hand and give quick, upward thrusts. **(Figure 7-10, B)**.

Person in a Wheelchair

For a choking person in a wheelchair, give abdominal thrusts **(Figure 7-11)**.

FIGURE 7-11 *For a choking person in a wheelchair, give abdominal thrusts.*

Care for Unconscious Choking

When giving care to a choking person, he or she may become unconscious if back blows and abdominal thrusts (chest thrusts for an infant) do not work to dislodge the object. If this happens:

- Carefully lower the person to the floor.
- Call 9-1-1 or the local emergency number if not already done.
- Open the person's mouth and look for an object. If an object is seen, remove it with your gloved finger (use your little finger for a child or infant). If no object is seen, open the person's airway using the head-tilt/chin-lift technique and attempt 2 rescue breaths. Often the throat muscles relax enough after a person becomes unconscious to allow air past the obstruction and into the lungs. You will know air has made it successfully into the lungs if the person's chest rises and falls with each rescue breath.
- If air does not go into the lungs and the chest does not rise, begin the modified CPR technique used for an unconscious choking person, which is described below.

If you discover a person who is already unconscious, you might not know whether the person was choking at first. As you learned in Chapter 5, unconsciousness is *always* a life-threatening condition. Call 9-1-1 or the local emergency number immediately. Ideally, someone will be available to make the call while you care for the person. If you are alone and the person is a child or infant, however, give 2 minutes of care first and then call 9-1-1 or the local emergency number.

As you also learned in Chapter 5, if during your check for other life-threatening conditions you find that the unconscious adult is not breathing, you should start CPR immediately with chest compressions. If the chest does not clearly rise after the first rescue breath in the cycle, retilt the head and give another rescue breath to ensure the airway is open. If that breath does not make the chest clearly rise, assume that the airway is blocked and use a modified CPR technique to care for unconscious choking as described on the next page.

What if...

I am giving back blows to an adult with a complete airway obstruction who is very heavy, and he or she loses consciousness. Do I let the person fall to the ground?

While providing care to a conscious choking adult, child or infant, you should always anticipate that the person may become unresponsive. If this does occur, every attempt should be made to lower the person to the floor safely. However, your safety also needs to be considered. If at any point in time you fear the risk of injury to yourself, especially when trying to lower a person to the ground who may be much heavier or larger than you, do your best to safely lower the person; but the priority is to protect yourself, because an injured first aid provider is of limited use.

For a child or infant who is unconscious and not breathing and who you did not witness collapse, 2 rescue breaths are included in the initial check for life-threatening conditions. If the chest does not clearly rise after the first rescue

breath, retilt the head and give another rescue breath to ensure the airway is open. If that breath does not make the chest clearly rise, assume that the airway is blocked and use a modified CPR technique to care for unconscious choking as described below.

Care for Unconscious Choking—Adult or Child

To care for an unconscious choking adult or child, perform a modified CPR technique:

- Locate the correct hand position for chest compressions. Use the same techniques that you learned for CPR.
- Give chest compressions. Compress an adult's chest 30 times to a depth of at least 2 inches or compress a child's chest 30 times to a depth of about 2 inches. Compress at a rate of at least 100 chest compressions per minute.
- Look for a foreign object.
  - Open the person's mouth (remove the CPR breathing barrier if you are using one) and look inside for a foreign object.
  - If you see an object, remove it with your finger (little finger for the child).
- Give 2 rescue breaths.
  - If the chest does not clearly rise, repeat cycles of chest compressions, foreign object check/removal and 2 rescue breaths. Do not stop this modified CPR technique except in one of these situations:
    - The object is removed and the chest clearly rises with rescue breaths (CPR may still be needed without the foreign object check).
    - The person starts to breathe on his or her own.
    - EMS personnel or another trained responder arrives and takes over.
    - You are too exhausted to continue.
    - The scene becomes unsafe.
  - If the breaths make the chest clearly rise, quickly check for breathing. Care for the conditions you find including continuing CPR with 30 chest compressions if the person is not breathing.

Care for Unconscious Choking—Infant

To care for an unconscious choking infant, perform a modified CPR technique:

- Locate the correct hand and finger position for chest compressions. Use the same techniques that you learned for CPR.
- Give 30 chest compressions to a depth of about 1½ inches. Compress at a rate of at least 100 chest compressions per minute.
- Look for a foreign object (remove the CPR breathing barrier if you are using one). If an object is seen, remove it using your little finger.
- Give 2 rescue breaths.
  - If the chest does not clearly rise, repeat cycles of chest compressions, foreign object check/removal and 2 rescue breaths. Do not stop this modified CPR technique except in one of these situations:
    - The object is removed and the chest clearly rises with rescue breaths (CPR may still be needed without the foreign object check).
    - The infant starts to breathe on his or her own.
    - EMS personnel or another trained responder arrives and takes over.

- You are too exhausted to continue.
- The scene becomes unsafe.

- If the breaths make the chest clearly rise, quickly check for breathing. Care for the conditions you find including continuing CPR with 30 chest compressions if the infant is not breathing.

After Giving Care to a Choking Person

A person who has choked and has been given back blows, abdominal thrusts and/or chest thrusts to clear the airway requires a medical evaluation. Internal injuries and damage to the airway may not be evident immediately.

SUMMARY

Breathing emergencies, including respiratory distress, respiratory arrest and choking, are life-threatening conditions. Respiratory distress is a condition in which breathing becomes difficult. Respiratory arrest occurs when breathing stops. Airway obstruction such as choking is the most common cause of breathing emergencies. As a lay responder, your role is to recognize the signals of a breathing emergency, call 9-1-1 or the local emergency number and give appropriate care.

READY TO RESPOND?

Think back to James in the opening scenario, and use what you have learned to respond to these questions:

1. How would you know that James's airway is partially blocked?
2. How would the actions you take differ if James's airway was partially blocked versus completely blocked?
3. If James became unconscious while giving care, what would your next step be?

STUDY QUESTIONS

1. Match each term with the correct definition.

    a. Airway obstruction
    b. Respiratory arrest
    c. Anatomical airway obstruction
    d. Respiratory distress
    e. Cyanotic

_____ Blockage of the airway that prevents air from reaching a person's lungs

_____ Condition in which breathing stops

_____ Condition in which breathing becomes difficult

_____ Bluish discoloration of the skin around the mouth or the fingertips

_____ Occurs when the airway is blocked by the tongue or swollen tissues of the mouth and throat

2. Circle four signals associated with respiratory distress that you find in the following scenario.

    When Rita walked into Mr. Boyd's office, she found him collapsed across his desk. His eyes were closed but she could hear him breathing, making a high whistling noise. He was flushed, sweating and seemed to be trembling uncontrollably. When he heard Rita, he raised his head a little. "My chest hurts," he gasped, "and I feel dizzy and can't seem to catch my breath." He looked frightened.

3. List three causes of choking in adults.

4. Match each type of care with its purpose.

    a. Back blows and abdominal thrusts
    b. Recognizing and caring for respiratory distress
    c. Giving chest compressions, foreign object check/removal and rescue breaths

_____ Modified CPR technique used for an unconscious choking person

_____ Force a foreign object out of the airway

_____ May prevent respiratory arrest from occurring

In questions 5 through 16, circle the letter of the correct answer.

5. Which of the following is a signal of respiratory distress?

    a. Gasping for air
    b. Breathing that is slower than normal
    c. Wheezing
    d. All of the above

6. How are asthma, hyperventilation and anaphylactic shock alike?

   a. They require rescue breaths.
   b. They are forms of respiratory distress.
   c. They are all always life threatening.
   d. They occur only in children and infants.

7. Care for people in respiratory distress always includes which of the following?

   a. Helping the person rest in a comfortable position
   b. Giving the person water to drink
   c. Giving rescue breaths
   d. Delivering abdominal thrusts

8. While eating dinner, a friend suddenly grabs at his throat and appears to by trying to cough without success. What should you do after getting consent?

   a. Lower him or her to the floor, check for and remove an object if it is visible at the back of the throat, give 2 breaths and up to 5 abdominal thrusts.
   b. Give back blows and abdominal thrusts until the object is dislodged or the person becomes unconscious.
   c. Encourage the person to continue coughing to try to dislodge the object.
   d. Open the airway using the head-tilt/chin-lift technique.

9. A woman is choking on a piece of candy but is conscious and coughing forcefully. What should you do?

   a. Slap her on the back until she coughs up the object.
   b. Give abdominal thrusts.
   c. Encourage her to continue coughing.
   d. Perform a check at the back of the throat.

10. What should you do for a conscious infant who is choking and cannot cry, cough or breathe?

    a. Give back blows and chest thrusts.
    b. Give 1 rescue breath.
    c. Give abdominal thrusts.
    d. Lower the infant to the floor and open the airway.

11. Number in order the following actions for giving care to an unconscious choking infant, starting from the time you first realize your breaths will not go in.

_____ Give 30 chest compressions.

_____ Check for an object.

_____ Repeat 2 rescue breaths.

_____ Reposition the infant's airway.

_____ Remove an object if you see one.

Answers are listed in Appendix B.

ASSISTING WITH AN ASTHMA INHALER

TIP: *Always obtain consent and wash your hands immediately after giving care. Read and follow all instructions printed on the inhaler prior to administering the medication to the person.*

IF THE PERSON HAS MEDICATION FOR ASTHMA, HELP HIM OR HER TAKE IT IF ASKED:

1 HELP PERSON SIT UP

Help the person sit up and rest in a position comfortable for breathing.

2 CHECK PRESCRIPTION

- Ensure that the prescription is in the person's name and is prescribed for "quick relief" or "acute" attacks.
- Ensure that the expiration date has not passed.

3 SHAKE INHALER

4 REMOVE MOUTHPIECE COVER

If an extension tube (spacer) is available, attach and use it.

5 INSTRUCT PERSON TO BREATHE OUT

Tell the person to breathe out as much as possible through the mouth.

TIP: *The person may use different techniques, such as holding the inhaler two finger lengths away from the mouth.*

6 ADMINISTER MEDICATION

Have the person place his or her lips tightly around the mouthpiece and take a long, slow breath.

- As the person breathes in slowly, administer the medication by quickly pressing down on the inhaler canister, or the person may self-administer the medication.
- The person should continue a full, deep breath.
- Tell the person to try to hold his or her breath for a count of **10**.
- When using an extension tube (spacer), have the person take **5** to **6** deep breaths through the tube without holding his or her breath.

7 RECORD TIME OF ADMINISTRATION

- Note the time of administration and any change in the person's condition.
- The medication may be repeated once after **1** to **2** minutes.

8 HAVE PERSON RINSE MOUTH

Have the person rinse his or her mouth out with water to reduce side effects.

- Stay with the person and monitor his or her condition and give **CARE** for any other conditions.

9 CARE FOR SHOCK

Care for shock.

- Keep the person from getting chilled or overheated.
- **CALL** 9-1-1 or the local emergency number if trouble breathing does not improve quickly.

> **TIP:** *These medications might take **5** to **15** minutes to reach full effectiveness. Follow label instructions regarding additional doses of the medication.*

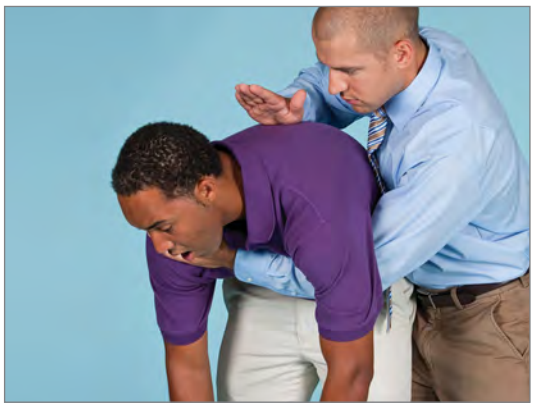
CONSCIOUS CHOKING—ADULT

CANNOT COUGH, SPEAK OR BREATHE

AFTER CHECKING THE SCENE AND THE INJURED OR ILL PERSON, HAVE SOMEONE CALL 9-1-1 AND GET CONSENT.

1 GIVE 5 BACK BLOWS

Bend the person forward at the waist and give **5** back blows between the shoulder blades with the heel of one hand.



2 GIVE 5 ABDOMINAL THRUSTS

- Place a fist with the thumb side against the middle of the person's abdomen, just above the navel.
- Cover your fist with your other hand.
- Give **5** quick, upward abdominal thrusts.

3 CONTINUE CARE

Continue sets of **5** back blows and **5** abdominal thrusts until the:

- Object is forced out.
- Person can cough forcefully or breathe.
- Person becomes unconscious.

WHAT TO DO NEXT

- IF PERSON BECOMES UNCONSCIOUS—**CALL** 9-1-1, if not already done.
- Carefully lower the person to the ground and give **CARE** for an unconscious choking adult, beginning with looking for an object.

CONSCIOUS CHOKING—CHILD

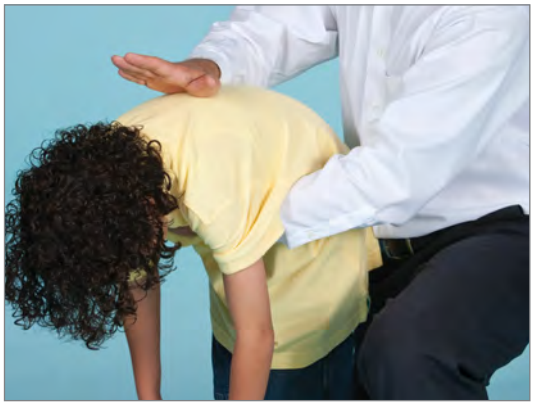
CANNOT COUGH, SPEAK OR BREATHE

TIP: *Stand or kneel behind the child, depending on his or her size.*

AFTER CHECKING THE SCENE AND THE INJURED OR ILL CHILD, HAVE SOMEONE CALL 9-1-1 AND GET CONSENT FROM THE PARENT OR GUARDIAN, IF PRESENT.

1 GIVE 5 BACK BLOWS

Bend the child forward at the waist and give **5** back blows between the shoulder blades with the heel of one hand.



2 GIVE 5 ABDOMINAL THRUSTS

- Place a fist with the thumb side against the middle of the child's abdomen, just above the navel.
- Cover your fist with your other hand.
- Give **5** quick, upward abdominal thrusts.

3 CONTINUE CARE

Continue sets of **5** back blows and **5** abdominal thrusts until the:

- Object is forced out.
- Child can cough forcefully or breathe.
- Child becomes unconscious.

WHAT TO DO NEXT

- IF CHILD BECOMES UNCONSCIOUS—**CALL** 9-1-1, if not already done.
- Carefully lower the child to the ground and give **CARE** for an unconscious choking child, beginning with looking for an object.

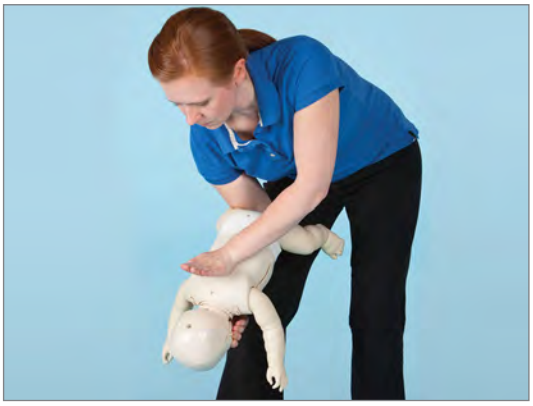
CONSCIOUS CHOKING—INFANT

CANNOT COUGH, CRY OR BREATHE

AFTER CHECKING THE SCENE AND THE INJURED OR ILL INFANT, HAVE SOMEONE CALL 9-1-1 AND GET CONSENT FROM PARENT OR GUARDIAN, IF PRESENT.

1 GIVE 5 BACK BLOWS

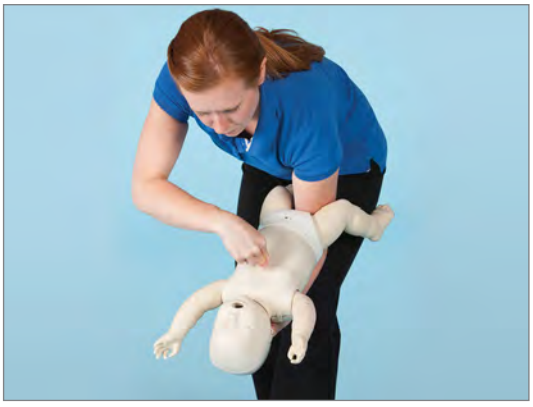
Give firm back blows with the heel of one hand between the infant's shoulder blades.



2 GIVE 5 CHEST THRUSTS

Place two or three fingers in the center of the infant's chest just below the nipple line and compress the breastbone about **1½** inches.

> **TIP:** *Support the head and neck securely when giving back blows and chest thrusts. Keep the head lower than the chest.*



3 CONTINUE CARE

Continue sets of **5** back blows and **5** chest thrusts until the:

- Object is forced out.
- Infant can cough forcefully, cry or breathe.
- Infant becomes unconscious.

WHAT TO DO NEXT

- IF INFANT BECOMES UNCONSCIOUS—**CALL** 9-1-1, if not already done.
- Carefully lower the infant on a firm, flat surface, and give **CARE** for an unconscious choking infant, beginning with looking for an object.

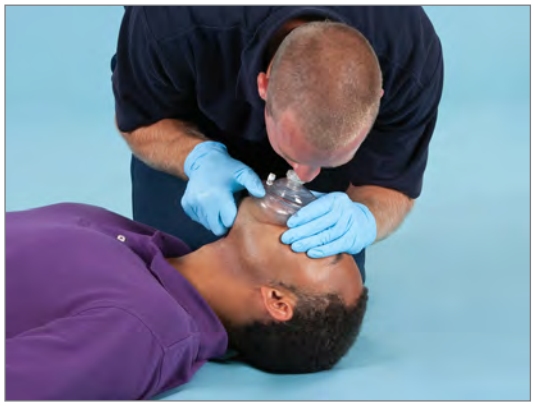
UNCONSCIOUS CHOKING—ADULT

CHEST DOES NOT RISE WITH RESCUE BREATHS

AFTER CHECKING THE SCENE AND THE INJURED OR ILL PERSON:

1 GIVE RESCUE BREATHS

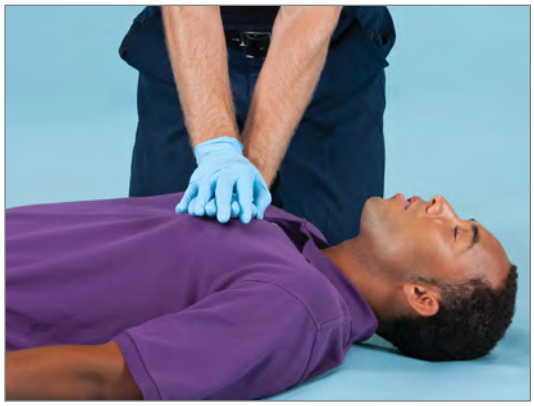
Retilt the head and give another rescue breath.



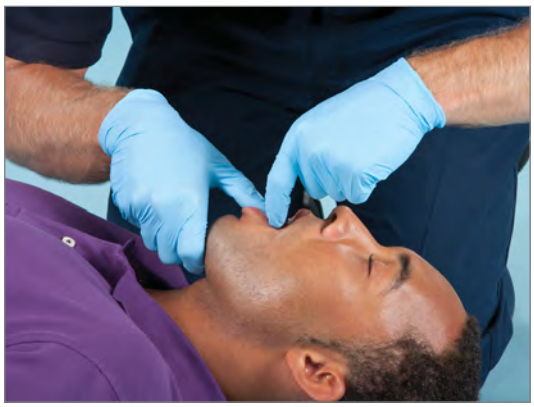
2 GIVE 30 CHEST COMPRESSIONS

If the chest still does not rise, give **30** chest compressions.

> **TIP:** *The person must be on a firm, flat surface. Remove the CPR breathing barrier when giving chest compressions.*



3 LOOK FOR AND REMOVE OBJECT IF SEEN



4 GIVE 2 RESCUE BREATHS

WHAT TO DO NEXT

- IF BREATHS DO NOT MAKE THE CHEST RISE—Repeat steps **2** through **4**.
- IF CHEST CLEARLY RISES—**CHECK** for breathing. Give **CARE** based on the conditions found.

UNCONSCIOUS CHOKING—CHILD AND INFANT

CHEST DOES NOT RISE WITH RESCUE BREATHS

AFTER CHECKING THE SCENE AND THE INJURED OR ILL CHILD OR INFANT:

1 GIVE RESCUE BREATHS

Retilt the head and give another rescue breath.

2 GIVE CHEST COMPRESSIONS

If the chest still does not rise, give **30** chest compressions.

TIP: *The child or infant must be on a firm, flat surface. Remove the CPR breathing barrier when giving chest compressions.*

3 LOOK FOR AND REMOVE OBJECT IF SEEN

4 GIVE 2 RESCUE BREATHS

WHAT TO DO NEXT

- IF BREATHS DO NOT MAKE THE CHEST RISE—Repeat steps **2** through **4**.
- IF CHEST CLEARLY RISES—**CHECK** for breathing. Give **CARE** based on the conditions found.

Bleeding

8

You are on a camping trip, and your friend Joe is starting to clean a fish he caught for dinner. Suddenly, the knife slips and cuts his arm deeply. While the blood does not come gushing out, the blood does start to flow steadily from the wound. You are bothered a bit by the sight of it, but you know you need to help. You take a deep breath, control your emotions and go to Joe's side.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Explain why severe bleeding must be controlled immediately.
- Identify two signals of life-threatening external bleeding.
- Describe the care for external bleeding.
- Describe how to minimize the risk of disease transmission when giving care in a situation that involves visible blood.
- Identify the signals of severe internal bleeding.
- Describe the care for minor internal bleeding.

After reading this chapter and completing the class activities, you should be able to:

- Demonstrate how to control minor and severe external bleeding.
- Demonstrate how to use a manufactured tourniquet.

KEY TERMS

Arteries: Large blood vessels that carry oxygen-rich blood from the heart to all parts of the body, except for the pulmonary arteries, which carry oxygen-poor blood from the heart to the lungs.

Blood volume: The total amount of blood circulating within the body.

Capillaries: Tiny blood vessels linking arteries and veins; they transfer oxygen and other nutrients from the blood to all body cells and remove waste products.

Clotting: The process by which blood thickens at a wound site to seal an opening in a blood vessel and stop bleeding.

Direct pressure: Pressure applied on a wound to control bleeding.

External bleeding: Bleeding on the outside of the body; often, visible bleeding.

Internal bleeding: Bleeding inside the body.

Pressure bandage: A bandage applied snugly to create pressure on a wound to aid in controlling bleeding.

Tourniquet: A tight, wide band placed around an arm or a leg to constrict blood vessels in order to stop blood flow to a wound.

Veins: Blood vessels that carry oxygen-poor blood from all parts of the body to the heart, except for the pulmonary veins, which carry oxygen-rich blood to the heart from the lungs.

INTRODUCTION

Bleeding is the escape of blood from arteries, capillaries or veins. A large amount of bleeding occurring in a short amount of time is called a **hemorrhage**. Bleeding is either external or internal. ***External bleeding***, or bleeding you can see coming from a wound, is usually obvious because it is visible. However, ***internal bleeding***, or bleeding inside the body, is often difficult to recognize.

Uncontrolled bleeding, whether external or internal, is a life-threatening emergency. As you learned in previous chapters, severe bleeding can result in death. In this chapter, you will learn how to recognize and give care for both external and internal bleeding.

THE BLOOD AND BLOOD VESSELS

Blood

Blood consists of liquid and solid components and comprises approximately 7 percent of the body's total weight. The average adult (weight of 150 pounds) has a blood volume of 10 to 12 pints. Blood has three major functions:

- Transporting oxygen, nutrients and wastes
- Protecting against disease by producing antibodies and defending against pathogens
- Maintaining body temperature by circulating throughout the body

The liquid part of the blood is called **plasma**. Plasma makes up about half the total ***blood volume***, or half of the total amount of blood that is circulating in the body. Composed mostly of water, plasma maintains the blood volume needed for normal function of the circulatory system. Plasma also contains nutrients essential for energy production, growth and cell maintenance; carries waste products for elimination; and transports the other blood components.

The solid components of blood include red and white blood cells and cell fragments called **platelets**. Red blood cells account for most of the solid components of the blood. They are produced in the marrow in the hollow center of large bones, such as the long bones of the arm (humerus) and thigh (femur). Red blood cells number nearly 260 million in each drop of blood. The red blood cells transport oxygen from the lungs to the body cells and carbon dioxide from the cells to the lungs. Red blood cells outnumber white blood cells about 1000 to 1. White blood cells are a key disease-fighting part of the immune system. They defend the body against invading microorganisms, or pathogens. They also aid in producing antibodies that help the body resist infection. Platelets are disk-shaped structures in the blood that are made up of cell fragments. Platelets are an essential part of the blood's clotting mechanism because of their tendency to bind together. Platelets help stop bleeding by forming blood clots at wound sites. Until blood clots form, bleeding must be controlled artificially.

Blood Vessels

As you learned in Chapter 4, blood is channeled through blood vessels. The three major types of blood vessels are arteries, capillaries and veins **(Figure 8-1)**. ***Arteries*** carry blood away from the heart. Arteries vary in size, with the smallest ones (arterioles) carrying blood to the capillaries. ***Capillaries*** are microscopic blood vessels linking arterioles and venules. They transfer oxygen and other nutrients from the blood into the cells, and pick up waste products, such as carbon dioxide, from the cells and move them into the venules, the smallest branches of the veins. The ***veins*** carry blood back to the heart. The veins also carry waste products from the cells to the kidneys, intestines and lungs, where waste products are eliminated.

Because the blood in the arteries is closer to the pumping action of the heart, blood in the arteries travels faster and under greater pressure than blood in the capillaries or veins. Blood flow in the arteries pulses with the heartbeat; blood in the veins flows more slowly and evenly.

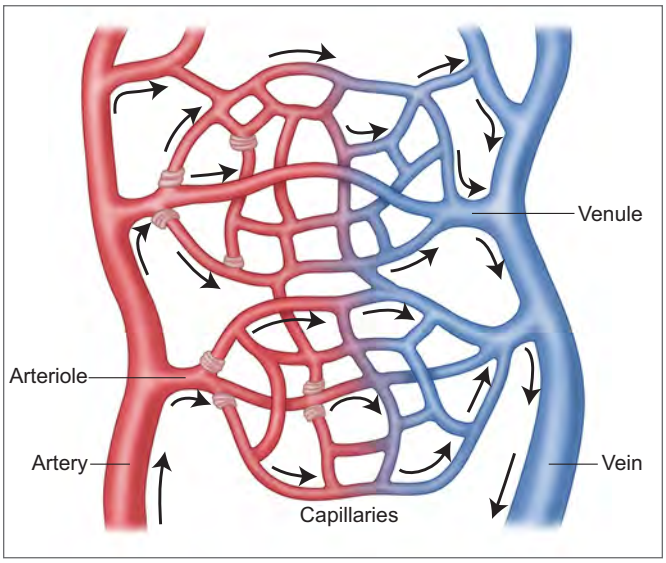


FIGURE 8-1 *Blood flows through the three major types of blood vessels: arteries, capillaries and veins.*

WHEN BLEEDING OCCURS

When bleeding occurs, a complex chain of events is triggered in the body. The brain, heart and lungs immediately attempt to compensate for blood loss to maintain the flow of oxygen-rich blood to the body tissues, particularly to the vital organs. The brain, recognizing a blood shortage, signals the heart to circulate more blood and to constrict blood vessels in the extremities. The brain signals the lungs to work harder, providing more oxygen.

Other important reactions to bleeding occur on a microscopic level. Platelets collect at the wound site in an effort to stop blood loss through the process of ***clotting***. White blood cells prevent infection by attacking microorganisms that enter through breaks in the skin. Over time, the body manufactures extra red blood cells to help transport more oxygen to the cells.

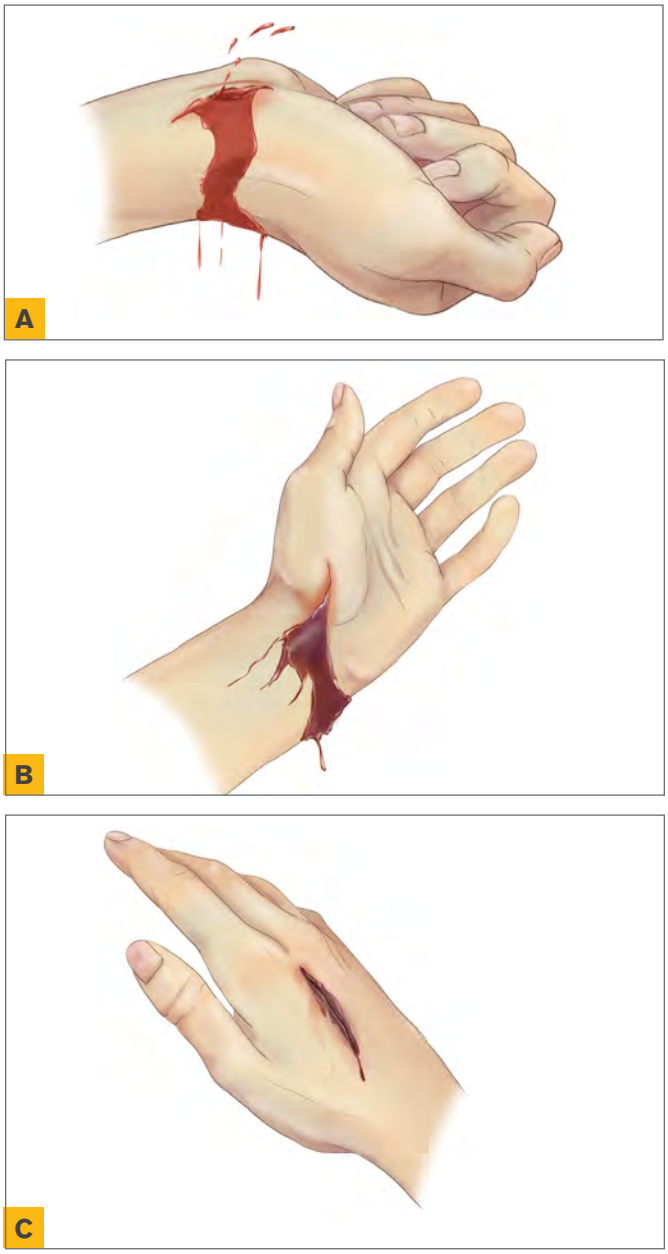


FIGURE 8-2, A–C **A,** *Arterial bleeding is the most serious type of bleeding, followed by* **B,** *venous bleeding.* **C,** *Capillary bleeding is not usually a concern in healthy people.*

Blood volume is also affected by bleeding. Normally, excess fluid is absorbed from the bloodstream by the kidneys, lungs, intestines and skin. However, when bleeding occurs, this excess fluid is reabsorbed into the bloodstream as plasma. This reabsorption helps to maintain the critical balance of fluids needed by the body to keep blood volume constant. Bleeding that is severe enough to critically reduce the blood volume is life threatening because tissues will die from lack of oxygen. Life-threatening bleeding can be either external or internal.

EXTERNAL BLEEDING

External bleeding occurs when a blood vessel is opened externally, such as through a tear in the skin. Each type of blood vessel bleeds differently. Arterial bleeding (bleeding from an artery) is often rapid and severe, and is at highest risk to be life threatening **(Figure 8-2, A)**. Because arterial blood is under more pressure, it usually spurts from the wound, making it difficult for clots to form. As a result, arterial bleeding is harder to control. The high concentration of oxygen gives arterial blood a bright red color.

Venous bleeding (bleeding from a vein) is generally easier to control than arterial bleeding **(Figure 8-2, B)**. Veins are damaged more often than arteries because veins are closer to the skin's surface. Venous blood is under less pressure than arterial blood and flows steadily from a wound without spurting. Only damage to veins deep in the body, such as those in the trunk or thigh, produces severe bleeding that is difficult to control. Because it is oxygen poor, venous blood is dark red or maroon.

Capillary bleeding, the most common type of bleeding, is usually slow because the vessels are small and the blood is

under low pressure **(Figure 8-2, C)**. It is often described as oozing from the wound. Clotting occurs easily with capillary bleeding. The blood is usually a paler red than arterial blood.

Most external bleeding you encounter will be minor, and easily controlled with direct pressure. Sometimes, however, the damaged blood vessel will be too large or the blood will be under too much pressure for effective clotting to occur. In these cases, bleeding can be life threatening, and you will need to recognize and control it promptly when you check for life-threatening conditions.

Care for External Bleeding

Generally, the pressure created by placing a sterile dressing and then a gloved hand, or even a gloved hand by itself, on a wound can control external bleeding. This technique, called ***direct pressure***, is the most effective means of controlling external bleeding **(Figure 8-3)**. Pressure placed on a wound restricts the blood flow through the wound and allows normal clotting to occur. Pressure on a wound can be maintained by applying a bandage snugly to the injured area. A bandage applied snugly to control bleeding is called a ***pressure bandage***.

FIGURE 8-3 *Direct pressure is the most effective way to control external bleeding.*

Care for Minor External Bleeding

To give first aid for minor external bleeding, follow these general steps:

- Use a barrier between your hand and the wound. If readily available, put on disposable gloves and place a sterile dressing on the wound.
- Apply direct pressure for a few minutes to control any bleeding.
- Wash the wound thoroughly with soap and water and gently dry with clean gauze. If possible, irrigate an abrasion for 5 minutes with clean, warm, running tap water.
- Cover the wound with a clean dressing and a bandage (or with an adhesive bandage) to keep the wound moist and prevent drying. Apply an antibiotic ointment to the dressing or bandage first if the person has no known allergies or sensitivities to the medication.
  Do not apply the antibiotic directly to the wound as doing so may contaminate the antibiotic tube.
- Wash your hands immediately after giving care, even if you wore gloves.

Care for Severe External Bleeding

In some cases, direct pressure may not immediately control bleeding. This is an indication of severe external bleeding. Signals of *severe* external bleeding include:

- Blood spurting from the wound.
- Bleeding that fails to stop after all measures have been taken to control it.

What if...

I secure a pressure bandage too tightly on the arm of an unresponsive person? How will I know if I can't ask?

There are ways to tell if a bandage is too tight, without having to ask the person how it feels. For starters, you can assess the person's skin temperature and observe the difference in skin color between the two limbs. A bandage applied too tightly will limit the circulatory system's (i.e., blood's) ability not only to distribute heat but also to regulate the exchange between oxygen and carbon dioxide to the body cells around the bandage. This will ultimately result in cooling of the skin and a change in the color of the skin, which will often take on a blue or purple tone due to the tissue near the skin surface being low on oxygen.

If bleeding is severe, call 9-1-1 or the local emergency number if you have not already done so. To give first aid for severe external bleeding:

- Put on disposable gloves. If blood has the potential to splatter, you may need to wear eye and face protection.
- Control external bleeding using the general steps below:
  - Cover the wound with a dressing and press firmly against the wound with a gloved hand.
  - Apply a pressure bandage over the dressing to maintain pressure on the wound and to hold the dressing in place.
  - If blood soaks through the bandage, do not remove the blood-soaked bandages. Instead, add more pads and bandages to help absorb the blood and continue to apply pressure.
- Continue to monitor the person's condition. Observe the person closely for signals that may indicate that the person's condition is worsening, such as faster or slower breathing, changes in skin color and restlessness.
- Take steps to minimize shock. Keep the person from getting chilled or overheated.
- Have the person rest comfortably and reassure him or her.
- Wash your hands immediately after giving care, even if you wore gloves.

There is *no* evidence to support using elevation to control external bleeding and there is evidence *against* using pressure points for controlling external bleeding. You will learn more about caring for specific types of wounds that are often accompanied by external bleeding in Chapter 10.

Using a Tourniquet When Help Is Delayed

A ***tourniquet*** is a tight band placed around an arm or leg to constrict blood vessels in order to stop blood flow to a wound. Because of the potential for adverse effects, a tourniquet should be used *only as a last resort* in cases of delayed care or situations in which response from emergency medical services (EMS) is delayed, direct pressure does not stop the bleeding or you are not able to apply direct pressure.

What if...

A bystander tells me I should be using pressure points and elevation to help control external bleeding? Are these suggestions valid?

According to the most recent science, there is no evidence to support using elevation to control external bleeding, and there is evidence against the use of pressure points to control external bleeding. Topical hemostatic agents, which are available over-the-counter, are also not recommended for routine use by lay responders due to the potential risk for injury. Instead, follow your training and use direct pressure, which remains the most effective method to control external bleeding!

For example, a tourniquet may be appropriate if you cannot reach the wound because of entrapment, there are multiple injuries or the size of the wound prohibits application of direct pressure. In most areas, application of a tourniquet is considered to be a skill at the emergency medical technician (EMT) level or higher and requires proper training. Several types of manufactured tourniquets are available and are preferred over makeshift (improvised) devices. When using a manufactured tourniquet, always follow the manufacturer's instructions.

In general, the tourniquet is applied around the wounded extremity, above the wound but not at a joint. The tag end of the strap is routed through the buckle, and the strap is pulled tightly, which secures the tourniquet in place. The rod (windlass) then is twisted to tighten the tourniquet until the bright-red bleeding stops. The rod

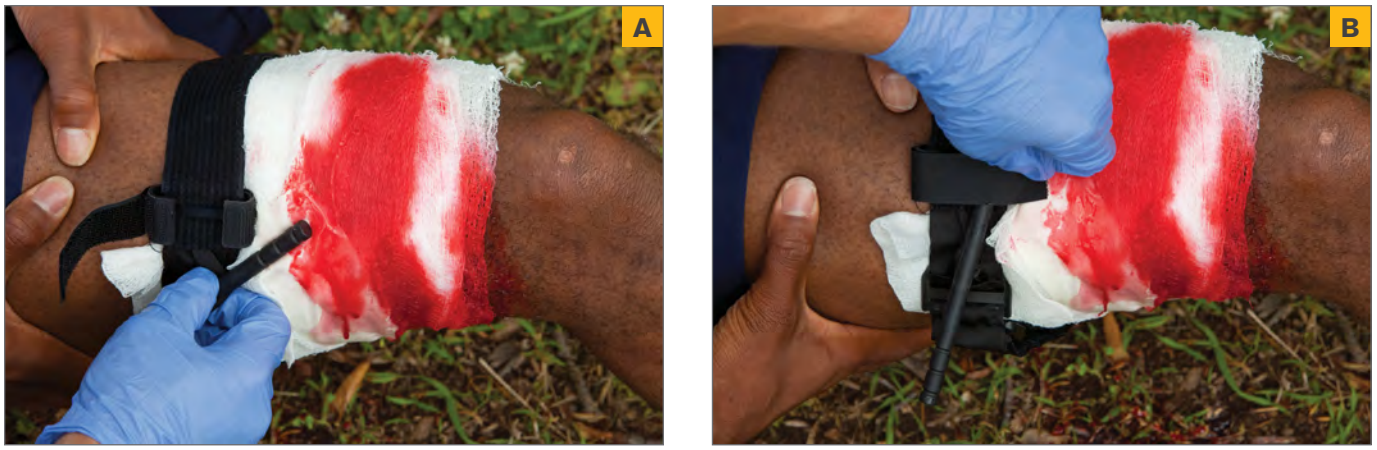


FIGURE 8-4, A–B *When applying a tourniquet:* **A,** *Twist the rod to tighten until bright-red bleeding stops.* **B,** *Secure the rod in place.*

then is secured in place **(Figure 8-4, A–B)**. The tourniquet should *not* be removed in the prehospital setting once it is applied. The time that the tourniquet was applied should be noted and recorded and then given to EMS personnel. See the Skill Sheet, Using a Manufactured Tourniquet, at the end of the chapter for additional guidelines for use.

Blood pressure cuffs sometimes are used as a tourniquet to slow the flow of blood in an upper extremity. Another technique is to use a bandage that is 4 inches wide and six to eight layers deep. Always follow local protocols or guidelines if established (i.e., by the medical director at your place of employment, or an EMS dispatcher who is providing guidance when you call).

Hemostatic Agents

Hemostatic agents generally are substances that speed clot formation by absorbing the excess moisture caused by the bleeding. Hemostatic agents are found in a variety of forms, including treated sponge or gauze pads and powder or granular forms. The powder or granular forms are poured directly on the bleeding vessel, then other hemostatic agents, such as gauze pads, are used in conjunction with direct pressure.

Over-the-counter versions of hemostatic bandages are available in addition to hemostatic agents intended for use by professional rescuers. Some are more effective than others. However, because some types present a risk for further injury or tissue damage, the routine use of hemostatic agents in first aid settings is not recommended.

INTERNAL BLEEDING

Internal bleeding is the escape of blood from arteries, capillaries or veins into spaces in the body. Severe internal bleeding can occur from injuries caused by a blunt force, such as a motor vehicle driver being thrown against the steering wheel in a car crash, or a chronic medical condition, such as an ulcer. Internal bleeding may also occur when an object, such as a knife or bullet, penetrates the skin and damages internal structures. A fractured bone, such as a rib, could penetrate and damage vital organs. In any traumatic injury, you should always suspect internal bleeding. For example, if a motorcycle rider is thrown from a bike, you may not see any serious external bleeding. However, you should consider that the impact may have caused internal injuries and bleeding.

FIGURE 8-5 *Signals of internal bleeding may take time to appear.*

Signals of Severe Internal Bleeding

Severe internal bleeding is often difficult to recognize because its signals are not obvious and may take time to appear. These signals include:

- Tender, swollen, bruised or hard areas of the body, such as the abdomen **(Figure 8-5)**.
- Rapid breathing.
- Skin that feels cool or moist or looks pale or bluish.
- Vomiting blood or coughing up blood.
- Excessive thirst.
- An injured extremity that is blue or extremely pale.
- Altered mental state, such as the person becoming confused, faint, drowsy or unconscious.

Many of these signals can also indicate a condition called shock. Shock is a progressive condition in which the circulatory system fails to circulate oxygen-rich blood to all parts of the body. You will learn more about shock in Chapter 9.

Care for Internal Bleeding

First aid for controlling internal bleeding depends on the severity and site of the bleeding. For minor internal bleeding, such as a bruise (contusion) on an arm, apply an ice pack (preferred method) or a chemical cold pack to the area to help reduce pain and swelling. Always remember to place something, such as a gauze pad or a towel, between the source of the cold and the skin to prevent damage to the skin.

If you suspect severe internal bleeding caused by serious injury, call 9-1-1 or the local emergency number immediately. You can do little to control serious internal bleeding effectively. Activating the EMS system is the best help that you can give. EMS personnel must rapidly transport the person to a hospital. Usually, the person needs immediate surgery. While waiting for EMS personnel to arrive, follow the general care steps for any emergency:

- Do no further harm.
- Monitor breathing and consciousness.
- Help the person rest in the most comfortable position.
- Keep the person from becoming chilled or overheated.
- Reassure the person.
- Give any specific care needed.

You will learn about specific care for closed wounds that often result in internal bleeding in Chapter 10.

SUMMARY

One of the most important things you can do in any emergency is to recognize and control life-threatening bleeding. Check for severe bleeding while checking for life-threatening conditions. External bleeding is easily recognized and should be cared for immediately by using direct pressure and a pressure bandage. Avoid contact with the injured person's blood by taking standard precautions such as using disposable gloves and washing your hands with soap and water as soon as possible after giving care.

Although internal bleeding is less obvious, it can also be life threatening. Recognize when a serious injury has occurred, and suspect internal bleeding. You may not identify internal bleeding until you check for non-life-threatening conditions. When you identify or suspect life-threatening internal bleeding, activate the EMS system immediately by calling 9-1-1 or the local emergency number and give care until EMS personnel arrive and take over.

READY TO RESPOND?

Think back to Joe in the opening scenario, and use what you have learned to respond to these questions:

1. From the description, would you suspect that Joe's bleeding is a result of an injury to an artery, a vein or capillaries? Why?
2. How could Joe's situation become life threatening?
3. What precautions should you use to minimize the risk of disease transmission while giving care?

STUDY QUESTIONS

1. Match each term with the correct definition.

   a. External bleeding
   b. Direct pressure
   c. Pressure bandage
   d. Internal bleeding
   e. Arteries
   f. Veins
   g. Tourniquet

_____ Using your gloved hand to apply pressure on the wound to control bleeding

_____ Bleeding that can be seen coming from a wound

_____ The escape of blood from an artery, vein or capillary into spaces inside the body

_____ A tight band placed around an arm or leg to constrict blood vessels in order to stop blood flow to a wound

_____ Blood vessels that carry blood from all parts of the body to the heart

_____ Vessels that transport blood to the capillaries for distribution to the cells

_____ A bandage applied snugly to maintain pressure on the wound to control bleeding

2. List two signals of life-threatening external bleeding.

3. Describe how to control severe external bleeding.

4. List five signals of severe internal bleeding.

5. Describe how to control minor internal bleeding.

Use the following scenario to answer question 6.

The usual Saturday morning baseball game is in progress. A few spectators are standing around on the sidelines. As Milo takes a swing at a curve ball, he loses his grip on the bat, which flies several feet, hitting Chris hard on the thigh. Chris drops to the ground, clutching his leg. The skin where the leg was struck immediately becomes red and begins to swell.

6. What type of bleeding do you suspect Chris has?

Circle the letter of the correct answer.

7. A child has a deep cut on his arm. His face is moist and very pale. What would you do first?

   a. Have someone call 9-1-1 or the local emergency number.
   b. Apply direct pressure to the wound with a dressing.
   c. Place an ice pack on the affected arm.
   d. Apply pressure at the closest pressure point.

Answers are listed in Appendix B.

CONTROLLING EXTERNAL BLEEDING

AFTER CHECKING THE SCENE AND THE INJURED OR ILL PERSON:

1 COVER THE WOUND

Cover the wound with a sterile dressing.

2 APPLY DIRECT PRESSURE

Apply pressure until bleeding stops.

3 COVER DRESSING WITH BANDAGE

Check for circulation beyond the injury (check for feeling, warmth and color).

4 APPLY MORE PRESSURE AND CALL 9-1-1

If bleeding does not stop:

- Apply more dressings and bandages and continue to apply additional pressure.
- Take steps to minimize shock.
- **CALL** 9-1-1 if not already done.

TIP: *Wash hands with soap and water after giving care.*

USING A MANUFACTURED TOURNIQUET

NOTE: ***Always follow standard precautions and follow manufacturer's instructions when applying a tourniquet. Call 9-1-1 or the local emergency number.***

1 POSITION THE TOURNIQUET

Place the tourniquet around the limb, approximately **2** inches (about two finger widths) above the wound but not over a joint.

2 PULL STRAP THROUGH BUCKLE

- Route the tag end of the strap through the buckle, if necessary.
- Pull the strap tightly and secure it in place.

3 TWIST THE ROD

Tighten the tourniquet by twisting the rod until the flow of bleeding stops and secure the rod in place. ***Do not*** cover the tourniquet with clothing.

4 RECORD TIME

Note and record the time that you applied the tourniquet and give this information to EMS personnel.

9 Shock

You are driving down an isolated road. As you round a curve, you are surprised to see a car that has crashed into a tree. You pull over, then carefully assess the scene and approach the car. You find a woman who is conscious, but very anxious and in obvious pain. She tells you she cannot move her legs, which appear to have been crushed by the collision. You dial 9-1-1. As you wait for emergency medical services (EMS) personnel to arrive, you can see the woman's condition is changing. She is now breathing faster, looks pale and appears drowsy. You touch her hand to comfort her and notice that her skin feels cold and moist. A moment later, she loses consciousness.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Identify the types of shock and the conditions that cause each of them.
- List the signals of shock.
- Explain what care can be given to minimize shock.

KEY TERM

Shock: A life-threatening condition that occurs when the circulatory system fails to provide adequate oxygenated blood to all parts of the body.

INTRODUCTION

Injuries and medical emergencies can become life threatening as a result of ***shock***. When the body experiences injury or sudden illness, it responds in a number of ways. Survival depends on the body's ability to adapt to the physical stresses of injury or illness. When the body's measures to adapt fail, the injured or ill person can progress into a life-threatening condition called shock. Shock complicates the effects of injury or sudden illness. In this chapter, you will learn to recognize the signals of shock and how to give care to minimize it.

SHOCK

When the body is healthy, three conditions are necessary to maintain adequate blood flow to perfuse all the body cells, tissues and organs:

- The heart must be working well.
- The blood vessels must be intact and able to adjust blood flow.
- An adequate amount of blood must be circulating in the body.

Injury or sudden illness can interrupt normal body functions. In cases of minor injury or illness, this interruption is brief because the body is able to compensate quickly. With more severe injuries or illnesses, however, the body is unable to adjust. When the body is unable to meet its demands for oxygen because the circulatory system fails to adequately circulate oxygenated blood to all parts of the body, shock occurs.

Shock is a progressive condition. When **vital organs**, such as the brain, heart and lungs, do not receive sufficient oxygenated blood, the body initiates a series of responses to protect those organs. The amount of blood circulating to the less important tissues of the arms, legs and skin is reduced so that more blood can go to the vital organs. This reduction in blood circulation to the skin causes a person in shock to appear pale or ashen (grayish) and feel cool. While this can protect the body's most crucial organs in the short term, if the situation is not treated quickly shock can lead to death. See Shock: The Domino Effect to learn more about this progression.

Causes of Shock

There are many possible reasons for shock to occur. These include:

- Cardiogenic shock, resulting from failure of the heart to pump enough oxygenated blood. If the heart rate is too slow, the rate of new oxygenated blood cells reaching

SHOCK: THE DOMINO EFFECT

Follow the progression to see how shock can quickly become a life-threatening emergency if not treated and stopped.

- An injury causes severe bleeding.
- The heart attempts to compensate for the disruption of blood flow by beating faster.
- The person first has a rapid pulse. More blood is lost. As blood volume drops, the pulse becomes weak or hard to find.
- The increased workload on the heart results in an increased oxygen demand. Breathing becomes faster.
- To maintain circulation of blood to the vital organs, blood vessels constrict in the arms, legs and skin. The skin appears pale or ashen and feels cool.
- In response to the stress, the body perspires heavily and the skin feels moist.
- Because tissues of the arms and legs are now without oxygen, cells start to die.
- In response, the brain sends a signal to return blood to the arms and legs in an attempt to balance blood flow between these body parts and the vital organs.
- Vital organs now are not receiving adequate oxygen.
- The heart tries to compensate by beating even faster.
- More blood is lost and the person's condition worsens.
- Without oxygen, the vital organs fail to function properly.
- As the brain is affected, the person becomes restless, drowsy and eventually loses consciousness.
- As the heart is affected, it beats irregularly, resulting in an irregular pulse. The rhythm then becomes chaotic and the heart fails to circulate blood.
- There are no longer signs of life.
- When the heart stops, breathing stops.
- The body's continuous attempt to compensate for severe blood loss eventually results in death.

each part of the body will not be enough to keep up with body's demand. Likewise, when the heart beats too rapidly **(ventricular tachycardia** or **ventricular fibrillation)**, the heart is not an effective pump, and oxygenated blood is not sent throughout the body as it should be. Damage to the heart can lead to weak and ineffective contractions; this can be related to trauma, disease (e.g., diabetes or cardiovascular disease), poisoning or respiratory distress.

- Distributive shock, resulting from abnormal dilation of the blood vessels. If the blood vessels are not able to adequately constrict or become abnormally dilated, even though the **blood volume** is adequate and the heart is beating well, the vessels are not filled completely with blood. Since oxygen is absorbed into the body through the walls of the blood vessels, this condition leads to less oxygen being delivered to the body. There are several types of distributive shock based on the cause. Abnormal dilation of the blood vessels can be caused by spinal cord or brain trauma (neurogenic/vasogenic shock), by infection (septic shock) or anaphylaxis (anaphylactic shock).

- Hypovolemic shock, resulting from severe bleeding or loss of fluid from the body. Insufficient blood volume can lead to shock. Also, if the levels of some components of the blood, such as plasma or fluids, become too low, blood flow will be impaired and shock can result. Hemorrhagic shock is the most common type of hypovolemic shock. It results from blood loss, either through external or internal bleeding. Other causes include severe vomiting, diarrhea and burns.
- Other causes. Shock can also occur following any injury to the chest, obstruction of the airway or any other respiratory problem that decreases the amount of oxygen in the lungs. This means insufficient oxygen enters the bloodstream.

Signals of Shock

Although you may not always be able to determine the cause of shock, remember that shock is a life-threatening condition. You should learn to recognize the signals that indicate a person may be going into shock. These include:

- Apprehension, anxiety, restlessness or irritability.
- Altered level of consciousness.
- Nausea or vomiting.
- Pale, ashen or grayish, cool, moist skin.
- Rapid breathing.
- Excessive thirst.

Care for Shock

Follow the emergency action steps: **CHECK—CALL—CARE**. **CHECK** the scene for safety and then check the person. If you find signals that the person is going into shock, **CALL** 9-1-1 or the local emergency number immediately. Shock cannot be managed effectively by first aid alone. A person suffering from shock requires prompt emergency medical care. While waiting for EMS personnel to arrive, **CARE** for the conditions you find. Any specific care you give for life-threatening conditions will help to minimize the effects of shock.

Caring for shock also includes the following simple steps:

- Be sure the person's airway is open and clear.
- Take steps to control any external bleeding and prevent further blood loss.
- If you see any suspected broken bones or dislocated or damaged joints, immobilize them in the position found to prevent movement that could cause more bleeding and damage. Often this is as simple as using the ground for support, or allowing the person to cradle an injured arm in a position of comfort (see Chapter 11 for more on immobilization).
- If possible, have the person lie down, or leave the person lying flat if already in this position. This is often the most comfortable position. Helping the person rest in a more comfortable position may

What if...

A person with a serious injury goes into shock—I learned before that I am supposed to elevate the legs. Should I?

Current science suggests that a person who shows evidence of shock should lie flat, in a face-up position. There are no specific studies that have determined the benefits of elevating the legs as a first aid step for the care of a person in shock, and because you may be unsure of the person's exact condition (such as whether the person has a head, neck or spinal injury), it is best to leave him or her lying flat regardless of what you have been told before.

lessen any pain. This is important because pain can intensify the body's stress and speed up the progression of shock.

- Help the person maintain normal body temperature. Keep the person from getting chilled or overheated. If the person is cool, try to cover him or her with a blanket to avoid chilling **(Figure 9-1)**. Blood clots best at body temperature. In cooler environments, if it is possible to do so without causing further harm, insulate the person from the ground as well by placing a blanket under him or her.
- Do not give the person anything to eat or drink, even though he or she may ask. The person is likely to be thirsty due to fluid loss, however the person's condition may be severe enough to require surgery, in which case it is better if the stomach is empty.
- Talk to the person in a calm and reassuring manner to reduce the harmful effects of emotional stress on the person.
- Continue to monitor the person's breathing and for any changes in his or her condition. Do not wait for signals of shock to develop before caring for the underlying injury or illness.

FIGURE 9-1 *Keep a person with signals of shock from getting chilled or overheated.*

What if...

I recognize that a person is demonstrating the signals of shock, but then I also notice signs of bleeding after I have completed the primary assessment. What should I do next?

As soon as you notice bleeding, especially in the presence of signals of shock, you must take immediate steps to control the bleeding using direct pressure and/or a pressure bandage as continued bleeding can make shock progress faster. Once the bleeding is controlled, continue to monitor the person, immobilize any broken bones or damaged joints, keep the person from becoming chilled or overheated, and talk to him or her in a calm and reassuring manner.

Special Considerations

Be aware that the early signals of shock may not be present in young children and infants. However, because children are smaller than adults, they have less blood volume and are more susceptible to shock.

The signals of shock may be harder to detect in children. Suspect that shock may develop if a child is experiencing severe vomiting or diarrhea for an extended period of time (1 day). Replacing the fluids lost through vomiting or diarrhea is critical. Do not hesitate to call 9-1-1 or the local emergency number for a child who has developed severe vomiting or diarrhea.

SUMMARY

Shock can be caused by loss of blood or body fluid, by the heart not pumping blood effectively, by abnormal dilation of the blood vessels or by damage to the chest or airway. *Do not wait* for shock to develop before giving care to a person who has an injury or sudden illness. Left untreated, shock is a progressive condition that can be fatal. Always follow the general care steps for any emergency to minimize the progression of shock. Care for life-threatening conditions, such as breathing emergencies or severe external bleeding, before caring for non-life-threatening conditions by ensuring the person has an open and clear airway. Remember that the key to managing shock effectively is calling 9-1-1 or the local emergency number and giving care as soon as possible.

READY TO RESPOND?

Think back to the injured driver in the opening scenario, and use what you have learned to respond to these questions:

1. Why did the woman likely go into shock?
2. What steps could you have taken to minimize shock until EMS personnel arrived?

STUDY QUESTIONS

Circle T if the statement is true, F if it is false.

1. Shock is a condition resulting *only* from severe blood loss. T F

2. List the signals of shock.

3. List two of the conditions that frequently result in shock in children.

Use the following scenario to answer question 4.

Tara saw her nephew Daren fall out of the tree he was climbing. When she reached him, he was lying on the ground, conscious, but in pain. One leg was strangely twisted. Tara ran into the house, called 9-1-1 and told the emergency medical dispatcher what had happened. Then she ran back to Daren, who was pale and appeared restless.

4. What can Tara do to care for Daren until EMS personnel arrive?

In questions 5 through 8, circle the letter of the correct answer.

5. Which of the following can cause shock?
   a. Bleeding
   b. Bee sting
   c. Heart attack
   d. All of the above

6. When shock occurs, the body prioritizes its need for blood. Where does it send blood first?
   a. The arms and legs
   b. The brain, heart and lungs
   c. The skin
   d. The spinal cord

7. Which of the following are included in the care for shock?
   a. Controlling external bleeding when present
   b. Having the person lie down
   c. Helping the person maintain a normal body temperature
   d. All of the above

8. Which body systems are affected by shock?
   a. Circulatory and respiratory
   b. All body systems
   c. Circulatory, respiratory and nervous
   d. Respiratory and nervous

Answers are listed in Appendix B.

Part Four

Injuries

10 Soft Tissue Injuries

After a week of all-nighters and grueling exams, you are happy to be having some fun with your friends at a bonfire on the beach. Everyone is enjoying themselves when Jeremy gets up to get something from his bag. As he goes to sit back down, he loses his balance and falls, burning his hand badly on the hot embers at the edge of the fire. As you inspect his injury after he agrees to your help, you can see the skin is red and already beginning to form blisters.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Describe the difference between a closed and open wound.
- List the signals of a severe closed wound.
- List six main types of open wounds.
- Describe how to care for closed and open wounds.
- List the signals of an infected wound.
- Describe how to prevent infection in an open wound.
- Describe how burns are classified.
- Describe the signals of the different types of burns.
- Describe how to care for heat (thermal), chemical, electrical and radiation burns.

KEY TERMS

Bandage: Material used to wrap or cover a part of the body; commonly used to hold a dressing or splint in place.

Burn: An injury to the skin or to other body tissues caused by heat, chemicals, electricity or radiation.

Closed wound: A wound in which soft tissue damage occurs beneath the skin and the skin is not broken.

Critical burn: Any burn that is potentially life threatening, disabling or disfiguring; a burn requiring advanced medical care.

Dressing: A pad placed directly over a wound to absorb blood and other body fluids and to prevent infection.

Full-thickness burn: A burn injury involving all layers of skin and underlying tissues; skin may be brown or charred, and underlying tissues may appear white; also referred to as a third-degree burn.

Open wound: A wound resulting in a break in the skin's surface.

Partial-thickness burn: A burn injury involving the epidermis and dermis, characterized by red, wet skin and blisters; also referred to as a second-degree burn.

Soft tissues: Body structures that include the layers of skin, fat and muscles.

Superficial burn: A burn injury involving only the top layer of skin, the epidermis, characterized by red, dry skin; also referred to as a first-degree burn.

Wound: An injury to the soft tissues.

INTRODUCTION

Soft tissue injuries happen to people of all ages. Fortunately, most soft tissue injuries are minor and will require little attention. However, some soft tissue injuries, such as those resulting from nonpenetrating or penetrating forces, may be severe or life-threatening and require immediate medical attention.

Examples of minor soft tissue injuries include scrapes, bruises and mild sunburns. Examples of serious soft tissue injuries include large cuts that require stitches and partial-thickness burns. Life-threatening soft tissue injuries include stab wounds to the abdomen, lacerations that cause serious bleeding and full-thickness burns.

This chapter discusses the signals of soft tissue injuries, including closed wounds, open wounds and burns, as well as signals of infection. You will learn about the differences between major wounds and minor wounds and between different types of burns. In addition, you will learn when to call 9-1-1 or the local emergency number and how to give care.

THE SOFT TISSUES

The ***soft tissues*** include the layers of skin, fat and muscle that protect the underlying body structures. As you learned in Chapter 4, the two primary layers of the skin are the outer layer, called the **epidermis**, that provides a barrier to bacteria and other organisms that can cause infection, and a deeper layer, called the **dermis**, that contains the nerves, sweat glands, oil glands and blood vessels. Because the skin is well supplied with blood vessels and nerves, most soft tissue injuries are likely to bleed and be painful depending on the severity of the injury.

The subcutaneous layer (also called the **hypodermis**), located beneath the epidermis and dermis, contains adipose (fat), blood vessels and connective tissues. The adipose layer insulates the body to help maintain body temperature, mechanical cushion, and most importantly, a source of energy. The amount of adipose varies among the different parts of the body and from person to person.

The muscles lie beneath the fat layer and comprise the largest segment of the body's soft tissues. Although the muscles are considered soft tissues, muscle injuries are discussed more thoroughly in Chapter 11.

WOUNDS

A ***wound*** is any physical injury involving the soft tissues. Wounds are typically classified as either closed or open. In a ***closed wound***, the skin's surface is not broken; therefore, tissue damage and any bleeding occur below the surface. In an ***open wound***, the skin's surface is broken, and blood may come through the break in the skin.

Fortunately, most of the bleeding you will encounter will not be serious. The trauma of an injury may cause a blood vessel to tear, causing bleeding, but the blood at the wound site usually clots quickly and stops flowing. Sometimes, however, the damaged blood vessel is too large or the pressure in the blood vessel is too great for the blood to clot. In these cases, bleeding can be life threatening. This can happen with both closed and open wounds.

Closed Wounds

The simplest closed wound is a bruise, also called a **contusion (Figure 10-1)**. Bruises result when the body is subjected to a blunt force, such as when you bump your leg on a table or chair. This bump or blow results in damage to soft tissue layers and vessels beneath the skin, causing internal bleeding. When blood and other fluids seep into the surrounding tissues, the area discolors and swells. The amount of discoloration and swelling varies depending on the severity of the injury.

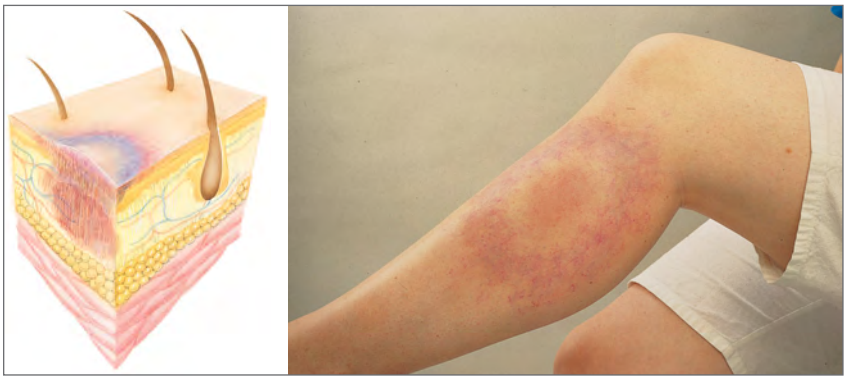


FIGURE 10-1 *The simplest closed wound is a bruise.*

FIGURE 10-2 *For a closed wound, apply cold to help control pain and swelling.*

At first, the area may only appear red. Over time, more blood and other fluids leak into the area, causing the area to turn dark red or purple.

A significant violent force can cause injuries involving larger blood vessels, deeper layers of muscle tissue and internal organs. These injuries can result in severe bleeding beneath the skin that may become life-threatening. As you learned in Chapter 8, signals of severe internal bleeding include:

- Tender, swollen, bruised or hard areas of the body, such as the abdomen.
- Rapid breathing.
- Skin that feels cool or moist or looks pale or bluish.
- Vomiting blood or coughing up blood.
- Excessive thirst.
- An injured extremity that is blue or extremely pale.
- Altered mental state, such as the person becoming confused, faint, drowsy or unconscious.

Care for Closed Wounds

Many closed wounds are minor and do not require special medical care. Applying cold, however, can be effective early on in helping control both pain and swelling **(Figure 10-2)**. When applying cold:

- Fill a plastic bag with ice and water or wrap ice in a wet cloth and apply it to the injured area for periods of about 20 minutes. Place a thin towel as a barrier between the ice and the bare skin.
- Remove the ice and wait 20 minutes before reapplying.
- If the person is not able to tolerate a 20-minute application, limit application to 10 minutes.
- Elevating the injured part may help to reduce swelling; however, *do not* elevate the injured part if doing so causes more pain or you suspect a dislocation or fracture (see Chapter 11).

Do not assume that all closed wounds are minor injuries. Take the time to evaluate whether more serious injuries could be present. Call 9-1-1 or the local emergency number immediately if:

- A person complains of severe pain or cannot move a body part without pain.
- You think the force that caused the injury was great enough to cause serious damage.
- An injured extremity is blue or extremely pale.
- The person's abdomen is tender and distended.
- The person is vomiting blood or coughing up blood.
- The person shows signals of shock or becomes confused, drowsy or unconscious.

With all closed wounds, help the person to rest in the most comfortable position possible. In addition, keep the person from getting chilled or overheated. It is also helpful to comfort and reassure the person. Be sure that a person with an injured lower extremity does not bear weight on it until advised to do so by a medical professional.

Open Wounds

In an open wound, the break in the skin can be as minor as a scrape of the surface layers or as severe as a deep penetration. The amount of bleeding depends on the location and severity of

the injury. The six main types of open wounds are abrasions, lacerations, avulsions, amputations, punctures/penetrations and crush injuries.

Abrasions

An **abrasion** is the most common type of open wound. It is characterized by skin that has been rubbed or scraped away, such as often occurs when a child falls and scrapes his or her hands or knees on a rough surface (road) **(Figure 10-3)**. An abrasion is sometimes called a scrape, a road rash or a strawberry. It is usually painful because scraping of the outer skin layers exposes sensitive nerve endings. Bleeding is not severe and is easily controlled, since only the small capillaries are damaged. Dirt and germs frequently have been rubbed into this type of wound, which is why it is important to clean and irrigate an abrasion thoroughly as described in the section, Specific Care for Minor Open Wounds.

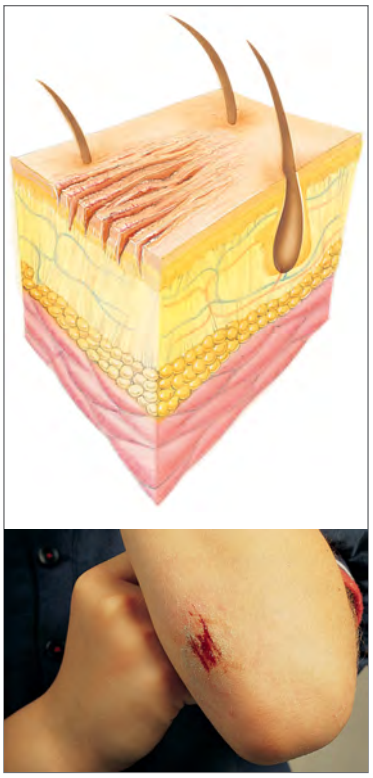


FIGURE 10-3 *Abrasions can be painful, but bleeding is easily controlled.*

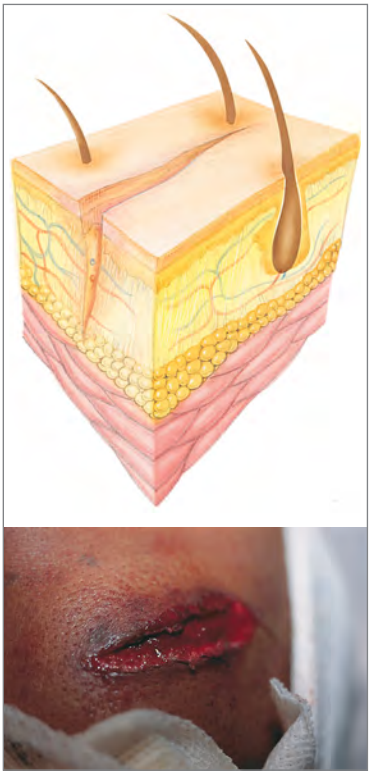


FIGURE 10-4 *A laceration may have jagged or smooth edges.*

Lacerations

A **laceration** is a cut, which may have either jagged or smooth edges **(Figure 10-4)**. Lacerations are commonly caused by sharp-edged objects, such as knives, scissors or broken glass. A laceration can also result when a blunt force disrupts or splits the skin. This splitting often occurs in areas where bone lies directly underneath the skin's surface, such as the chin bone or skull. Deep lacerations can also affect the layers of adipose and muscle, as well as damaging both nerves and blood vessels. Lacerations usually bleed freely and, depending on the structures involved, can bleed heavily. Lacerations are not always painful because damaged nerves cannot transmit pain signals to the brain. Lacerations can easily become infected if not cared for properly.

Avulsions

An **avulsion** is a serious injury in which a portion of the skin and sometimes other soft tissue is partially or completely torn away **(Figure 10-5)**. A partially avulsed piece of skin may remain attached but hangs like a flap. Bleeding is usually significant because avulsions often involve deeper soft tissue layers.

Amputations

Sometimes a body part, such as a finger, may be severed **(Figure 10-6)**. Such an injury is called an **amputation**. Although damage to the tissue is severe when a body part is severed, bleeding may not be as bad as you might expect. The blood vessels usually constrict and retract (pull in) at the point of injury, slowing bleeding and making it relatively easy to control with direct pressure. In the past, a completely severed body part could not be successfully reattached. With today's medical technology, reattachment is sometimes possible, making it important to carefully handle and send the severed body part to the hospital with the patient.

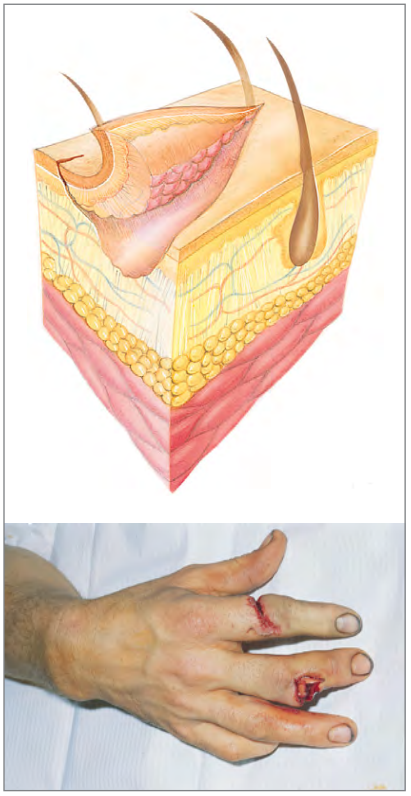


FIGURE 10-5 *In an avulsion, part of the skin and other soft tissue is torn away.*

FIGURE 10-6 *An amputation is a complete severing of a part of the body.*

Punctures/Penetrations

A **puncture/penetration wound** results when the skin is pierced with a pointed object, such as a nail, a piece of glass, a splinter or a knife **(Figure 10-7)**. A gunshot wound is also a puncture wound. Because the skin usually closes around the penetrating object, external bleeding is generally not severe. However, internal bleeding can be severe if the penetrating object damages major blood vessels or internal organs. An object that remains in the open wound is called an **embedded object (Figure 10-8)**. An object may also pass completely through a body part, creating two open wounds—one at the entry point and one at the exit point.

Although puncture wounds generally do not bleed profusely, they are more likely to become infected. Objects penetrating the soft tissues carry microorganisms that cause infections. Of particular danger is the microorganism that causes tetanus, a severe infection.

Crush Injuries

A **crush injury** is the result of a body part, usually an extremity, being subjected to a high degree of pressure, in most cases after being compressed between two heavy objects **(Figure 10-9)**. This type of injury may result in serious damage to underlying tissues and cause bleeding, bruising, fracture, laceration and **compartment syndrome**, which is swelling and an increase in pressure within a limited space that presses on and compromises blood vessels, nerves and tendons that run through that space. In a severe crush injury to the torso, internal organs may rupture. Crush injuries can be open or closed.

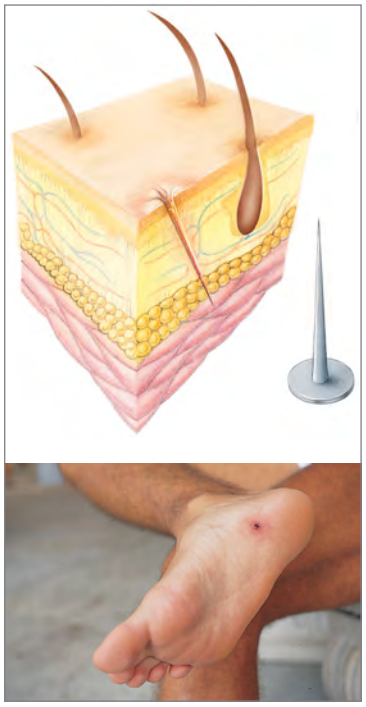


FIGURE 10-7 *A puncture wound results when skin is pierced by a pointed object.*

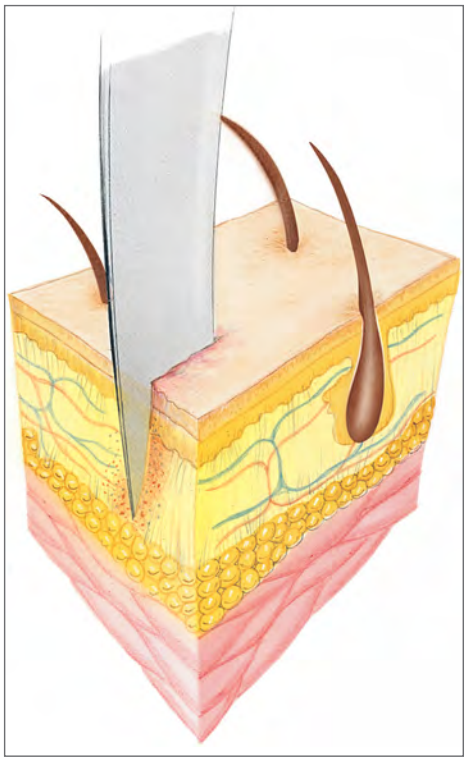


FIGURE 10-8 *An object can become embedded in a wound.*

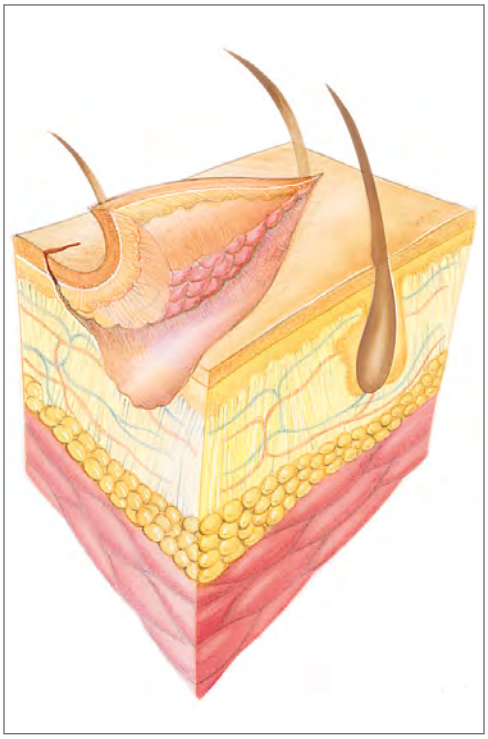


FIGURE 10-9 *Crush injuries occur when a body part is subjected to a high degree of pressure.*

Crush syndrome is also common in people who are trapped in collapsed structures due to, for example, an earthquake or act of terrorism. The injury does not happen at the time that the tissue is crushed, but once the crushed muscle is released from compression and the tissue is reperfused with blood. At that point, multiple adverse processes occur, as the products of muscle breakdown are released into the blood. The person may suffer major shock and renal failure and death may occur.

FIGURE 10-10 *Dressings are pads placed directly on the wound. They come in various sizes. Some have surfaces that will not stick to a wound.*

General Care for Open Wounds

General care for open wounds includes controlling bleeding and preventing infection. Using dressings and bandages assists in both goals.

Using Dressings and Bandages

All open wounds need some type of covering to help control bleeding and prevent infection. These coverings are commonly referred to as dressings and bandages, and there are many types.

Dressings are pads placed directly on the wound to absorb blood and other fluids and to prevent infection. To minimize the chance of infection, dressings should be sterile. Standard dressings include varying sizes of cotton gauze, commonly ranging from 2 to 4 inches square. Much larger dressings are used to cover very large wounds and multiple wounds in one body area. Some dressings have nonstick surfaces to prevent the dressing from sticking to the wound **(Figure 10-10)**.

An **occlusive dressing** is a dressing that closes a wound or damaged area of the body and prevents it from being exposed to the air or water **(Figure 10-11)**. By preventing exposure to the air, occlusive dressings help to further prevent infection. Occlusive dressings help keep in medications that are applied to the affected area. They also help keep in heat, body fluids and moisture. Occlusive dressings can be manufactured or improvised. An example of an improvised occlusive dressing is plastic wrap secured with medical tape. This type of dressing is used for certain chest and abdominal injuries that will be discussed in Chapter 14.

A ***bandage*** is any material that is used to wrap or cover any part of the body. Bandages are used to hold dressings in place, to apply pressure to control bleeding, to protect a wound from dirt and infection and to provide support to an injured limb or body part. Any bandage applied snugly to create pressure on a wound or an injury is called a **pressure bandage**. Many different types of bandages are available commercially **(Figure 10-12)**.

FIGURE 10-11 *Occlusive dressings are designed to prevent air from passing through.*

FIGURE 10-12 *Different types of bandages are used to hold dressings in place, apply pressure to a wound, protect the wound from infection and provide support to an injured area.*

FIGURE 10-13 *A common type of bandage is an adhesive compress.*

FIGURE 10-14 *Roller bandages can be used to secure a dressing in place.*

A common type of bandage is a commercially made **adhesive compress** or adhesive bandage **(Figure 10-13)**. Available in assorted sizes, adhesive bandages consist of a small pad of nonstick gauze on a strip of adhesive tape that is applied directly to minor wounds.

A **bandage compress** is a thick gauze dressing attached to a bandage that is tied in place. Bandage compresses are specially designed to help control severe bleeding and usually come in sterile packages.

A **roller bandage** is usually made of gauze or gauze-like material. Roller bandages are available in assorted widths from ½ to 12 inches and lengths from 5 to 10 yards. A narrow bandage would be used to wrap a hand or wrist. A medium-width bandage would be used for an arm or ankle. A wide bandage would be used to wrap a leg. A roller bandage is generally wrapped around the body part. It can be tied or taped in place. A roller bandage may also be used to hold a dressing in place, secure a splint or control external bleeding **(Figure 10-14)**.

Follow these general guidelines when applying a roller bandage:

- Check for feeling, warmth and color of the area distal to (below) the injury site, especially fingers and toes, before and after applying the bandage.
- Secure the end of the bandage in place with a turn of the bandage. Wrap the bandage around the body part until the dressing is completely covered and the bandage extends several inches beyond the dressing. Tie or tape the bandage in place **(Figure 10-15, A–C)**.
- Do not cover fingers or toes. By keeping these parts uncovered, you will be able to see if the bandage is too tight **(Figure 10-15, D)**. If fingers or toes become cold or begin to turn pale, blue or ashen, the bandage is too tight and should be loosened slightly.
- If blood soaks through the bandage, apply additional dressings and another bandage. Do not remove the blood-soaked bandages and dressings. Disturbing them may disrupt the formation of a clot and restart the bleeding.

Elastic roller bandages, sometimes called elastic wraps, are designed to keep continuous pressure on a body part **(Figure 10-16)**. Elastic bandages are available in 2-, 3-, 4- and 6-inch widths. As with roller bandages, the first step in using an elastic bandage is to select the correct size of bandage: a narrow (2- or 3-inch) bandage is used to wrap a hand or wrist; a medium-width (3- to 4-inch) bandage is used for an arm or ankle and a wide (6-inch) bandage is used to wrap an upper leg or shoulder.

When properly applied, an elastic bandage can effectively control swelling or support an injured limb, as in the care for a venomous snakebite (see Chapter 17). An improperly applied elastic bandage can restrict blood flow, which is not only painful but can also

FIGURE 10-15, A–D *To apply a roller bandage:* **A,** *Start by securing the roller bandage in place.* **B,** *Use overlapping turns to cover the dressing completely.* **C,** *Tie or tape the bandage in place.* **D,** *Check the fingers or toes for feeling, warmth and color.*

cause tissue damage if not corrected. To apply an elastic roller bandage:

- Check for feeling, warmth and color of the area distal to (below) the injury site, especially the fingers and toes, before *and* after applying the bandage. By checking both before and after bandaging, you will be able to tell if any tingling or numbness is from the bandaging or the injury.
- Place the end of the bandage against the skin and use overlapping turns.
- Gently stretch the bandage as you continue wrapping **(Figure 10-17, A)**. The wrap should cover a long body

FIGURE 10-16 *Elastic roller bandages can be applied to control swelling or support an injured limb.*

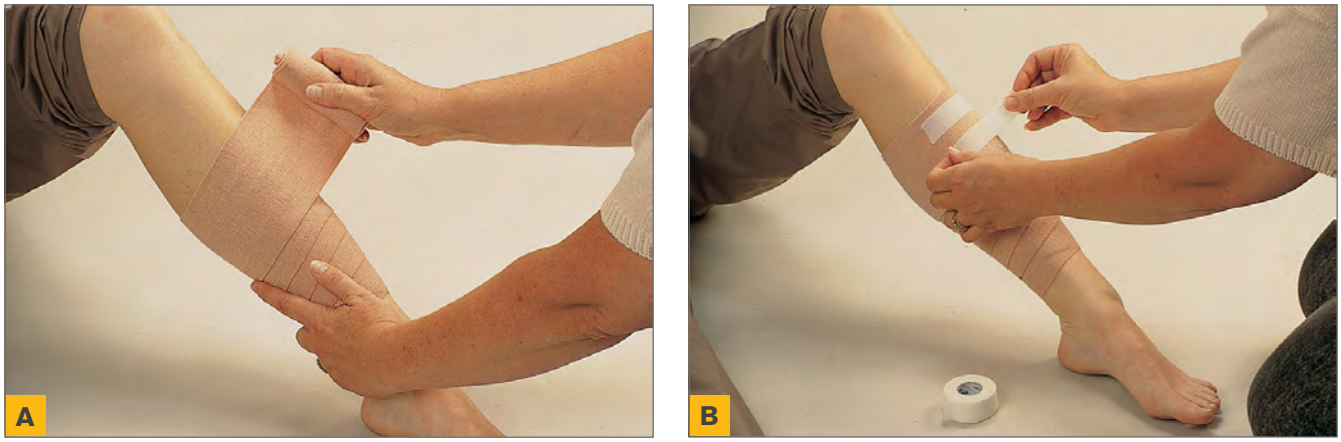


FIGURE 10-17, A–B *To apply an elastic bandage: Place the bandage against the skin and use overlapping turns.* **A,** *Gently stretch the bandage as you continue wrapping. The wrap should cover a long body section, such as an arm or calf, beginning at the point farthest from the heart.* **B,** *Tape the end of the bandage in place.*

section, such as an arm or a calf, beginning at the point farthest from the heart. For a joint like an ankle, knee, or elbow, use figure-eight turns to support the joint.

- Tape the end of the bandage in place **(Figure 10-17, B)**. Check the snugness of the bandaging—a finger should easily, but not loosely, pass under the bandage.

See A Stitch in Time for information about when a wound may require stitches as well.

Specific Care for Minor Open Wounds

In minor open wounds, such as abrasions, damage is only superficial and bleeding is normally minimal. To care for a minor open wound, follow these general guidelines:

- Use a barrier between your hand and the wound. If readily available, put on disposable gloves and place a sterile dressing on the wound.
- Apply direct pressure for a few minutes to control any bleeding.
- Wash the wound thoroughly with soap and water and gently dry with clean gauze. If possible, irrigate an abrasion for 5 minutes with clean, warm, running tap water.
- Cover the wound with a clean dressing and a bandage (or with an adhesive bandage) to keep the wound moist and prevent drying. Apply an antibiotic ointment to the dressing or bandage first if the person has no known allergies or sensitivities to the medication. Do not apply the antibiotic directly to the wound as doing so may contaminate the antibiotic tube.
- Wash your hands immediately after giving care, even if you wore gloves.

A STITCH IN TIME

Stitches speed the healing process, lessen the chances of infection and improve the look of scars. It can be difficult to judge, however, when a wound requires stitches. A general rule of thumb is that stitches are needed when the edges of skin do not fall together, when the laceration involves the face or when any wound is over ½ inch long. In addition, the following major injuries always require medical attention and often need stitches:

- Bleeding from an artery or bleeding that is difficult to control
- Deep cuts or avulsions that show the muscle or bone, involve joints such as the elbows, gape widely or involve the hands, feet or face
- Large punctures
- Large embedded objects
- Some human and animal bites
- Wounds that, if left unattended, could leave a conspicuous scar, such as those that involve the lip or eyebrow

If you are caring for a wound and think it may need stitches, it probably does. If you are not sure, check with a health care provider immediately as stitches should be applied within the first few hours after the injury. It can be dangerous to close a wound after a delay because of the probability of infection.

Specific Care for Major Open Wounds

A major open wound may have severe bleeding, deep or extensive destruction of tissue or a deeply embedded or impaled object. To care for a major open wound, follow these general guidelines:

- Call 9-1-1 or the local emergency number.
- Put on disposable gloves. If blood has the potential to splatter, you may need to wear eye and face protection.
- Control external bleeding using the general steps below:
  - Cover the wound with a dressing, and press firmly against the wound with a gloved hand until the bleeding stops.
  - Apply a pressure bandage over the dressing to maintain pressure on the wound and to hold the dressing in place.
  - If blood soaks through the bandage, do not remove the blood-soaked bandages. Instead, add more pads and bandages to help absorb the blood and continue to apply direct pressure.
- Continue to monitor the person's condition. Observe the person closely for signals that may indicate that the person's condition is worsening, such as faster or slower breathing, changes in skin color and restlessness.
- Take steps to minimize shock. Keep the person from getting chilled or overheated.
- Have the person rest comfortably and reassure him or her.
- Wash your hands immediately after giving care, even if you wore gloves.

As discussed in Chapter 8, it is not recommended to use one of the topical hemostatic agents that are available over-the-counter as there is a potential risk for injury with certain types of agents. Hemostatic agents should only be used as needed by a professional responder. In addition, there is *no* evidence to support using elevation to control external bleeding and there is evidence *against* using pressure points to control external bleeding.

What if...

A person has a small- to medium-size superficial wound on his arm that is gaping open? I have heard that Super Glue® can be used to close the wound rather than seeking medical care. Is this true?

While it is true that health care providers do sometimes use glue to close a wound, the use of "fast-acting" adhesives (cyanoacrylate) such as Super Glue® or Krazy Glue® is not recommended for lay responders as there is evidence that when placed in contact with cotton and other fabrics, these glues may cause a powerful, rapid heating reaction that creates the risk for thermal burns. When a health care provider uses glue to close a wound, he or she does so based on a set of established criteria, and the glue is medical-grade glue designed to be nontoxic and less irritating to skin tissue.

Special Considerations When Caring for Open Wounds

Amputations

If the person has an amputation in which a body part has been completely severed:

- Call 9-1-1 or the local emergency number.
- Put on disposable gloves.
- First care for the wound as described above in *Specific Care for Major Open Wounds*.
- After controlling external bleeding, locate and care for the severed body part (or have another person on the scene follow these steps while you control the bleeding):
  - Wrap the severed body part in sterile gauze or any clean material, such as a washcloth. Moisten the cloth with sterile saline if available.
  - Place the wrapped part in a plastic bag or container. Label it with the person's name and the time and date it was placed in the bag.

FIGURE 10-18 *Wrap a severed body part in sterile gauze, seal it in a plastic bag and put the bag in an ice and water slurry.*

- Keep the bag cool by placing it in a larger bag or container of an ice and water slurry **(Figure 10-18)**—*not* on ice alone and *not* on dry ice.
- Make sure the bag or container is transported to the medical facility by emergency medical services (EMS) personnel with the injured person.

Embedded/Impaled Objects

If an object, such as a knife or a piece of glass or metal, is embedded/impaled in a wound, do not remove it. Instead, care for the wound with the object in place as follows:

- Call 9-1-1 or the local emergency number if you have not already done so.
- Put on disposable gloves.
- Do *not* remove the object.
- Apply direct pressure with sterile dressings to the edges of the wound. Avoid placing pressure on or moving the object.
- Use a bulky dressing to stabilize the object. Any movement of the object can result in further tissue damage **(Figure 10-19, A)**.
- Control bleeding by bandaging the dressing in place around the object **(Figure 10-19, B)**.
- Wash your hands immediately after giving care.

What if...

A person has an embedded object that has gone through both sides of the body? Do I stabilize the object on both sides?

Yes, you will need to apply bulk-dressing support to both sides of the object to stabilize it. Stabilization of one side and not the other increases the risk for moving the object and causing further tissue damage.

If there is a splinter embedded in the skin, it can be removed with tweezers. After removing the splinter from the skin, wash the area with soap and water and rinse the area with tap water for about 5 minutes. After drying the area, cover it with a dressing and bandage to keep it clean. Apply antibiotic ointment to the dressing first if there are no known allergies or sensitivities to the medication.

If the splinter is embedded in the eye, do not attempt to remove it. Call 9-1-1 or the local emergency number.

FIGURE 10-19, A–B **A,** *Use bulky dressings to support an embedded object.* **B,** *Use bandages over the dressing and around the object to control bleeding.*

Using Tourniquets When Help Is Delayed

For any wound that is bleeding, if direct pressure fails to control bleeding or is not possible, and professional medical help is not available or is delayed, application of a manufactured (commercial) tourniquet by a properly trained responder can be considered. Manufactured tourniquets are preferred over makeshift or homemade devices. See Chapter 8 for details on applying a tourniquet.

FIGURE 10-20 *The area around an infected wound becomes swollen and red. There may be a pus discharge.* Image © Fedor Kondratenko, 2010 Used under license from Shutterstock.com.

Infection

Any break in the skin can provide an entry point for microorganisms that can cause infection. Even a small, seemingly minor laceration, abrasion or burn has the potential to become infected. An infection can range from being merely unpleasant to being life threatening. Of particular danger is the microorganism that causes **tetanus**. Tetanus is a disease caused by bacteria that produces a powerful poison in the body. This poison enters the nervous system and can cause muscle paralysis (also known as "lockjaw"). Once tetanus reaches the nervous system, its effects are highly dangerous and can be fatal. However, in many cases, tetanus can now be successfully treated with **antitoxins**.

The best initial defense against infection is to clean the area. As reflected in the care steps for minor wounds discussed above, after controlling any bleeding, you should wash the area with soap and water and, if possible, irrigate with large amounts of fresh running water to remove debris and germs. You should not wash more serious wounds that require medical attention, however, because they involve more extensive tissue damage or bleeding and it is more important to control the bleeding. A person who has an open wound should also be advised to check with his or her health care provider about the need to get or update his or her tetanus immunization whenever skin is punctured or cut by an object, such as a rusty nail, that could carry infection, or an animal bite.

Signals of Infection

Sometimes even the best care for a soft tissue injury is not enough to prevent infection. You can easily recognize the signals of an infection, which include:

- The area around the wound becomes swollen and red.
- The area may feel warm or throb with pain.
- Some wounds have a pus discharge **(Figure 10-20)**.
- More serious infections may cause a person to develop a fever and feel ill.
- Red streaks may develop that progress from the wound in the direction of the heart.

Care for Infection

If you see any signals of infection, keep the area clean, soak it in clean, warm water and apply an antibiotic ointment to the wound covering if the person has no known allergies or sensitivities to the medication. Coverings over the wound should be changed daily. If a fever or red streaks develop, the infection is worsening and a health-care provider should be contacted to determine what additional care is necessary.

BURNS

Burns are another kind of soft tissue injury caused by exposure to heat, chemicals, electricity or radiation. Burns caused by exposure to heat are the most common. Burns account for about 25 percent of all soft tissue injuries. Like other types of soft tissue injuries,

burns can damage the top layer of skin or the skin and the layers of adipose, muscle and bone beneath.

More severe burns break the skin and thus can cause infection, fluid loss and loss of body temperature control. Burns can also damage the respiratory system and the eyes. The severity of a burn depends on:

- The temperature of the source of the burn.
- The length of exposure to the source.
- The location of the burn.
- The extent of the burn.
- The person's age and medical condition.

Because their skin is thinner and more delicate, older adults and young children are particularly susceptible to severe burns. People with chronic medical problems also tend to have more complications from severe burns, especially if they are not well nourished or have heart or kidney problems. People with nerve damage resulting from paralysis or other medical conditions may have no sensation. Therefore, they become burned more easily because they do not feel heat.

Types of Burns

Burns are classified by depth. The deeper the burn, the more severe it is. The three classifications of burns include ***superficial burns*** (sometimes referred to as first degree), ***partial-thickness burns*** (sometimes referred to as second degree) and ***full-thickness burns*** (sometimes referred to as third degree). Burns are also classified by their source: heat (thermal), chemical, electrical or radiation (such as from the sun).

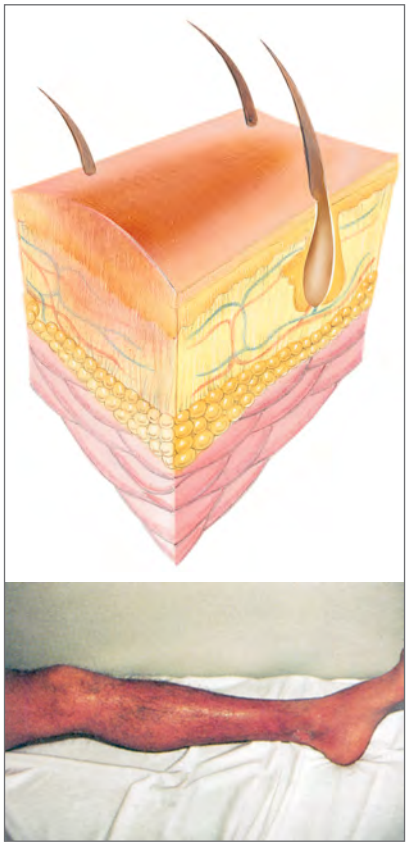


FIGURE 10-21 *A superficial burn involves only the top layer of skin.* Courtesy of Alan Dimick, M.D., Professor of Surgery, Former Director of UAB Burn Center.

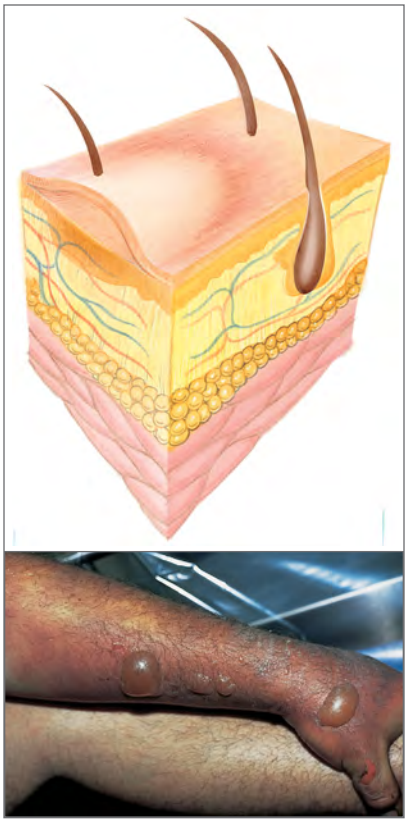


FIGURE 10-22 *A partial-thickness burn involves the epidermis and dermis.* Courtesy of Alan Dimick, M.D., Professor of Surgery, Former Director of UAB Burn Center.

Signals of Burns

Signals of burns depend on whether the burn is superficial, partial-thickness or full-thickness:

- Superficial burns:
  - Involve only the top layer of skin **(Figure 10-21)**.
  - Cause skin to become red and dry; are usually painful; and the area may swell.
  - Usually heal within a week without permanent scarring.
- Partial-thickness burns:
  - Involve the top layers of skin (epidermis and dermis) **(Figure 10-22)**.
  - Cause skin to become red; are usually painful; have blisters that may open

and weep clear fluid, making the skin appear wet; may appear mottled; and often swell.
    - Usually heal in 3 to 4 weeks and may scar.
- Full-thickness burns:
    - May destroy all layers of skin and some or all of the underlying structures—fat, muscles, bones and nerves.
    - The skin may be brown or black (charred), with the tissue underneath sometimes appearing white, and can either be extremely painful or relatively painless (if the burn destroys nerve endings) **(Figure 10-23)**.
    - Healing requires medical assistance; scarring is likely.

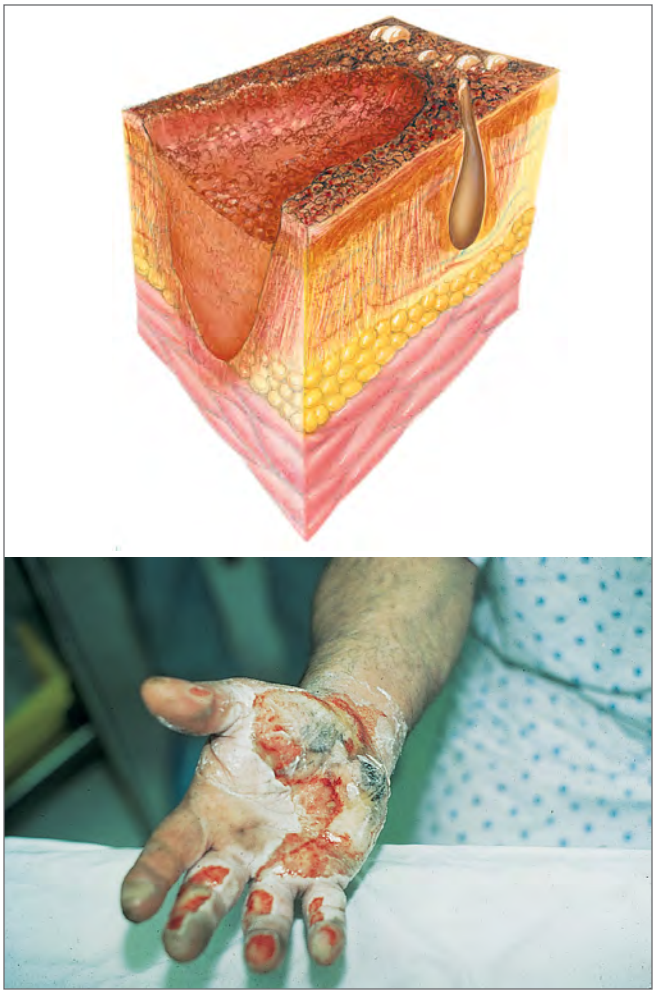


FIGURE 10-23 *A full-thickness burn destroys both layers of skin in addition to any or all of the underlying structures, including fat, muscles, bones and nerves.* Courtesy of Alan Dimick, M.D., Professor of Surgery, Former Director of UAB Burn Center.

Identifying Critical Burns

A ***critical burn*** requires immediate medical attention. Critical burns are potentially life threatening, disfiguring and disabling. Knowing whether you should call 9-1-1 or the local emergency number for a burn is often difficult. It is not always easy or possible to assess the severity of a burn immediately after injury. Even superficial burns to large areas of the body or to certain body parts can be critical. You cannot judge severity of a burn by the pain the person feels because nerve endings may be destroyed.

Call 9-1-1 or the local emergency number immediately if the person:

- Has trouble breathing.
- Has burns covering more than one body part or a large surface area.
- Has suspected burns to the airway. Burns to the mouth and nose may be a signal of this **(Figure 10-24)**.
- Has burns to the head, face, neck, hands, feet or genitals.
- Has a partial- or full-thickness burn and is younger than age 5 or older than age 60.
- Has a burn resulting from chemicals, explosions or electricity.

FIGURE 10-24 *Burns around the mouth and nose may indicate that the airway is burned.*

Care for Heat (Thermal) Burns

Follow these basic steps when caring for a heat burn:

- Check the scene for safety and only approach if it is safe to do so.
- Stop the burning by removing the person from the source of the burn.

FIGURE 10-25, A–B **A,** *Cool a heat (thermal) burn with large amounts of cold running water until the pain is relieved.* **B,** *Cover the burned area loosely with a sterile dressing.*

- Check for life-threatening conditions.
- As soon as possible, cool the burn with large amounts of cold running water, at least until pain is relieved **(Figure 10-25, A)**.
- Cover the burn loosely with a sterile dressing **(Figure 10-25, B)**.
- Take steps to minimize shock. Keep the person from getting chilled or overheated.
- Comfort and reassure the person.

Remember, even after the source of the burn has been removed, soft tissue will continue to burn for minutes afterward, causing more damage. Therefore, it is essential to cool any burned areas immediately with large amounts of cold water. Do *not* use ice or ice water. Ice or ice water causes the body to lose critical heat and further damages delicate tissues, making the burn deeper. Use whatever resources are available to flush the area—a tub, shower or garden hose. You can apply clean soaked towels, sheets or other wet cloths to a burned face or other area that cannot be immersed. Be sure to keep these compresses cool and moist by adding more water. Otherwise, the compresses will quickly absorb the heat from the skin's surface, dry out and stick to the skin.

Allow several minutes for the burned area to cool. If pain continues when the area is removed from the water, continue cooling. When the burn is cool, remove all clothing from the area by carefully removing or cutting material away. Do *not* try to remove any clothing that is stuck to the skin. Remove jewelry only if doing so will not further injure the person as swelling may occur.

Burns often expose sensitive nerve endings. Cover the burned area to keep out air and help reduce pain. Use dry, sterile dressings if possible and loosely bandage them in place. Do *not* touch a burn with anything except a clean covering. The bandage should not put pressure on the burn surface. If the burn covers a large area of the body, cover the burned area with clean, dry sheets or other cloth. Covering the burn also helps to prevent infection. Do *not* try to clean a severe burn.

Do not put ointments, butter, oil or other commercial or home remedies on blisters, deep burns or burns that may require medical attention. Oils and ointments seal in heat, do not relieve pain and will have to be removed by medical personnel. Other home remedies can contaminate open skin areas, causing infection. Do not break blisters. Intact skin helps prevent infection.

For small superficial burns that are not sufficiently severe or extensive enough to require medical attention, care for the burned area as an open wound. Wash the area with soap and water, and keep the area clean. Cover the burn with a dressing and bandage. Apply antibiotic ointment to the dressing first if the person has no known allergies or sensitivities to the medication. Tell the person to watch for signals of infection.

Large partial-thickness and full-thickness burns can cause shock as a result of pain and loss of body fluids. In addition, when a person suffers a burn, he or she is less able to regulate body temperature. As a result, a person who has been burned has a tendency to become chilled. To help maintain normal body temperature and prevent hypothermia, keep the person warm and away from drafts. Have the person lie down unless he or she is having trouble breathing. Also remember that cooling a burn over a large area of the body can bring on hypothermia. Be aware of this risk and look for signals of hypothermia (see Chapter 19). If possible, monitor the person's core body temperature when cooling a burn that covers a large area.

Care for Chemical Burns

Chemical burns are common in industrial settings but also occur in the home. Typically, burns result from chemicals that are strong acids or alkalis. Cleaning solutions, such as household bleach, drain cleaners, toilet bowl cleaners, paint strippers, and lawn or garden chemicals are common sources of chemicals that can eat away or destroy tissues. These substances can quickly injure the skin. Signals of a chemical burn include:

- Pain.
- Burning.
- Numbness.
- Change in level of consciousness.
- Respiratory distress.
- Oral discomfort or swelling.
- Eye discomfort.
- Change in vision.

As with heat burns, the stronger the chemical and the longer the contact, the more severe the burn. The chemical will continue to burn as long as it is on the skin. You must remove the chemical from the body as quickly and safely as possible and call 9-1-1 or the local emergency number. To care for a chemical burn:

- If the chemical is dry or in a powdered form, brush the chemical from the skin with a gloved hand or a towel and remove any contaminated clothing or jewelry. Be careful not to get the chemical on yourself or on a different area of the person's skin.
- Flush the burn with large amounts of cool running tap water (under pressure). Continue flushing the burn for at least 20 minutes or until EMS personnel arrive. Do not use a forceful flow of water from a hose; the force may further damage burned skin.
- Take steps to minimize shock. Keep the person from getting chilled or overheated.
- If an eye is burned by a chemical, flush the affected eye with water for at least 20 minutes or until EMS personnel arrive. Tilt the head so that the affected eye is lower than the unaffected eye as you flush **(Figure 10-26)**. This position helps prevent the chemical from getting into the unharmed eye. Flush from the nose outward. If both eyes are affected, direct the flow to the bridge of the nose and flush both eyes from the inner corner outward.

FIGURE 10-26 *If an eye is burned by a chemical, flush the affected eye with cool water until EMS personnel take over.*

What if...

A person has a chemical burn and the water reacts with the burn while flushing it, making the situation worse?

While there are some substances that dissolve readily in water to form a corrosive solution (e.g., ammonia and hydrogen chloride), flushing the area with large amounts of water for at least 20 minutes should adequately dilute the solution to avoid additional damage. If the solution penetrates clothing, ask the person to remove the contaminated clothing while continuing to flush the skin with water. Be careful not to contaminate yourself while giving care.

FIGURE 10-27 *An electrical burn may severely damage underlying tissues.*

- Be aware that chemicals can be inhaled, potentially damaging the airway or lungs. Call 9-1-1 or the local emergency number if you believe chemicals have been inhaled and give that information to the call taker.

Care for Electrical Burns

The human body is a good conductor of electricity. When someone comes in contact with an electric source, such as a power line, a malfunctioning household appliance or lightning, electricity is conducted through the body. Electrical resistance of body parts produces heat, which can cause burn injuries **(Figure 10-27)**. The severity of an electrical burn depends on the type and amount of contact, the current's path through the body and how long the contact lasted. Electrical burns are often deep. The person may have an entrance wound and an exit wound where the current entered and exited the body. Although these wounds may look superficial, the tissues below may be severely damaged.

Electrical injuries also cause problems in addition to burns. Electricity running through the body can make the heart beat erratically. As a result, the person's heart or breathing may stop. The person may also have fractured bones caused by strong muscle spasms. The signals of electrical injury include:

- Unconsciousness.
- Dazed, confused behavior.
- Obvious burns on the skin's surface.
- Trouble breathing or no breathing.
- Burns both where the current entered and where it exited the body, often on the hand or foot.

Suspect a possible electrical injury if you hear a sudden loud pop or bang or see an unexpected flash. If you encounter a person with an electrical burn:

- Scene safety is of the utmost importance—never go near the person until you are sure he or she is *not* still in contact with the power source.
- If possible, turn off the power at its source and care for any life-threatening emergencies (if you cannot safely turn power off at its source, call 9-1-1 or the local emergency number and wait for advanced help to arrive).
- Call 9-1-1 or the local emergency number. Any person who has suffered an electric shock needs to be evaluated by a medical professional to determine the extent of the injury.
- Remember that electrocution can cause cardiac and breathing emergencies. Be prepared to perform CPR or use an automated external defibrillator (AED).
- Care for shock and thermal burns.
- Look for entry and exit wounds and give appropriate care.
- Check for additional injuries, such as fractures, which may result from severe muscle contractions that occur in resistance to the electric current.

STRIKING DISTANCE

While lightning fatalities have decreased during the past three decades, the National Weather Service still lists lightning among the top three storm-related killers in the United States, claiming an average of 100 people each year and injuring hundreds more.

Anything tall—a tower, a tree or a person—can become a path for lightning's electric current. Traveling at speeds up to 300 miles per second, a lightning strike can hurl a person through the air, burn his or her clothes off and sometimes cause the heart to stop beating. The most severe lightning strikes carry up to 50 million volts of electricity, enough to light 13,000 homes. Lightning can "flash" over a person's body, or, in its more dangerous path, it can travel through blood vessels and nerves to reach the ground.

If a person survives a lightning strike, besides burns, he or she may also sustain neurological damage, fractures and loss of hearing or eyesight. A person who is struck by lightning sometimes acts confused and may describe the episode as getting hit on the head or hearing an explosion.

To prevent lightning injuries, use common sense before, during and after thunderstorms. The National Weather Service advises you to:

- Watch cloud patterns and conditions for signs of an approaching storm.
- Designate safe locations and move or evacuate to a safe location at the first sound of thunder.
- Postpone activities immediately; do not wait for rain to begin. Lightning can strike without rain.
- Where possible, quickly find shelter in a fully enclosed building (*not* a carport, open garage, covered patio, tent, picnic shelter or the like), or in a fully enclosed metal vehicle, such as a hardtop car (*not* a convertible), truck or van, with the windows completely shut. The electric and telephone wiring and plumbing pathways in inhabited buildings aid in grounding a building, which is why being inside a building is safer than remaining outdoors during thunderstorm.
- Use the 30-30 rule where visibility is good and there is nothing obstructing your view of the thunderstorm:
  - When you see lightning, count the time until you hear thunder. If that time is 30 seconds or less, the thunderstorm is within 6 miles (every 5 seconds between the flash of lightning and the sound of thunder equals 1 mile of distance) (Flash-to-Bang method). Seek shelter immediately.
  - Wait at least 30 minutes after the last clap of thunder before leaving shelter. The threat of lightning continues for a much longer period than most people realize—even when blue sky is visible overhead—as lightening can travel horizontally many miles away from a thunderstorm and strike the ground (known as "Bolts from the Blue").
- If inside during a storm, keep away from windows. Injuries may occur from flying debris or glass if a window breaks. Also stay away from showers, sinks, bathtubs and electronic equipment such as stoves, corded telephones, radios and computers.
- If there is a tornado alert, go to the basement or the lowest interior level of a building.

If you are not able to get indoors during a lightning storm, you can lessen your risk of being struck by following these guidelines:

- Avoid open fields, the top of a hill or a ridge top.
- Seek uniform cover, such as low rolling hills or trees of about the same size.
- If you are boating or swimming, get to land and move away from the shore.
- If you know of a safe structure in the area (see above), keep moving toward it.
- Avoid all of the following:
  - Metal
  - Anything connected to electrical power
  - High places and high objects such as tall trees
  - Open places
  - Damp, shallow caves and tunnels
  - Overhangs
  - Flood zones

(*continued*)

STRIKING DISTANCE (continued)

- Places obviously struck by lightning in the past
- Long conductors, such as fences

If lightning is striking nearby when you are outside:

- Squat or sit in a tight body position on insulating material such as a sleeping pad or a life jacket *(pictured)*.

Courtesy of the Canadian Red Cross

- Take off any metal-framed packs and toss hiking poles away from the group.
- Do not lie down; instead, try to make as little contact with the ground as possible.
- If you feel your hair stand on end or your skin get tingly, cover your ears with your hands, close your eyes and get your head close to your knees.
- Avoid squatting or sitting close to other people. Maintain a minimum distance of at least 15 feet between people. Keep everyone in sight if possible.

SOURCES: National Weather Service. www.lightningsafety.noaa.gov/outdoors.htm. Accessed 10/28/11.

FIGURE 10-28 *Radiation burns, such as sunburn, are usually mild, but they can be painful and blister when involving more than one layer of skin.*

Care for Radiation Burns

Radiation burns may occur from exposure to nuclear radiation, X-rays or as a side effect of radiation therapy. They can also be caused by tanning beds or solar radiation from the sun. Solar burns are similar to heat burns. Usually solar burns are mild but can be painful **(Figure 10-28)**. They may blister, involving more than one layer of skin. Care for sunburns as you would any other heat burn. Cool the burn and protect the burned area from further damage by keeping it away from the sun. Do not break blisters. Intact skin helps prevent infection.

People are rarely exposed to other types of radiation unless working in special settings, such as certain types of medical, industrial or research facilities. If you work in such settings, you should be informed of the risks and will be required to take precautions to prevent overexposure.

SMART MOVES: PREVENTING BURNS

- Heat burns can be prevented by following safety practices that prevent fire and by being careful around sources of heat.
- Chemical burns can be prevented by following safety practices around all chemicals and by following manufacturers' guidelines when handling chemicals.
- Electrical burns can be prevented by following safety practices around electrical lines and equipment and by leaving outdoor areas when lightning could strike.
- Sunburn (radiation burn) can be prevented by wearing appropriate clothing and using sunscreen. Sunscreen should have a sun protection factor (SPF) of at least 15.

SUMMARY

Caring for soft tissue injuries involves a few simple steps. With closed wounds, minor injuries require no special medical care, although applying cold can help minimize pain and swelling. If you suspect the possibility of a serious internal injury, always call 9-1-1 or the local emergency number. With open wounds, you need to control bleeding and minimize the risk for infection. Remember that with minor wounds, your primary concern is to cleanse the wound to prevent infection. With major wounds, you should control the bleeding quickly and seek medical attention. Wear disposable gloves or use a barrier, such as plastic wrap, dressings or a clean folded cloth, to avoid contact with blood. Dressings and bandages, when correctly applied, help control bleeding and minimize the danger of infection.

Burns damage the layers of the skin and sometimes the internal structures as well. Heat, chemicals, electricity and radiation all cause burns. When caring for a person with burns, always first ensure your personal safety. When the scene is safe, approach the person and check for life-threatening conditions, followed by non-life-threatening conditions, if necessary. Follow the steps for burn care. In addition, always check for inhalation injury if the person has a heat or chemical burn. With electrical burns and victims of a lightning strike, check carefully for additional conditions, such as trouble breathing, cardiac arrest and fractures.

READY TO RESPOND?

Think back to Jeremy's burn injury in the opening scenario, and use what you have learned to respond to these questions:

1. What type of burn was sustained by Jeremy? Why do you think so?
2. Will the burn require medical attention? Why or why not?
3. What steps would you take to care for Jeremy's burns?

STUDY QUESTIONS

1. Match each term with the correct definition.

    a. Soft tissue
    b. Open wound
    c. Critical burn
    d. Bandages
    e. Closed wound
    f. Full-thickness burn

_____ Any burn that is potentially life threatening, disabling or disfiguring

_____ A burn that destroys skin and underlying tissues

_____ The layers of the skin, adipose and muscles

_____ Wrappings that hold dressings in place

_____ Injury resulting in tissue damage beneath the skin's surface, while the skin remains intact

_____ Injury resulting in a break in the skin's surface

2. Match each type of injury to its example.

    a. Abrasion
    b. Puncture
    c. Avulsion
    d. Contusion

_____ Torn earlobe

_____ Black eye

_____ Scraped knee

_____ Gunshot wound

3. Match each type of wound with the appropriate care.

    a. A major open wound
    b. A minor open wound
    c. A major open wound with an embedded object
    d. A severed body part

_____ Cover with dressing and pressure bandage.

_____ Wash the wound thoroughly with soap and water.

_____ Wrap the part and place it in a plastic bag, and then in an ice and water slurry.

_____ Use bulky dressings to stabilize.

4. List five signals of infection.
5. List two of the purposes of bandaging.
6. List and briefly describe six types of open wounds.
7. List four sources of burns.
8. Describe the following types of burns:
    a. Superficial burn
    b. Partial-thickness burn
    c. Full-thickness burn

In questions 9 through 22, circle the letter of the correct answer.

9. To prevent infection of a minor open wound, you should—
    a. Wash the area with soap and water.
    b. Apply a pressure bandage.
    c. Remove all jewelry.
    d. Wrap the affected area with moist sterile dressings.
10. A signal of an infected open wound is—
    a. Red streaks from the wound in the direction of the heart.
    b. Swelling and redness around the wound.
    c. The affected area is cool to the touch.
    d. a and b
11. Which should you do to care for an infected wound?
    a. Keep the area clean.
    b. Apply warm, wet compresses and an antibiotic ointment.
    c. Change coverings daily.
    d. All of the above
12. Which statement applies to all open wounds?
    a. They always bleed heavily.
    b. They are at risk for infection.
    c. They must always be cleaned immediately before bleeding is controlled.
    d. They are life threatening.
13. Which should you do in caring for a major open wound?
    a. Apply direct pressure with a dressing to control bleeding.
    b. Wash the wound.
    c. Apply an occlusive dressing.
    d. Apply an antibiotic ointment.

14. Which should you do when caring for an injury in which the body part has been completely severed?

    a. Place the part directly on ice.
    b. Seek medical assistance and make sure the part is transported with the person.
    c. Wash the body part thoroughly with soap and water.
    d. Secure the part back in place using sterile roller bandages.

15. A 6-year-old girl falls on a sharp object. The object is sticking out of her leg. What should you do?

    a. Allow the area to bleed freely.
    b. Remove the object and control bleeding.
    c. Wash the wound with soap and water.
    d. Stabilize the object in the position in which you find it.

16. Which is the step you should take to control external bleeding (minor)?

    a. Elevate the injured area.
    b. Apply direct pressure.
    c. Apply a pressure point.
    d. Apply a tourniquet.

17. Which could swelling and discoloration indicate?

    a. A closed wound
    b. Damage to underlying structures
    c. Internal bleeding
    d. All of the above

18. Which action would you take when caring for a minor closed wound?

    a. Apply a warm compress over the wound.
    b. Apply cold for 20 minutes using a barrier between the skin and cold pack.
    c. Keep the injured area below the level of the heart.
    d. Call 9-1-1 or the local emergency number.

19. What is the first step you should take when caring for an electrical burn?

    a. Check for life-threatening conditions.
    b. Make sure the scene is safe (the power source is turned off).
    c. Look for an entry and exit wound.
    d. Check for non-life-threatening conditions.

20. Which burns require professional medical attention?

    a. Burns that cover more than one body part.
    b. Burns that cause the person to have trouble breathing.
    c. Burns resulting from electricity, explosions or chemicals.
    d. All of the above

21. The student at the lab table near you spills a liquid corrosive chemical on his arm. Which would you do first?

    a. Remove the chemical with a clean cloth.
    b. Put a sterile dressing over the burn site.
    c. Flush the arm with water.
    d. Have the person immediately remove contaminated clothes.

22. Luke's grandmother was burned on one leg and foot when a pan of boiling water tipped off the stove. Which should Luke have done first to care for her?

    a. Put ice cubes on the burned area.
    b. Immediately put a dry, sterile dressing on the burned area.
    c. Help her put her foot and leg in the bathtub and flood it with cool water.
    d. Wash the area and then apply a burn ointment.

Answers are listed in Appendix B.

11 Musculoskeletal Injuries

You are running soccer practice for the team you coach when one of the players, Kelly, stumbles on a rough spot in the field while running and dribbling the ball. She grabs her ankle and grimaces. With the big tournament ahead, you wonder if she has sprained her foot badly, or if it is just a simple muscle strain that could heal quickly.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Identify three types of forces that can act upon the body and how these forces can lead to injury.
- Identify four basic types of musculoskeletal injuries.
- List the signals of a serious musculoskeletal injury.
- Describe the general care for musculoskeletal injuries.
- List the general guidelines for splinting.
- List the purposes of immobilizing a musculoskeletal injury.

KEY TERMS

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

Dislocation: The displacement of a bone from its normal position at a joint.

Fracture: A break or disruption in bone tissue.

Immobilize: To use a splint or other method to keep an injured body part from moving.

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

Ligament: A fibrous band that holds bones together at a joint.

Muscle: A tissue that contracts and relaxes to create movement.

Skeletal muscles: Muscles that attach to the bones.

Splint: A device used to immobilize body parts.

Sprain: The partial or complete tearing or stretching of ligaments and other soft tissue structures at a joint.

Strain: The excessive stretching and tearing of muscles or tendons; a pulled or torn muscle.

Tendon: A fibrous band that attaches muscle to bone.

INTRODUCTION

Injuries to the musculoskeletal system are common. Millions of people at home, at work or at play injure their muscles, bones or joints. No age group is exempt. A person may fall and bruise his or her hip. A person who braces a hand against a dashboard in a car crash may injure the bones at the shoulder, disabling the arm. A person who falls while skiing may twist a leg, tearing the supportive tissues of a knee and making it impossible to stand or move.

Although musculoskeletal injuries are almost always painful, they are rarely life threatening when cared for properly. However, when not recognized and cared for properly, musculoskeletal injuries can have serious consequences and even result in permanent disability or death. In this chapter, you will learn how to recognize and care for musculoskeletal injuries. Developing a better understanding of the structure and function of the body's framework will help you assess musculoskeletal injuries and give appropriate care.

THE MUSCULOSKELETAL SYSTEM

The musculoskeletal system is made up of muscles and bones that form the skeleton, as well as connective tissues, tendons and ligaments. Together, these structures give the body shape, form and stability. Bones and muscles connect to form various body segments. They work together to provide body movement.

Muscles

Muscles are soft tissues that are able to contract and relax. The body has over 600 muscles **(Figure 11-1)**. Most are ***skeletal muscles***, which attach to the bones. Skeletal muscles account for most of your lean body weight (body weight without excess fat). Skeletal muscles protect the bones, nerves and blood vessels. All body movements result from the brain directing skeletal muscles to contract and relax via a pathway of nerves. Skeletal muscle actions are under our conscious control. Because you move them voluntarily, skeletal muscles are also called voluntary muscles.

Most skeletal muscles are anchored to bone at each end by strong, cordlike, fibrous tissues called ***tendons*** **(Figure 11-2)**. Muscles and their adjoining tendons extend across joints. When the brain sends a command to move, nerve impulses travel through the spinal cord and nerve pathways to the individual muscles and stimulate the muscle

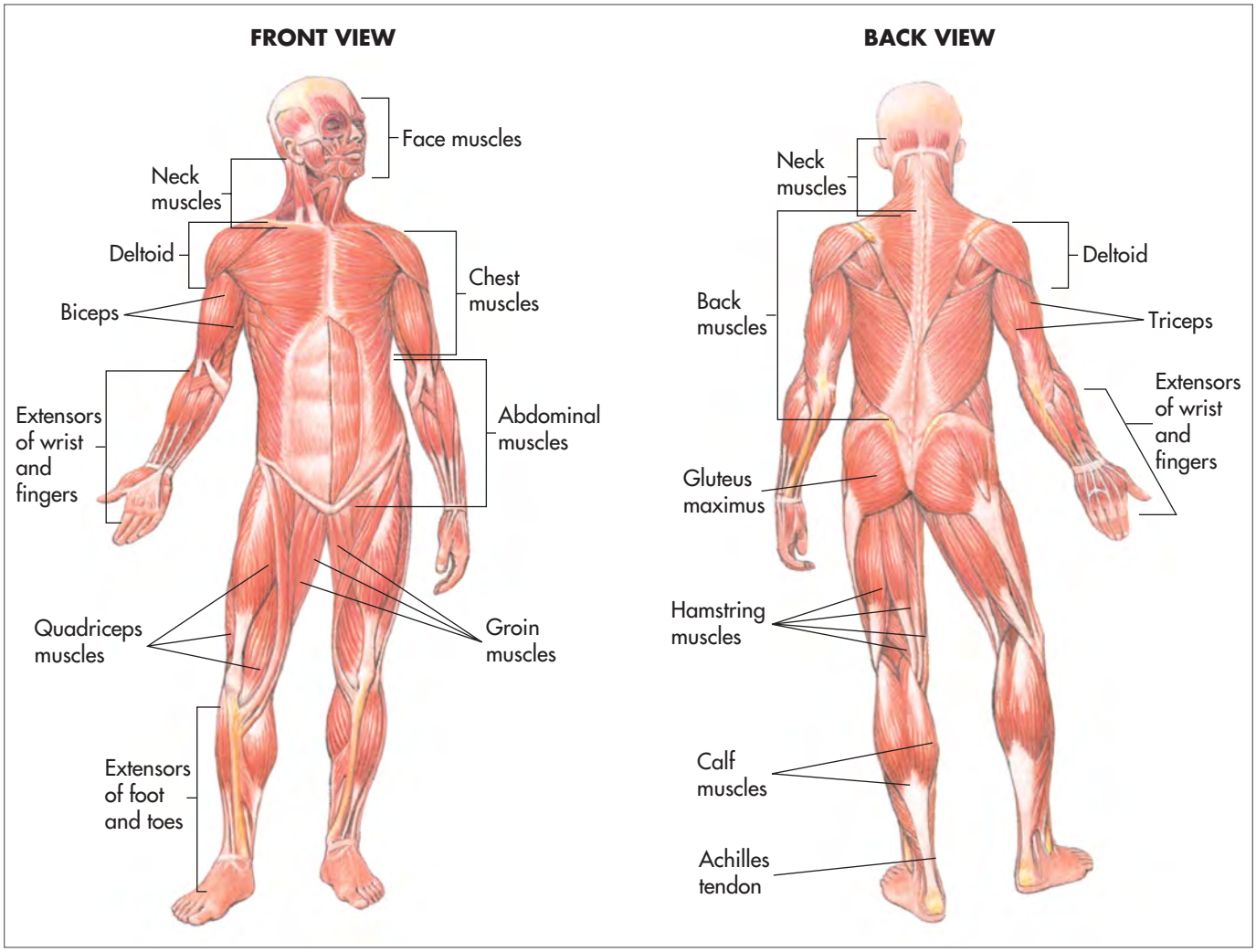


FIGURE 11-1 *The body has over 600 muscles. The shortening and lengthening of the muscles are what make the body move.*

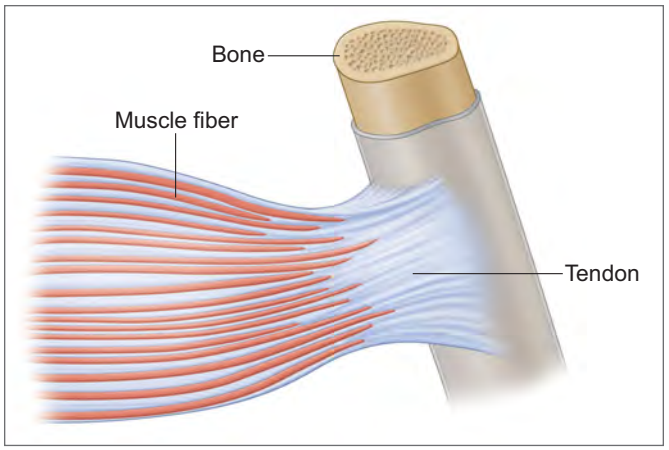


FIGURE 11-2 *Most of the body's muscles are attached to bones by tendons.*

fibers to contract. When the muscle fibers contract, pulling the ends of the muscle closer together, the muscles pull the bones, causing motion at the joint.

Muscles in a group often pull at the same time. For instance, the hamstring muscles are a group of muscles at the back of the thigh. When the hamstrings contract, the leg bends at the knee joint. The biceps are a group of muscles at the front of the upper arm. When the biceps contract, the arm bends at the elbow joint. Generally, when one group of muscles contracts, another group of muscles on the opposite side of the body part relaxes. Even simple tasks, such as bending to pick up an object from the floor, involve a complex series of movements in which different muscle groups contract and relax.

Injuries to the brain, spinal cord or nerves can affect muscle control. A loss of muscle movement is called **paralysis**. Less serious or isolated muscle injuries may affect only strength because adjacent muscles can often do double duty and take over for the injured muscle.

Bones

The skeleton is formed by over 200 bones of various sizes and shapes **(Figure 11-3)**. The skeleton protects vital organs and other soft tissues. The skull protects the brain. The ribs protect the heart and lungs. The bones that form a canal called the spinal column protect the **spinal cord**.

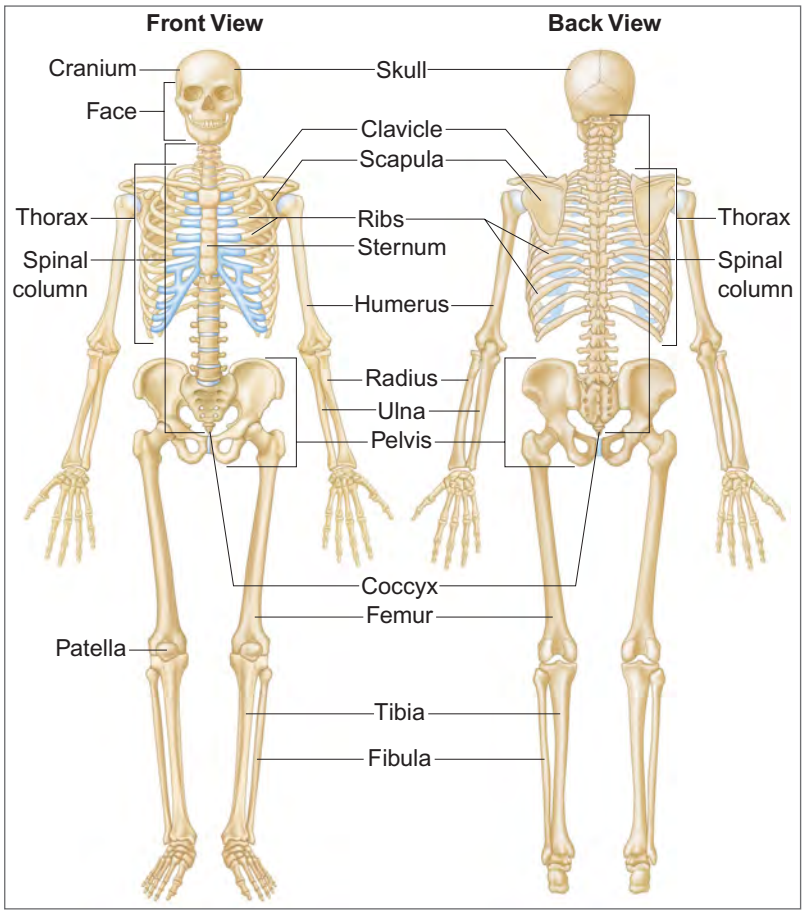


FIGURE 11-3 *The skeleton is formed from 206 bones in various sizes and shapes. The skeleton protects many of the organs inside the body.*

Bones are hard, dense **tissues**. The strong, rigid structure of bones helps them to withstand stresses that cause injuries. The shape of bones depends on what the bones do and the stresses placed on them. For instance, although similar to the bones of the arms, the bones of the legs are much larger and stronger because they carry the body's weight.

Bones are classified as long, short, flat or irregular **(Figure 11-4)**. Long bones are longer than they are wide and include the bones of the upper arm (humerus), the forearm (radius and ulna), the thigh (femur) and the lower leg (tibia and fibula). Short bones are about as wide as they are long and include the small bones of the hand (carpals) and feet (tarsals). Flat bones have a relatively thin, flat shape. Flat bones include the breastbone (sternum), the ribs and the shoulder blade (scapula). Bones that do not fit into the other categories are called irregular bones. Examples include the

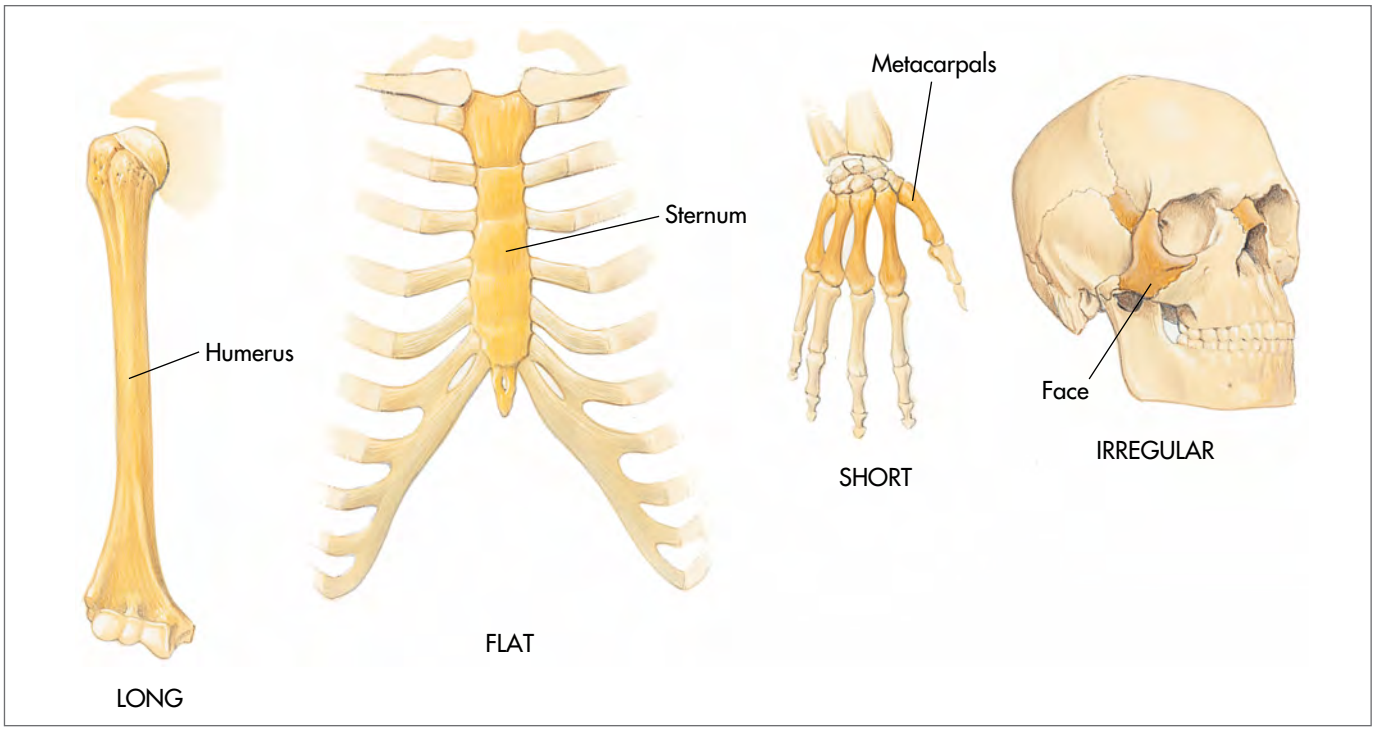


FIGURE 11-4 *Bones vary in shape and size. Bones are weakest at the points where they change shape and usually fracture at these points.*

vertebrae and the bones that make up the skull, including the bones of the face. Bones are weakest at the points where they change shape, so they usually fracture at these points. In children, the bones are weakest at the growth plates, located at the ends of long bones.

Bones have a rich supply of blood and nerves. Some bones store and manufacture red blood cells and supply them to the circulating blood. Bone injuries can bleed and are usually painful. The bleeding can become life threatening if not properly cared for. Bones heal by developing new bone cells within a fibrous network of tissue that forms between the broken bone ends. Bone is the only body tissue that can regenerate in this way.

The bones of young children are softer and more porous than the bones of adults, so they bend and break more easily. At puberty, a child's bones become as hard as an adult's. As people age, their bones lose mass and density and are more likely to give way to even everyday stresses, which can cause significant injuries. For instance, an elderly person with significant bone loss can easily break the strongest bone in the body, the femur (thigh bone), just by pivoting his or her weight on one leg. The gradual, progressive weakening of bone is called **osteoporosis**. See The Breaking Point to learn about this disease.

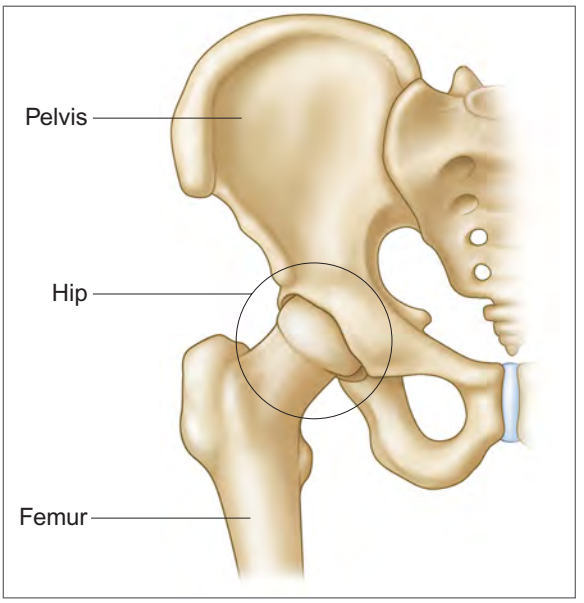


FIGURE 11-5 *The ends of two or more bones coming together at one place form a joint.*

Joints

A ***joint*** is formed by the ends of two or more bones coming together at one place **(Figure 11-5)**. Most joints allow motion. However, the ends of the bones at some joints are fused together, which restricts motion. Fused bones, such as the bones of the skull, form solid structures that protect their contents.

Joints that allow movement are held together by tough, fibrous connective tissues called ***ligaments***. Because ligaments actually

THE BREAKING POINT

Osteoporosis is a disease that causes the bones to fracture easily. Approximately 10 million Americans have osteoporosis, and 80 percent of these are women. Almost 34 million more are estimated to have low bone density, placing them at increased risk for osteoporosis and broken bones. People usually have osteoporosis for decades before they experience signals. People do not usually become aware they have this "silent" disease until after the age of 60 years.

Osteoporosis is caused by a decrease in calcium content of the bones. Normal bones are hard, dense tissues that can endure great stresses. Calcium is a key to bone growth, development and repair. When the calcium content of bones decreases, bones become frail and less dense. They are less able to repair the normal damage they incur. This leaves bones, especially in the hips, back and wrists, more prone to fractures. These fractures may occur with only a little force. Some even occur without force. The person may be taking a walk or washing dishes when the fracture occurs.

Some risk factors for osteoporosis cannot be changed. These include being female; having ancestors from northern Europe, the British Isles, Japan or China; being of an advanced age; having a family history of the disease; having a small, thin body frame and reaching menopause. However, there are steps that a person can take to lower the risk of developing osteoporosis. These involve lifestyle choices that you can make now.

Osteoporosis can begin as early as 30 years of age. Building strong bones before age 35 years is the key to preventing osteoporosis. To help prevent osteoporosis:

- **Eat a Well-Balanced Diet.** A diet rich in calcium, vitamins and minerals and low in salt is essential for bone health. Limiting caffeine intake and avoiding a high protein diet also are important. As a person ages, the amount of calcium absorbed from the diet declines, making it more important to have an adequate calcium intake. Three to four daily servings of low-fat dairy products should provide enough calcium for good bone health.

Vitamin D also is necessary because it helps the body to absorb the calcium to strengthen bones. Exposure to sunshine enables the body to make vitamin D. People who do not receive adequate exposure to the sun need to eat foods that contain vitamin D. The best sources are vitamin-fortified milk and fatty fish, such as tuna, salmon and eel. When exposing yourself to the sun, however, you should not risk a burn or deep tan because both increase the risk of skin cancer.

- **Take Vitamins and Supplements if Necessary.** People who do not take in adequate calcium may be able to make up for the loss by taking calcium supplements. Some are combined with vitamin D. An insufficient intake of phosphorus, magnesium, and vitamins K, B6 and B12 also can increase your risk for osteoporosis. To ensure that you are getting enough calcium and these other vitamins and minerals, talk to your health care provider about taking a daily supplement.
- **Exercise.** Weight-bearing exercise increases bone density and the activity of bone-building cells. Regular exercise may reduce the rate of bone loss by promoting new bone formation. It also may stimulate the skeletal system to repair itself. An effective exercise program, such as aerobics, jogging or walking, involves the weight-bearing bones and muscles of the legs.
- **Stop Smoking.** Smoking is bad for your bone health since it can block your body's ability to absorb calcium. The chemicals in cigarettes are bad for bone cells. Also, in women, smoking can block the bone-protective effects of the hormone estrogen, which can affect bone density.
- **Avoid Too Much Alcohol.** Alcohol intake should be limited to two drinks per day. Drinking more than this on a regular basis can reduce bone formation. Too much alcohol also can reduce calcium levels in the body.

If you have questions about your health and osteoporosis, consult your health care provider.

resist joint movement, joints that are surrounded by ligaments have restricted movement; while joints that have few ligaments move more freely. For instance, the shoulder joint, with few ligaments, allows greater motion than the hip joint, although their structures are similar.

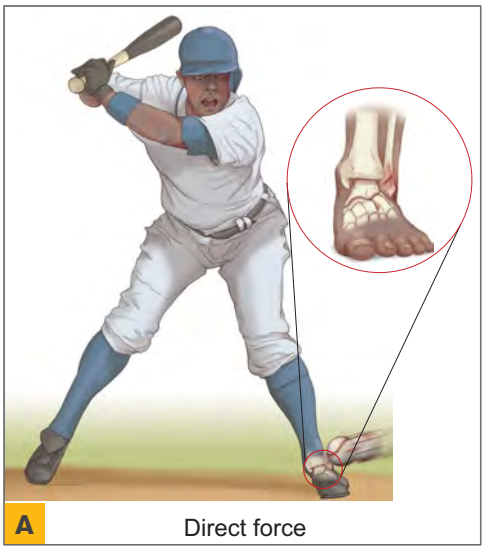
Joints that move more freely, such as the ankle and shoulder, have less natural support, which makes them more prone to injury. However, all joints have a normal range of movement. When a joint is forced beyond its normal range, ligaments stretch and tear, making the joint unstable. Unstable joints can be disabling, particularly when they are weight bearing, such as the knee or ankle. Unstable joints are also prone to re-injury and often develop arthritis in later years.

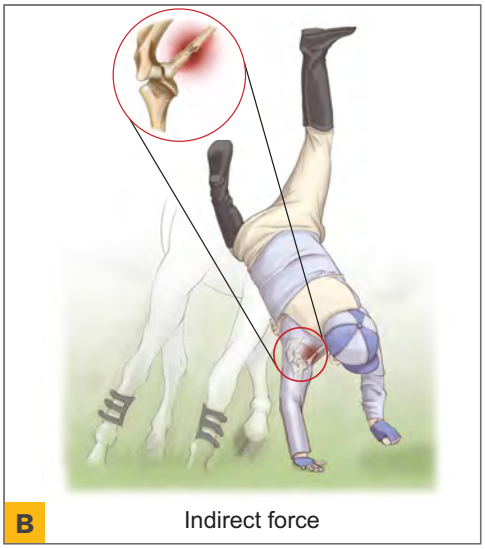
INJURIES TO THE MUSCULOSKELETAL SYSTEM

Muscles, bones and joints are injured when a force is applied to them. Knowing the cause of injury can give you important clues about which parts of the body may be injured, what other hidden injuries might exist along with the more obvious ones and how serious the injuries may be.

There are three basic causes of musculoskeletal injury:

- Direct force causes injury at the point of impact and can either be blunt or penetrating **(Figure 11-6, A)**. For example, a person might be hit by a loose pitch during a baseball game, fracturing the bone in the ankle. Or, penetrating objects, such as bullets and knives, can injure structures beneath the skin at the point where they penetrate.
- Indirect force transmits energy through the body and causes injury to a body part away from the point of impact **(Figure 11-6, B)**. For example, a fall on an outstretched hand may result in an injury to the shoulder or collarbone.
- Twisting force, or rotating force, causes injury when one part of the body remains still while the rest of the body is twisted or turned away from it **(Figure 11-6, C)**. For example, if a ski and its binding keep the lower leg in one position while the body falls in another, the knee may be forced beyond its normal range of motion, causing injury. Twisting injuries are not always this complex. Twisting injuries more often occur from simply stepping off a curb (ankle) or turning to reach for an out-of-the-way object (back).





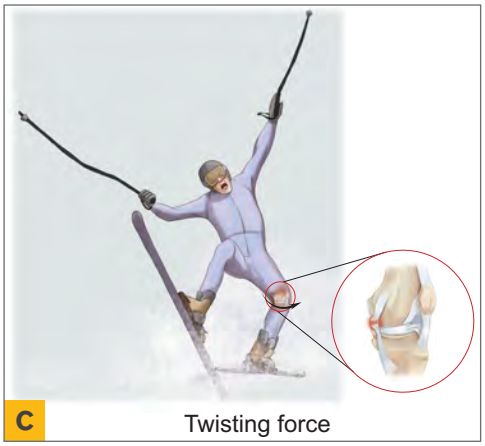


FIGURE 11-6, A–C *The three basic causes of musculoskeletal injury are* **A,** *direct force,* **B,** *indirect force and* **C,** *twisting force.*

Types of Musculoskeletal Injuries

The four basic types of musculoskeletal injuries are fractures, dislocations, sprains and strains.

Fractures

A ***fracture*** is a break or disruption in bone tissue. Fractures include bones that are chipped or cracked, as well as bones that are broken all the way through **(Figure 11-7)**. Direct and indirect forces, such as from a fall or a blow, commonly cause fractures. However, if strong enough, twisting forces can also cause a fracture. Some fractures are obvious, but others may not be easy to detect without further assessment.

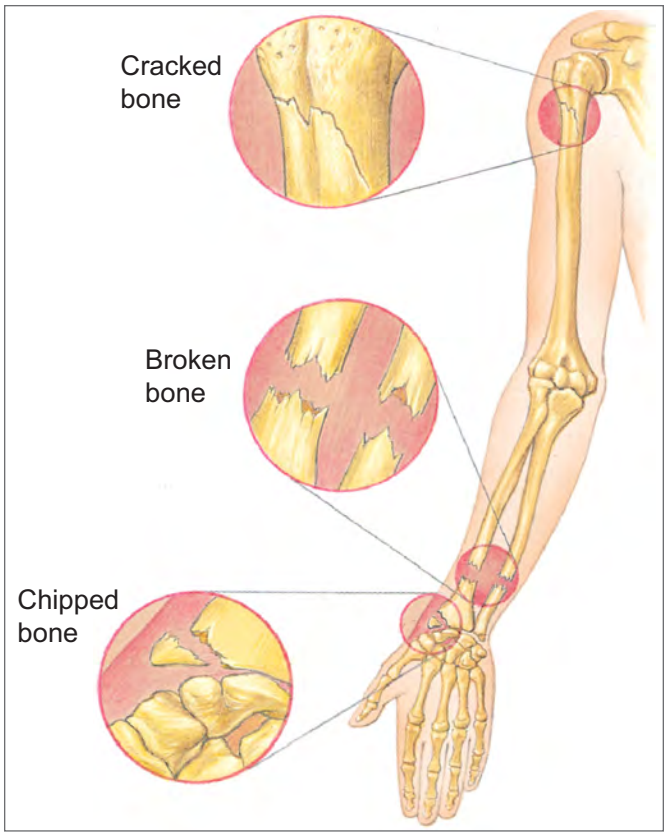


FIGURE 11-7 *A fracture is a crack, complete break or chip in a bone.*

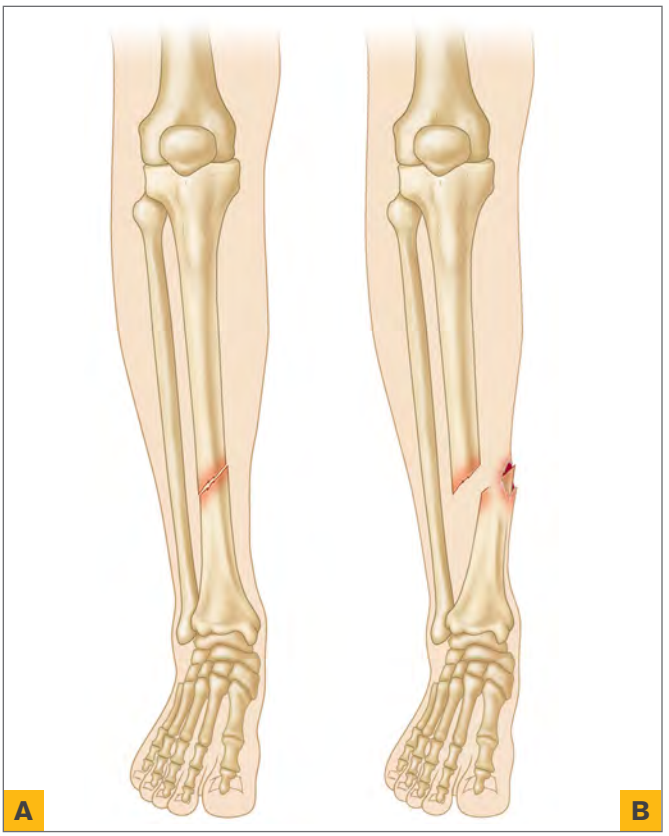


FIGURE 11-8, A–B **A,** *Closed fracture.* **B,** *Open fracture.*

While most isolated fractures are not considered critical or life-threatening, if the femur or pelvis is fractured the person is at serious risk for excessive blood loss, shock, and death. Fractures to the spine can also result in damage to the spinal cord.

Fractures are classified as either open or closed. **Closed fractures** leave the skin unbroken and are more common than open fractures **(Figure 11-8, A)**. **Open fractures** occur when the skin over the fracture site is broken **(Figure 11-8, B)**. An example of an open fracture is when a limb is severely angulated or bent, causing bone ends to tear the skin and surrounding soft tissues. Another example is when an object penetrates the skin and breaks the bone. Bone ends do not have to be visible in an open fracture. Open fractures are more serious than closed fractures because of the risks for severe blood loss and infection. Although fractures are rarely an immediate threat to life, any fracture involving a large bone, such as the femur or pelvis, can cause severe shock because bones and soft tissue may bleed heavily. Fractures can also be life-threatening if they sever an artery or affect breathing.

Fractures are not always obvious unless a telltale sign, such as an open wound with protruding bone ends or a severely deformed body part, is present. The way in which the injury occurred, however, is often enough to suggest a possible fracture. A fall from a significant height or a motor vehicle crash could signal a possible fracture.

Dislocations

Dislocations are usually more obvious than fractures. A ***dislocation*** is a displacement or separation of a bone from its normal position at a joint **(Figure 11-9)**. This movement is usually caused by a violent force tearing the ligaments that hold the bones in place. However, if a joint has been dislocated once, and the ligaments holding the bones in place were damaged, subsequent dislocations are then more likely to occur. In some cases, dislocation can become chronic so that relatively minor movements can cause joint instability. When a bone is moved

FIGURE 11-9 *A dislocation is a separation of bone from its normal position at a joint.*

out of place, the joint no longer functions. The displaced end of the bone often forms a bump, a ridge or a hollow that does not normally exist.

Some joints, such as the shoulder or finger, dislocate easily because they are relatively exposed and not as well protected by ligaments. Other joints, such as joints of the elbow or spine, are well protected because of the shape of the bones and the way they fit together; therefore, they dislocate less easily.

What if...

A person has a dislocated finger? Is it OK to "pop" it back into place? I know people who have done this before without any problems.

As a lay responder, you should never attempt to "pop" (or technically speaking, reduce) a dislocated joint, not even a finger. This can cause additional damage to the normal articulation of the bone as well as associated tendon, ligament, vascular, and neurological damage. Only a licensed medical professional should perform reduction or realignment of a joint dislocation if deemed appropriate.

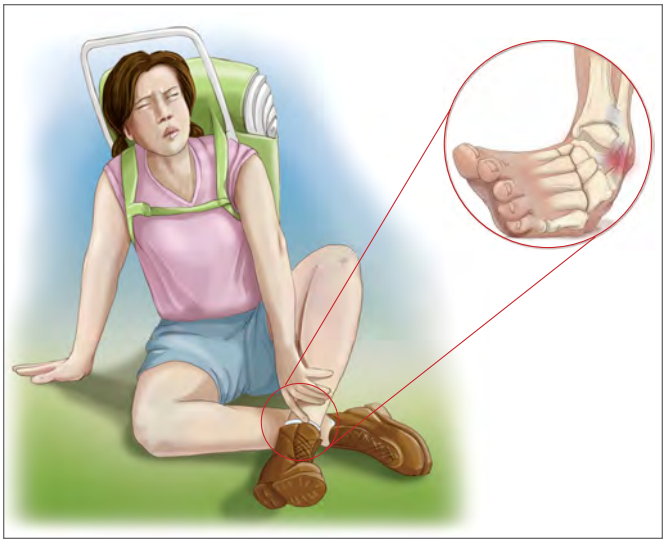


FIGURE 11-10 *A sprain is the tearing of ligaments at a joint.*

A force strong enough to cause an initial dislocation can also cause a fractured bone, bleeding, and nerve damage. It is important to check for those injuries as well. A dislocation can be extremely painful.

Sprains

A ***sprain*** is the partial or complete tearing or stretching of ligaments and other tissues at a joint **(Figure 11-10)**. A sprain usually results when the bones that form a joint are forced beyond their normal or usual range of motion. The more ligaments are stretched or torn, the more severe the injury. The sudden, violent forcing of a joint beyond its range of motion can completely rupture ligaments and even dislocate the bones. Severe sprains may also involve a fracture of the bones that form the joint. Ligaments may pull bone away from their point of attachment. Young children are more likely to have a fracture than a sprain because their ligaments are stronger than their bones.

Mild sprains, which stretch ligament fibers, generally heal quickly. The person may have only a brief period of pain or discomfort and quickly return to activity with little or no soreness. For this reason, people often neglect sprains and the joint is often re-injured.

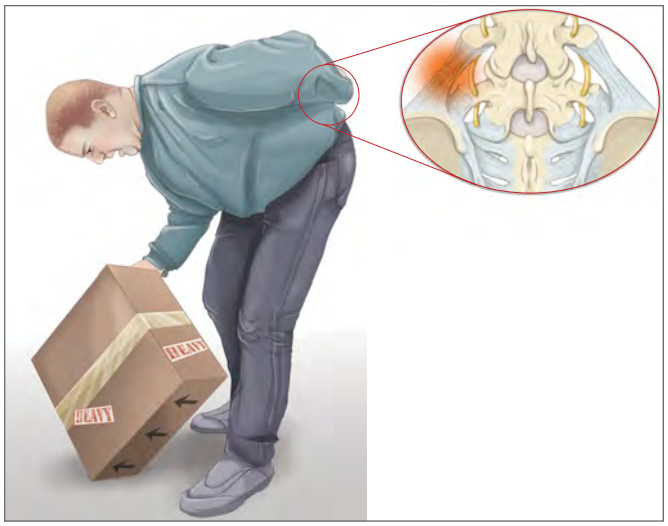


FIGURE 11-11 *A strain is the stretching and tearing of muscles or tendons.*

Severe sprains or sprains that involve a fracture usually cause pain when the joint is moved or used. The weight-bearing joints of the ankle and knee and the joints of the fingers and wrist are those most commonly sprained.

Surprisingly, a sprain can be more disabling than a fracture. When fractures heal, they usually leave the bone as strong as it was before, or stronger, decreasing the likelihood that a second break will occur at the same spot. On the other hand, ligaments cannot regenerate. If a torn ligament(s) is not repaired, it can render the joint less stable and may impede motion. The injured area may also be more susceptible to re-injury.

Strains

A ***strain*** is the excessive stretching and tearing of muscle fibers or tendons **(Figure 11-11)**. A strain is sometimes called a muscle pull or tear. Because tendons are tougher and stronger than muscles, tears usually occur in the muscle itself or where the muscle attaches to the tendon. Strains often result from overexertion, such as lifting something too heavy or working a muscle too long. They can also result from sudden or uncoordinated movement. Strains commonly involve the muscles in the neck or back, the front or back of the thigh or the back of the lower leg. Strains of the neck and lower back can be particularly painful and therefore disabling.

Like sprains, strains are often neglected, which commonly leads to re-injury. Strains sometimes recur chronically, especially to the muscles of the neck, lower back and the back of the thigh. Neck and back problems are two of the leading causes of absenteeism from work, accounting annually for billions of dollars in workers' compensation claims and lost productivity.

Checking for Musculoskeletal Injuries

You will identify and care for injuries to the musculoskeletal system during the check for non-life-threatening conditions. Because musculoskeletal injuries look alike, you may have difficulty determining exactly what type of injury has occurred. Usually only a trained medical professional can tell the difference between a sprain, strain, fracture or dislocation, often with the use of an X-ray, computed tomography (CT) scan or magnetic resonance imaging (MRI). However, you do not need to know what kind of injury a person has in order to give the appropriate care. The primary goal of care is to prevent further injury and get medical attention for the person.

As you check the person, think about how the body normally looks and feels. Ask how the injury happened and if there are any areas that are painful. Visually inspect the entire body, beginning with the head. Compare the two sides of the body. Then, carefully visually check each body part. Do not ask the person to move any areas in which he or she has pain or discomfort or if you suspect injury to the head, neck or spine. Start with the neck, followed by the shoulders, the chest and so on. As you conduct the check, look for clues that may indicate a musculoskeletal injury.

Keep in mind that if there was sufficient force to fracture a bone or dislocate a joint, that force may also cause internal injuries leading to internal bleeding and the possibility of shock. Fractures and dislocations can cause severe pain, and the person may be so focused on the pain that he or she will not mention other problems, such as abdominal pain, which may actually indicate more serious injuries.

Signals of Musculoskeletal Injuries

Always suspect a serious musculoskeletal injury when any of the following signals are present:

- There was a snapping sound. If a bone has fractured, the person may report hearing or feeling the bone snap or break.
- There is pain. One of the most common signals in any muscle, bone or joint injury is pain. The injured area may be very painful to touch or move.
- There is significant bruising and swelling. The area may be swollen and red or bruised.
- There is significant deformity. The area may be twisted or strangely bent compared with the uninjured side **(Figure 11-12)**.
- The injured area has visible abnormal lumps, ridges and hollows (i.e., deformities).
- The person is unable to use the affected part normally. This may be due to pain or a dislocated joint.
- There are bone fragments sticking out of a wound.
- The person feels bones grating. Crepitus, or a grating sound or feeling, occurs when two pieces of bone rub together.
- The injured area is cold, numb and tingly.
- The cause of the injury suggests that it may be severe.

FIGURE 11-12 *Areas of serious bone or joint injury may appear deformed.*

Obvious deformities, such as abnormal lumps, ridges, depressions or unusual angles in body parts, are often a signal of a fracture or dislocation. Dislocations are generally more obvious than other musculoskeletal injuries because the joint appears deformed. Comparing the injured part with an uninjured part may help you detect a deformity.

Pain, swelling and discoloration of the skin commonly occur with any significant musculoskeletal injury. The injured area may be painful to touch and to move. Swelling and discoloration of the skin surrounding the injury may be evident; these are due to bleeding from damaged blood vessels and tissues in the injured area. Swelling may appear rapidly at the site of injury, develop gradually or not appear at all. At first, the skin may only look red. As blood seeps to the skin's surface, the area begins to look bruised.

A person's inability to move or use an injured part may also indicate a significant injury. The person may tell you he or she is unable to move the part or that moving the injured part is simply too painful. Often, the muscles of an affected area contract in an attempt to hold the injured part in place. This muscle contraction helps to reduce pain and prevent further injury. Similarly, a person often supports the injured part in the most comfortable position. To manage musculoskeletal injuries, avoid any movement of an injured body part that causes pain.

A lack of sensation in the affected part can indicate serious injury or injury in another area. Fingers or toes, for example, can lose sensation if the arm or leg is injured. Also, check the person's skin below the injured site for feeling, warmth and color. Skin that is cold to the touch or bluish in color indicates a lack of or reduced circulation below the site of the injury.

Care for Musculoskeletal Injuries

A gentle, reassuring approach is important in caring for a person with muscle, bone and joint injury. The person is likely to be experiencing severe pain and may be frightened. Avoid moving the injured part of the person's body, keep the injured area stable in the position found until more advanced medical personnel take over.

Call 9-1-1 or the local emergency number for a musculoskeletal injury if:

- There is obvious deformity.
- There is moderate or severe swelling and discoloration.
- Bones sound or feel like they are rubbing together.
- A snap or pop was heard or felt at the time of the injury.
- There is a fracture with an open wound at, or bone piercing through, the injury site.
- The injured person cannot move or use the affected part normally.
- The injured area is cold and numb.
- The injury involves the head, neck or spine.
- The injured person has trouble breathing.
- The cause of the injury suggests that the injury may be severe.
- It is not possible to safely or comfortably move the person to a vehicle for transport to a hospital.

The general care for musculoskeletal injuries includes following the mnemonic RICE: rest, immobilize, cold and elevate.

What if...

A person has an angulated fracture of the tibia or radius? On television they always seem to realign these fractures to prevent further injury. Should I do this, too?

You should *never* attempt to realign an angulated fracture. Instead, follow the care steps outlined in this chapter, and call 9-1-1 or the local emergency number immediately so that the person can receive advanced medical care as quickly as possible.

Rest

Avoid any movements or activities that cause pain. Do not move or straighten the injured area; and do not try to straighten angulated fractures. Help the person find the most comfortable position to rest in until help arrives.

If you suspect injuries to the head, neck or spine, use manual stabilization—a technique that involves using your hands to support the person's head and neck in the position found without any movement or alignment of the body—*unless* the airway is compromised. You will learn more about manual stabilization in Chapter 13. Immobilization devices (e.g., cervical collars) should not be used unless you are properly trained to do so. If you are alone and have to leave to get help, place the person in a modified H.A.IN.E.S. (High Arm in Endangered Spine) recovery position (refer to Chapter 5 for steps).

Immobilize

If you suspect a serious musculoskeletal injury, you must ***immobilize*** the injured part (keep it from moving) before giving the additional care described below. The purposes of immobilizing an injury are to:

- Lessen pain.
- Prevent further damage to soft tissues.
- Reduce the risk for serious bleeding.
- Reduce the possibility of loss of circulation to the injured part.
- Prevent closed fractures from becoming open fractures.

An injured area should be stabilized in the position found. Often, this is as simple as using the ground to provide support to an injured leg, ankle or foot; or letting the person cradle an injured elbow or arm in a position of comfort.

Splint the injured part only if the injured person must be moved or transported by non-professional emergency personnel to a medical facility for treatment. When using a splint, follow these four basic principles:

- Splint *only* if you have to move the injured person and can do so without causing more pain and discomfort to the person.
- Splint an injury in the position in which you find it. Do *not* move, straighten or bend angulated bones or joints.
- Splint the injured area and the joints or bones above and below the injury site.
- Check for proper circulation (feeling, warmth and color) before and after splinting.

Chapter 12 discusses splinting in detail.

Do not use a pressure immobilization bandage as there is no evidence to support its effectiveness in the care of an injured extremity.

Cold

Cold helps reduce swelling and eases pain and discomfort. You can make an ice pack by filling a plastic bag with ice and water, wrapping ice with a damp cloth or by using a large bag of frozen vegetables, such as peas. You can also use a commercial cold pack if other options are not available. Always place a layer of gauze or cloth between the source of cold and the skin to prevent damage to the skin.

Leave an ice or cold pack on the injured part for no longer than 20 minutes. If continued icing is needed, remove the ice pack for 20 minutes, then reapply a new ice pack for an additional 20 minutes. If 20 minutes of icing cannot be tolerated, apply ice for periods of 10 minutes.

Do not apply an ice or cold pack to an open fracture. This could put pressure on the open fracture site, which could cause discomfort to the person and possibly make the injury worse. Instead, place the ice packs around the site. Do not apply heat to any musculoskeletal injury as there is no evidence that applying heat helps.

Elevate

Elevating the injured area above the level of the heart helps slow the flow of blood, reducing swelling. Elevation is particularly effective in controlling swelling in extremity injuries. However, you should only elevate the injured part if it *does not* cause more pain. In addition, *do not* attempt to elevate a seriously injured area of a limb unless it has been immobilized.

Considerations for Transporting a Person

Some injuries, such as a broken finger, may not require you to call 9-1-1 or the local emergency number, yet they still need medical attention. When transporting the person to a medical facility, bring someone along or have someone else drive. This way you can keep an eye on the person and give care if needed. Injuries to the pelvis, hip or thigh can be life threatening. A person with such an injury should not be moved unnecessarily. Minimizing

What if...

A friend or family member has a sprained ankle for which emergency medical care is not needed? How long should a cold pack be used on the injury?

Soft tissue injuries such as joint sprains and strains respond well to the application of a cold pack or ice. Specifically, the application of ice assists in decreasing hemorrhaging and swelling by causing a narrowing of the blood vessels (vasoconstriction). The reduction in swelling also assists in reducing the effects of inflammation and may ease a person's pain and discomfort. That said, the length of application of ice is dependent on the severity of the injury and the presence of the signals of inflammation (i.e., heat, redness, swelling, pain and loss of function) rather than a predetermined time frame. Use ice as long as it is needed to help the person see a reduction in pain and swelling.

movement until emergency medical services (EMS) personnel take over can help to prevent the injury from becoming worse.

SUMMARY

Sometimes it is difficult to tell whether an injury is a fracture, dislocation, sprain or strain. Because you cannot be sure which type of injury a person might have, always care for the injury as if it were serious. If EMS personnel are on the way, do not move the person. Control any bleeding. Take steps to minimize shock, monitor the person's airway and breathing and reassure and comfort the person. If you need to transport the person to a medical facility yourself, be sure to immobilize the injury before moving the person.

READY TO RESPOND?

Think back to Kelly in the opening scenario, and use what you have learned to respond to these questions:

1. What types of musculoskeletal injuries could Kelly have as a result of her fall?
2. What would indicate that Kelly's injury is severe?
3. What can you do to make Kelly more comfortable?

STUDY QUESTIONS

1. Match each item with the correct definition.

a. Bone	g. Skeletal muscles
b. Dislocation	h. Splint
c. Fracture	i. Sprain
d. Joint	j. Strain
e. Ligaments	k. Tendon
f. Muscle	

_____ Device used to keep body parts from moving

_____ Displacement of a bone from its normal position at a joint

_____ Tissue that contracts and relaxes to create movement

_____ Broken bone

_____ Dense, hard tissue that forms the skeleton

_____ Injury that stretches and tears ligaments and other soft tissues at joints

_____ Fibrous band attaching muscle to bone

_____ Structure formed where two or more bones meet

_____ Injury that stretches and tears muscles and tendons

_____ Muscles that attach to bones

_____ Fibrous bands holding bones together at joints

2. List the reasons to call 9-1-1 or the local emergency number for a musculoskeletal injury.

3. List four principles of splinting.

In questions 4 through 8, circle the letter of the correct answer.

4. Which should you do when caring for an injured joint?

   a. Have the person immediately move the injured area.
   b. Straighten the injured area before splinting.
   c. Apply cold to the injured area.
   d. Keep the injured area below the level of the heart.

5. Signals of a serious musculoskeletal injury include—

   a. Feeling, warmth and color below the site of the injury.
   b. Deformity or bone fragments protruding from a wound.
   c. The person was hit in the thigh by a softball.
   d. Ability to move the injured area.

6. You find a person lying quietly on the ground. Her right leg is twisted at an unusual angle and you can see protruding bones and blood. The scene is safe. Which do you do first?

   a. Straighten the leg.
   b. Check for life-threatening conditions.
   c. Use direct pressure to stop the bleeding.
   d. Look for material to use to immobilize the injured area.

7. Why should you immobilize a musculoskeletal injury?

   a. To prevent further injury to soft tissues.
   b. To eliminate all discomfort or pain.
   c. To control serious bleeding.
   d. To help the person to heal.

8. Which step would you take before *and* after splinting an injury?

   a. Tell the person to move the injured area.
   b. Check for feeling, warmth and color.
   c. Slide the splint down to extend below the injured area.
   d. Elevate the legs 8 inches.

Answers are listed in Appendix B.

Injuries to the Extremities

12

You decide to rollerblade a few miles to the park to meet your friend Sue and do some additional exercise with her. As you prepare to set off again together, Sue suddenly loses her balance and falls backwards. Luckily, she doesn't hit her head, especially since she was adjusting her helmet at the time; but she did use her arms to break her fall—and now one wrist is bleeding and she cannot move it without serious pain.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Describe the reasons for immobilizing an injury to an extremity.
- Describe the general guidelines for splinting.
- Describe how to care for injuries to the shoulder, upper arm and elbow.
- Describe how to care for injuries to the forearm, wrist and hand.
- List three specific signals of a fractured femur.
- Describe how to care for injuries to the femur, knee and lower leg.
- Describe how to care for injuries to the ankle and foot.

After reading this chapter and completing the class activities, you should be able to:

- Demonstrate how to effectively immobilize an injured extremity using an anatomic, soft or rigid splint.
- Demonstrate how to effectively immobilize an upper extremity injury using a sling and a binder.

KEY TERMS

Binder: A cloth wrapped around a person to securely hold the arm against the person's chest to add stability; also called a *swathe*.

Extremity: A limb of the body; *upper extremity* is the arm; *lower extremity* is the leg.

Forearm: The part of the upper extremity from the elbow to the wrist.

Lower extremity: The parts of the body from the hip to the toes.

Lower leg: The part of the lower extremity from the knee to the ankle.

Thigh: The part of the lower extremity from the pelvis to the knee.

Upper arm: The part of the upper extremity from the shoulder to the elbow.

Upper extremity: The parts of the body from the shoulder to the fingers.

INTRODUCTION

Injuries to an ***extremity***—an arm or leg—are quite common. They can range from a simple contusion to a severe, painful, life-threatening injury, such as a fracture of the femur (thigh bone). The prompt care you give can help prevent further pain, damage and a life-long disability.

The extremities consist of bones, soft tissues, blood vessels and nerves. They are subject to various kinds of injury. Injury can affect the soft tissues, resulting in open or closed wounds. Injury can also affect the musculoskeletal system, resulting in sprains, strains, fractures or dislocations. You learned about providing care for soft tissue and musculoskeletal injuries in Chapters 10 and 11. This chapter will provide more specific information on how to care for these types of injuries when they involve the extremities.

IMMOBILIZING SERIOUS EXTREMITY INJURIES

As you learned in Chapter 11, if you suspect a serious musculoskeletal injury, you must immobilize the injured part before giving additional care, such as applying cold or elevating the injured extremity. Always suspect a serious extremity injury when any of the following are present:

- Pain or tenderness
- Swelling
- Discoloration
- Deformity of the limb
- Inability to move or use the limb
- Severe external and/or internal bleeding
- Loss of sensation or feeling, or tingling
- A limb that is cold to the touch

Immobilizing an injury serves to:

- Lessen pain.
- Prevent further damage to soft tissues.
- Reduce the risk for serious bleeding.
- Reduce the possibility of loss of circulation to the injured part.
- Prevent closed fractures from becoming open fractures.

Generally, immobilizing an injury simply requires stabilizing it in the position found. For example, an injured leg stretched out on the ground is supported by the ground. However, if a person must be moved or transported in order to seek additional medical attention, and it does not cause more pain, you will use a splint to immobilize the extremity before moving the person.

A tool or device used to immobilize an injured extremity is called a splint. There are many commercially manufactured types of splints, but if necessary one can be improvised from items available at the scene.

Types of Splints

Splints are commercially made or can be improvised from materials on hand. As a lay responder, there are three types of splints you are likely to use—soft, rigid and anatomic:

- Soft splints, as the name suggests, include soft materials such as folded blankets, towels, pillows or a folded triangular bandage (cravat) **(Figure 12-1)**. A sling is a specific kind of soft splint that uses a triangular bandage to provide stability and support when the shoulder, elbow or upper arm has been injured. A sling is used in conjunction with a ***binder*** (also referred to as a *swathe*) to immobilize the injury and support the weight of the arm.

FIGURE 12-1 *Folded blankets, towels, pillows or a triangular bandage tied as a sling can be used as soft splints.*

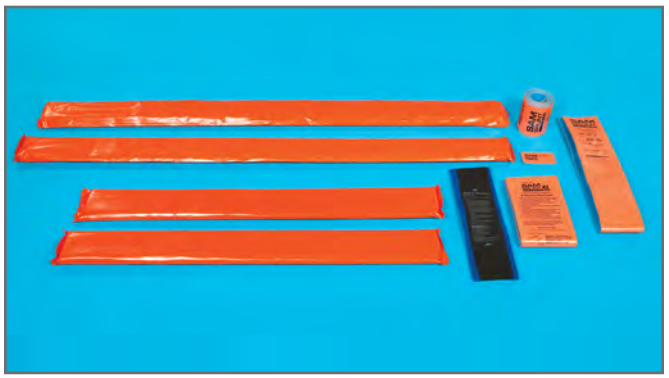


FIGURE 12-2 *Commercially made rigid splints are available (shown), but many items, such as padded boards or folded newspapers, can be used.*

FIGURE 12-3 *An anatomic splint uses a part of the body as the splint.*

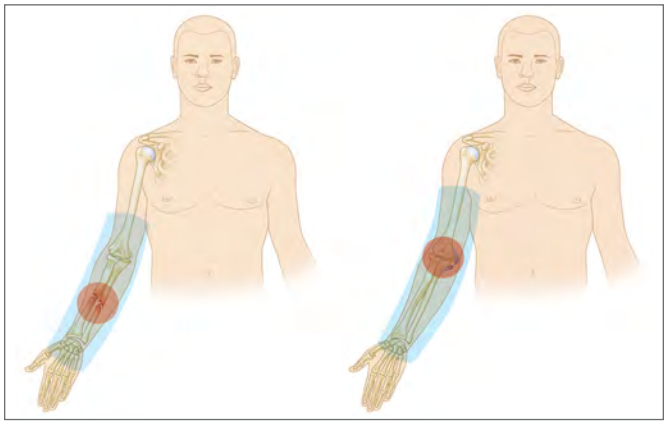


FIGURE 12-4 *For fractures, splint the* joints *above and below the site of the injury.*

- Rigid splints include padded boards, folded magazines or newspapers, and padded metal strips that do not have any sharp edges **(Figure 12-2)**.
- Anatomic splints use the person's own body as a splint **(Figure 12-3)**. For example, an arm can be splinted to the chest. An injured leg can be splinted to the uninjured leg.

Applying a Splint

No matter where the splint will be applied, or what the injury is, there are some general rules for splinting. To splint an injured body part:

- Support the injured part in the position in which you find it. If possible, have the person or a bystander help you.
- Check the body part that is on the other side of the injury for circulation (feeling, warmth and color) before and after splinting to make sure the splint is not too tight.
- Apply the splint to immobilize the bones or joints above and below an injured area **(Figure 12-4)**. For example, if a bone in the lower leg is broken, use the splint to immobilize the knee and ankle.
- Cut off or remove any clothing around the injury site. If the person is wearing a watch or jewelry near the injury, these should be removed as swelling may occur beyond the actual injury site. For example, if an elbow is injured, any bracelets, watches or rings should be removed.
- Cover any bleeding or open wounds, including open fractures, with sterile dressings and carefully bandage with minimal pressure before splinting.
- Do *not* try to push protruding bones back below the skin.
- Do *not* attempt to straighten any angulated fracture; always splint the limb in the position found.
- Do *not* allow the person to bear weight on an injured lower extremity.
- Pad the splints you are using so that they will be more comfortable and conform to the shape of the injured body part.
- Secure the splint in place with cravats, roller bandages or other wide strips of cloth. Avoid securing the splint directly over an open wound or the injury.
- Elevate the splinted part if doing so does not cause the person discomfort.

After the injured extremity has been immobilized, apply cold to the injured area to help minimize pain and swelling. Be sure to place a thin barrier between the source of cold and the skin. Help the person rest in the most comfortable position, and comfort and reassure him or her. Do *not* apply ice or a cold pack directly over an open fracture, because doing so would require you to put pressure on the open fracture site and could cause discomfort to the person. Instead, place cold packs around the site. Do *not* apply heat, as there is no evidence that applying heat helps.

Take steps to minimize shock, including preventing the person from becoming chilled or overheated. As you determine what additional care might be needed, continue to monitor the person's level of consciousness, breathing, skin color and temperature. Be alert for any signals, such as changes in breathing rate, skin color or level of consciousness, that may indicate the person's condition is worsening.

UPPER EXTREMITY INJURIES

The term ***upper extremity***, or arm, describes the parts of the body from the shoulders to the fingers. The bones of the upper extremities include the collarbone **(clavicle)**, shoulder blade **(scapula)**, bone from the shoulder to the elbow **(humerus)**, forearm **(radius** and **ulna)**, wrist **(carpals)**, hand **(metacarpals)** and fingers **(phalanges)**. The upper extremities also include several major blood vessels and nerves. **Figure 12-5** shows the major structures of the upper extremities.

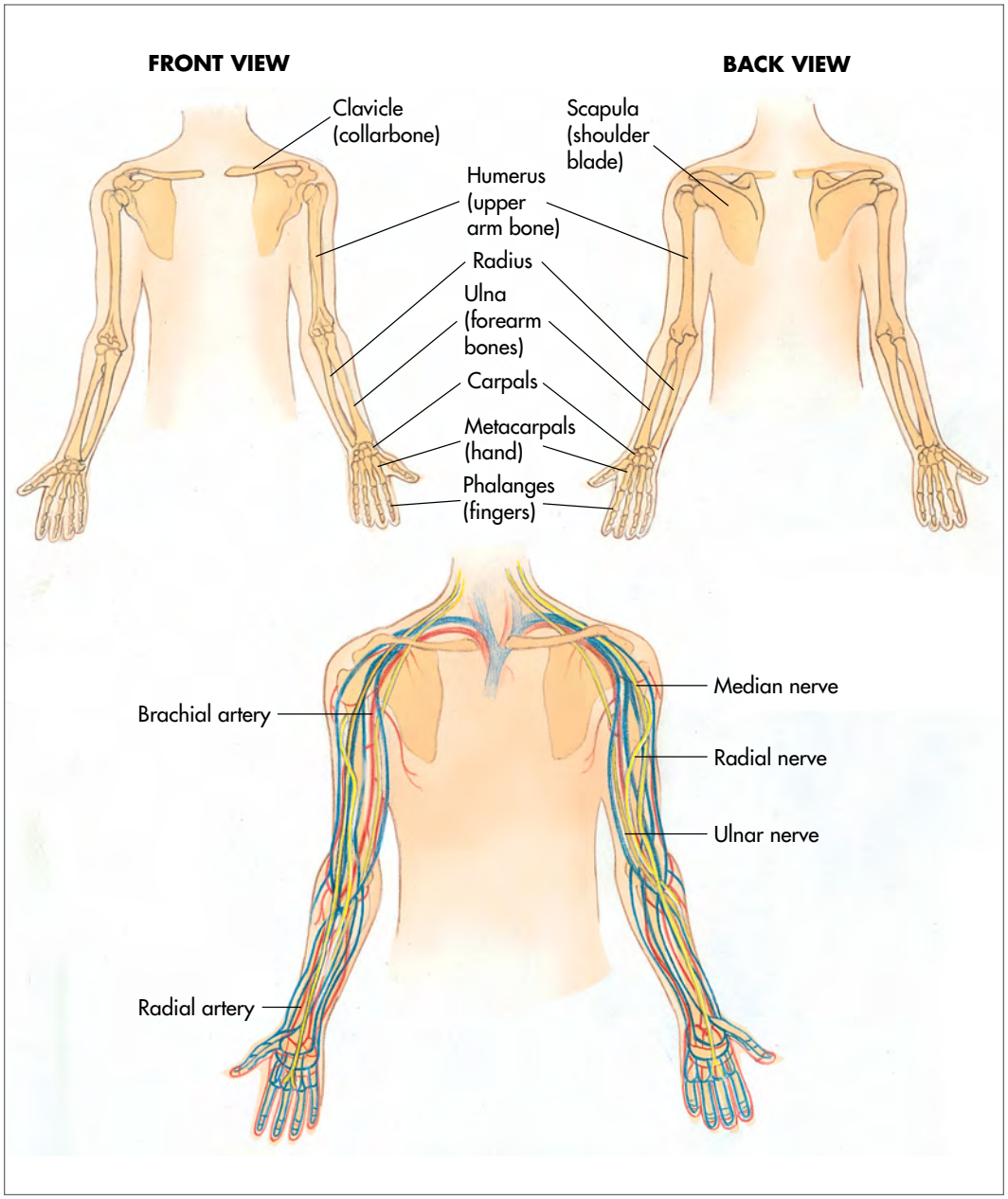


FIGURE 12-5 *Major structures of the upper extremities.*

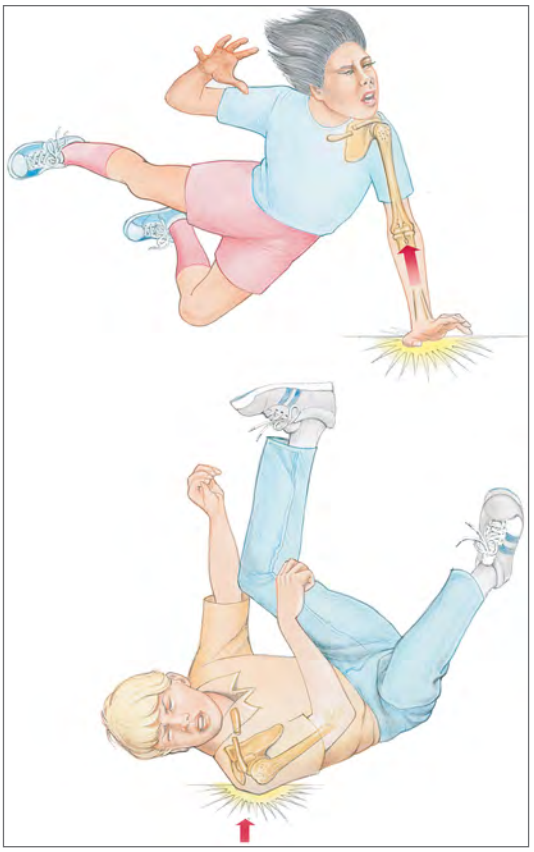


FIGURE 12-6 *A clavicle fracture is usually caused by a fall.*

The upper extremities are one of the most commonly injured areas of the body. The most frequent cause of injury is falling on the hand of an outstretched arm. Because a falling person instinctively tries to break his or her fall by extending the arms and hands, these areas receive the force of the body's weight, which can cause a serious injury.

Shoulder Injuries

The shoulder consists of three bones that meet to form the shoulder joint. These bones are the clavicle, scapula and humerus. The most common shoulder injuries are sprains. However, injuries to the shoulder may also involve a fracture or dislocation of one or more of these bones.

The most frequently injured bone of the shoulder is the clavicle. Clavicle injuries are more common in children than adults. Typically, the clavicle is fractured or separates from its normal position at either end of the bone as a result of a fall **(Figure 12-6)**. An injury commonly occurs when the impact from a fall forces the outer end of the clavicle to separate from the joint where it touches the scapula. The person usually feels pain in the shoulder area, which may radiate down the upper extremity. A person with a clavicle injury usually attempts to ease the pain by holding the arm against the chest. Because the clavicle lies directly over major blood vessels and nerves to the upper extremity, it is especially important to immobilize a fractured clavicle promptly to prevent injury to these structures.

Scapula fractures are not common. A fracture of the scapula typically results from a violent force, such as a fall from a height or being hit by a car. Because it takes great force to fracture the scapula, you should look for additional injuries to the head, neck, spine or chest. The most significant signals of a fractured scapula are extreme pain and the inability to move the shoulder. If the chest cavity is injured, the person may have trouble breathing.

A dislocation of the shoulder joint is another common type of shoulder injury. Like fractures, dislocations often result from falls. They also often result from a direct blow when the arm is in the throwing position. Such dislocations happen frequently in sports, such as football and rugby, when a player attempts to break a fall with an outstretched arm or gets tackled with the arm positioned away from the body. This movement can result in ligaments tearing, which displaces bones. Shoulder dislocations are painful and can often be identified by deformity. As with other shoulder injuries, the person often tries to minimize the pain by holding the upper extremity in the most comfortable position.

Care for Shoulder Injuries

To care for shoulder injuries:

- Do not move or straighten the injured area. Stabilize the injury in the position found. If an injured person is holding the forearm securely against the chest, do not change the position. Holding the arm against the chest is an effective method of immobilization. Allow the person to continue to support the upper extremity in the position in which he or she is holding it, usually the most comfortable position.
- Control any external bleeding with direct pressure, unless the bleeding is located directly over a suspected fracture. With a fracture, apply pressure around the area. Always wear disposable gloves or use another protective barrier.

- If the person is holding the upper extremity away from the body, use a pillow, rolled blanket or similar object to fill the gap between the upper extremity and chest to provide support for the injured area.
- If you must transport or move the person, and it does not cause more pain, splint the upper extremity in place using the guidelines described earlier in the chapter. Place the upper extremity in a sling and bind it to the chest with cravats (sling and binder) to further stabilize the injury **(Figure 12-7)**.
- Apply ice or a cold pack.
- Take steps to minimize shock.

FIGURE 12-7 *Splint for a shoulder injury.*

Upper Arm Injuries

The ***upper arm*** is the area that extends from the shoulder to the elbow. The bone of the upper arm is the humerus. The humerus is the largest bone in the arm.

The humerus can be fractured at any point, although it is usually fractured at the upper end near the shoulder or in the middle of the bone. The upper end of the humerus often fractures in the elderly and in young children as a result of a fall. Breaks in the middle of the bone mostly occur in young adults. When the humerus is fractured, the blood vessels and nerves supplying the entire upper extremity may be damaged. Most humerus fractures are very painful and the person will most likely not be able to use the injured arm. Do not permit the person to use the arm. A humerus fracture can also cause considerable deformity.

Care for Upper Arm Injuries

In general, care for upper arm injuries in the same way as for shoulder injuries.

- Do not move or straighten the injured area. Stabilize the injury in the position found.
- Control any external bleeding with direct pressure, unless the bleeding is located directly over a suspected fracture. With a fracture, apply pressure around the area. Always wear disposable gloves or use another protective barrier.
- If you must transport or move the person, and it does not cause more pain, splint an upper arm injury using a padded rigid splint on the outside of the arm.
  - If the elbow can be comfortably bent, place the upper extremity in a sling and binder to further stabilize the injury.
  - If the elbow cannot be comfortably bent, or if the rigid splint you are using is longer than the upper arm, keep the arm straight at the person's side and wrap bandages or binders around the arm and chest **(Figure 12-8)**.
- Apply ice or a cold pack.
- Take steps to minimize shock.

What if...

I need to transport someone with a shoulder injury and I do not have a splint or triangular bandages in my kit to immobilize the injury?

In a majority of cases, a responsive person with an injury to the shoulder (i.e., scapula or clavicle) will attempt to ease the pain by holding the arm against the chest. However, if you need to transport the person and splinting material is not readily available, an improvised sling and binder, or at least a sling, can be produced easier than you think. Two simple methods are using a belt as a sling and/or placing the involved extremity inside a jacket or button-down shirt as a binder. Even better, when designing a first aid kit for home or recreational use, consider adding at least four 40 × 40 × 56-inch triangular bandages. While many preassembled kits come with one such bandage, a minimum of four would be necessary to immobilize a forearm injury or lower leg injury, while two or three are needed for a sling and binder, depending on person's torso size.

FIGURE 12-8 *Splint for an upper arm injury.*

FIGURE 12-9 *Splint for an elbow injury.*

Elbow Injuries

The elbow is a joint formed by the humerus and the two bones of the forearm, the radius and the ulna. Injuries to the elbow can cause permanent disability, because all the nerves and blood vessels to the forearm and hand go through the elbow. Therefore, treat elbow injuries seriously.

Like other joints, the elbow can be sprained, fractured or dislocated. Injuries to a joint such as the elbow can be made worse by movement because movement can easily damage the nerves and blood vessels located in the elbow. An injured elbow may be in a bent or straight position.

Care for Elbow Injuries

To give care for elbow injuries:

- Do not move or straighten the injured area. Stabilize the injury in the position found.
- Control any external bleeding with direct pressure, unless the bleeding is located directly over a suspected fracture. With a fracture, apply pressure around the area. Always wear disposable gloves or use another protective barrier.
- If you must transport or move the person, and it does not cause more pain, splint the arm from the shoulder to the wrist in the best way possible in the position you find it.
  - If the elbow is bent, even if it is deformed, splint with a sling and binder **(Figure 12-9)**.
  - If the elbow is straight, immobilize the elbow with rigid splints along the length of both sides of the arm, from fingertips to the underarm.
- Apply ice or a cold pack.
- Take steps to minimize shock.

Forearm, Wrist and Hand Injuries

The ***forearm*** is the area between the elbow and the wrist. The wrist is a joint formed by the hand and forearm. Injuries to the wrist may involve one or both of the two forearm bones, the radius and ulna. The hand consists of many small bones—the carpals, metacarpals and phalanges. Serious injuries to the wrists and hands can significantly impact a person's daily activities.

If a person falls on an outstretched upper extremity, both forearm bones may break. When both forearm bones fracture, the arm may look S-shaped **(Figure 12-10)**. Because the radial artery and nerve are close to these bones, a fracture may cause severe bleeding or loss of movement in the wrist and hand. The wrist is a common site of sprains and fractures. It is often difficult to tell the extent of the injury.

Because the hands are used in so many daily activities, they are susceptible to injury. Most injuries to the hands and fingers involve minor soft tissue damage. However, a serious injury may damage nerves, blood vessels and bones. Home, recreational and industrial mishaps often produce lacerations, avulsions, burns and fractures of the hands.

Care for Forearm, Wrist and Hand Injuries

To give care for forearm, wrist or hand injuries:

- Do not move or straighten the injured area. Stabilize the injury in the position found.
- Control any external bleeding with direct pressure, unless the bleeding is located directly over a suspected fracture. With a fracture, apply pressure around the area. Always wear disposable gloves or use another protective barrier.
- If you must transport or move the person, and it does not cause more pain:
  - Support an injured forearm or wrist by placing a rigid splint underneath the forearm, from the elbow to the fingertips. A sling and binder can then be applied to support the arm against the chest.
  - If a single finger is injured, you may be able to create an anatomic splint by taping the injured finger to the one beside it. You can also improvise a rigid splint by taping the injured area to a small object, such as an ice cream stick or tongue depressor **(Figure 12-11)**.
  - For several broken fingers or when the back of the hand is involved in the injury, place a rolled up bandage or a small ball in the palm of the person's hand with the fingers curled naturally around it, then wrap the entire hand and splint the lower arm and wrist with a rigid splint. A sling can be added to help support the arm.
- Apply ice or a cold pack.
- Take steps to minimize shock.

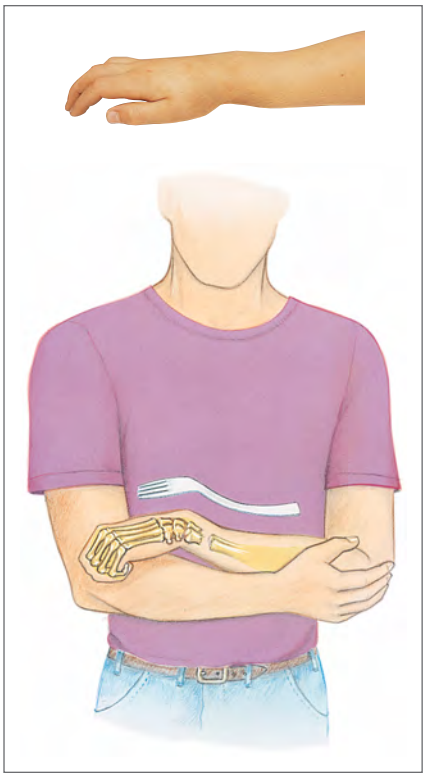


FIGURE 12-10 *Fractures of both forearm bones often have a characteristic S-shaped deformity.*

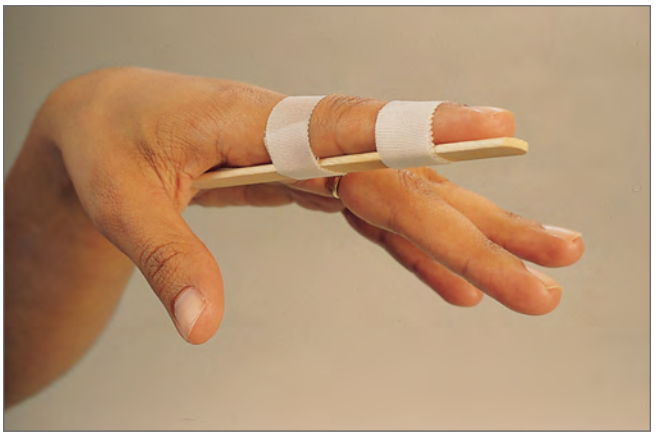


FIGURE 12-11 *An ice cream stick or tongue depressor can be used to splint a finger injury.*

LOWER EXTREMITY INJURIES

Injuries to the leg, or ***lower extremity***—the part of the body from the hip (pelvis) to the toes—can involve both soft tissue and musculoskeletal damage. The lower extremity includes the pelvic bones, thigh bone **(femur)**, kneecap **(patella)**, two bones in the lower leg **(tibia** and **fibula)**, bones of the ankle **(tarsals)**, foot **(metatarsals)** and toes **(phalanges)**. **Figure 12-12** shows the major structures of the lower extremities.

Thigh Injuries

Located in the ***thigh***, which is the part of the lower extremity between the pelvis and the knee, the femur is the largest bone in the body. The **femoral arteries** are the major supplier of blood to the lower extremities. Because of the size and strength of the femur, a significant amount of force is required to cause an injury (fracture). When the femur is fractured, the blood vessels and nerves may be damaged. If a femoral artery is damaged, the blood loss can be life threatening.

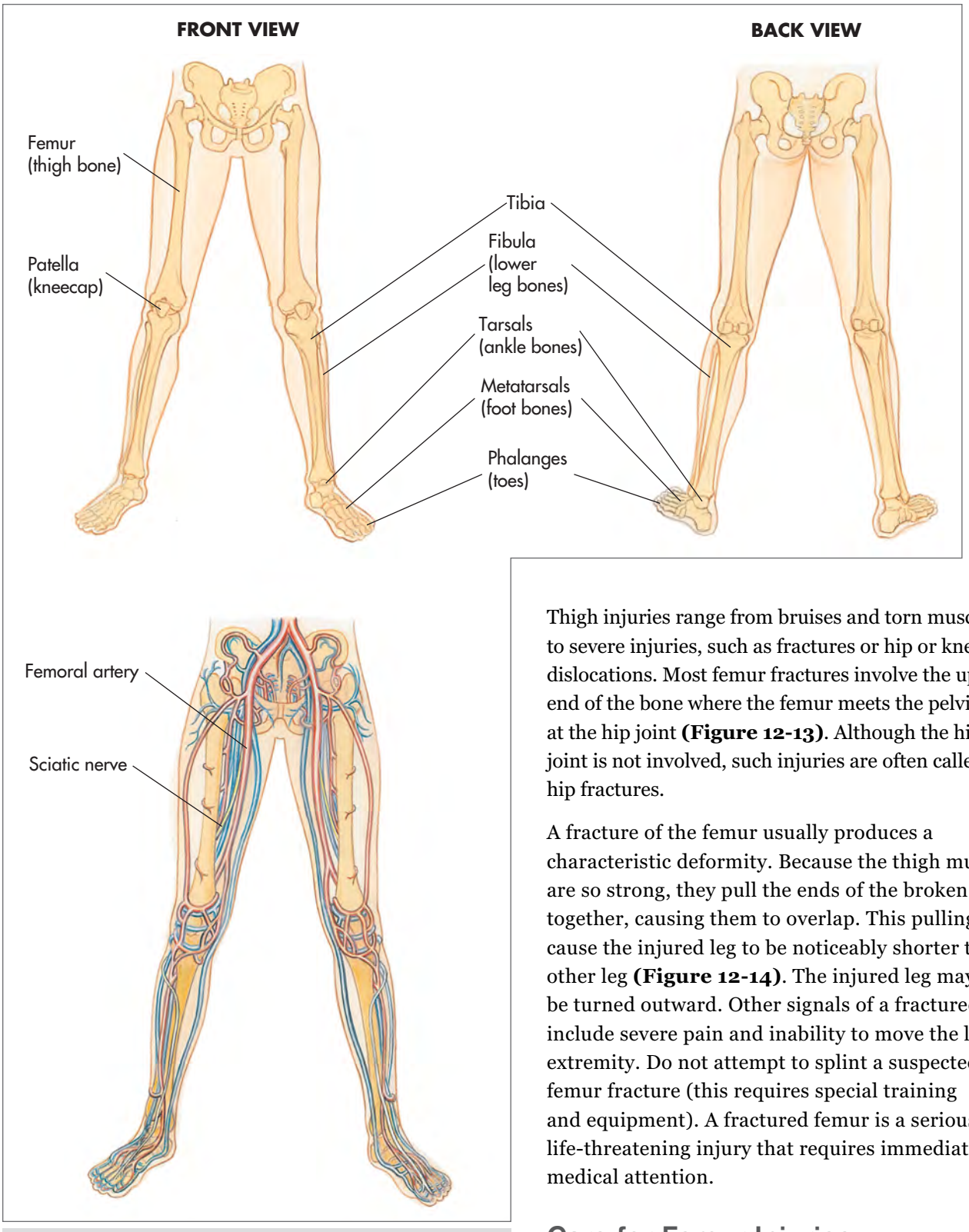


FIGURE 12-12 *Major structures of the lower extremities.*

Thigh injuries range from bruises and torn muscles to severe injuries, such as fractures or hip or knee dislocations. Most femur fractures involve the upper end of the bone where the femur meets the pelvis at the hip joint **(Figure 12-13)**. Although the hip joint is not involved, such injuries are often called hip fractures.

A fracture of the femur usually produces a characteristic deformity. Because the thigh muscles are so strong, they pull the ends of the broken bone together, causing them to overlap. This pulling may cause the injured leg to be noticeably shorter than the other leg **(Figure 12-14)**. The injured leg may also be turned outward. Other signals of a fractured femur include severe pain and inability to move the lower extremity. Do not attempt to splint a suspected femur fracture (this requires special training and equipment). A fractured femur is a serious life-threatening injury that requires immediate medical attention.

Care for Femur Injuries

Initial care for a serious injury to the thigh includes:

- Do not move or straighten the injured area.
- Control any external bleeding with direct pressure, unless the bleeding is located directly over a suspected fracture. With a fracture, apply pressure around the area. Always wear disposable gloves or use another protective barrier.
- Call 9-1-1 or the local emergency number immediately.

Emergency medical services (EMS) personnel are much better prepared to care for and transport a person with a serious thigh injury. While waiting for EMS personnel to arrive:

- Stabilize the injury in the position found. If the person's leg is supported by the ground, do not move it. Rather, use rolled towels or blankets to support the leg in the position in which you found it.
- Help the person rest in the most comfortable position.
- Apply ice or a cold pack.
- Take steps to minimize shock, remembering that a fractured femur can result in serious internal bleeding and the likelihood of shock is considerable:
  - Keep the person lying down and try to keep him or her calm.
  - Keep the person from becoming chilled or overheated and make sure to call 9-1-1 or the local emergency number.
  - Monitor the person's breathing and his or her general condition.
  - Watch for changes in the person's level of consciousness.

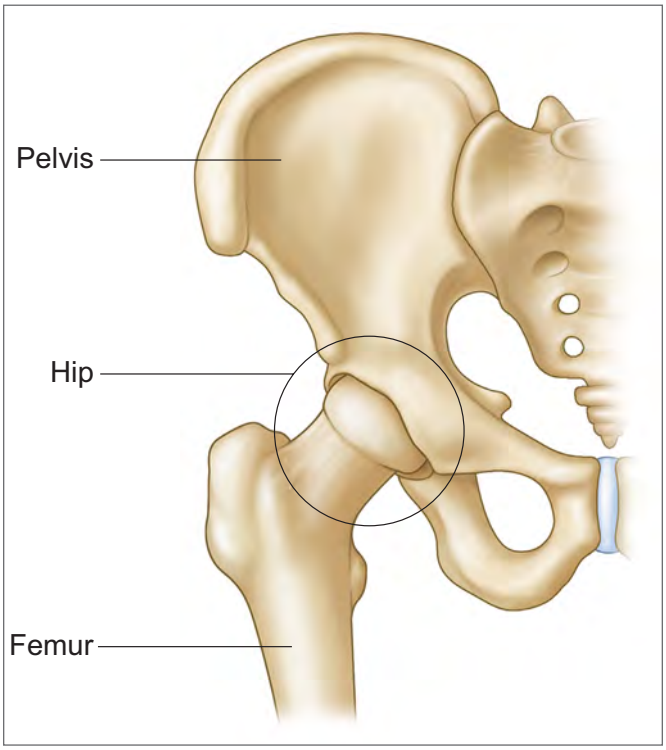


FIGURE 12-13 *Most femur fractures involve the upper end of the bone where the femur meets the pelvis at the hip joint.*

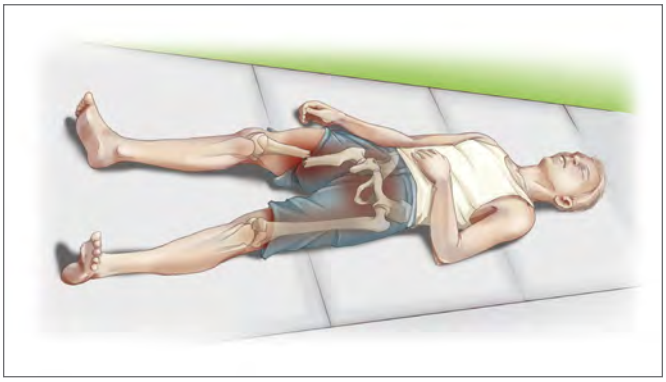


FIGURE 12-14 *A fractured femur often produces a characteristic deformity. The injured leg is shorter than the uninjured leg and may be turned outward.*

Knee Injuries

The knee joint is highly vulnerable to injury. The knee comprises the upper ends of the tibia and fibula, the lower end of the femur and the patella. The patella is a free-floating bone that moves on the lower front surface of the thigh bone.

Sprains, fractures and dislocations of the knee are common in athletic activities that involve quick movements or exert unusual force on the knee. Deep lacerations in the area of the knee can cause severe joint infections. The patella is very vulnerable to bruises and lacerations, as well as dislocations. Violent forces to the front of the knee, such as those caused by hitting the dashboard of a motor vehicle or falling and landing on bent knees, can fracture the kneecap or cause a dislocation of the knee or hip.

Care for Knee Injuries

To care for an injured knee:

- Do not move or straighten the injured area. Stabilize the injury in the position found. If the knee is bent, you can support it on a pillow or folded blanket in the bent position. If the knee is on the ground, the ground will provide adequate support.
- Control any external bleeding with direct pressure, unless the bleeding is located directly over a suspected fracture. With a fracture, apply pressure around the area. Always wear disposable gloves or use another protective barrier.

- Call 9-1-1 or the local emergency number.
- If you must transport or move the person, and it does not cause more pain:
  - Use padded rigid splints running around either side of the knee to immobilize the knee. If the knee is straight, use two padded rigid splints on either side of the affected leg. The inside splint should start at the groin and extend past the bottom of the foot. The outside splint should start at the hip and also extend past the foot. Cravats will help keep the splint in place.
  - If the knee is straight, you might also splint by securing the injured knee to the uninjured leg, as you would do for a lower leg injury.
- Apply ice or a cold pack.
- Take steps to minimize shock.

Lower Leg Injuries

The ***lower leg*** is the area between the knee and the ankle. The tibia and fibula are the two bones in the lower leg. A fracture in the lower leg may involve the tibia, the fibula or both bones. Sometimes both are fractured simultaneously. However, a blow to the outside of the lower leg can cause an isolated fracture of the smaller bone (fibula). Since the fibula is not a major weight-bearing bone, these fractures can be harder to detect.

Because these two bones lie just beneath the skin, open fractures are common. Lower leg fractures may cause a severe deformity in which the lower leg is angulated, as well as pain and inability to move the leg.

Care for Lower Leg Injuries

To care for a lower leg injury:

- Do not move or straighten the injured area. Stabilize the injury in the position found. Do not forget that the ground acts as an adequate splint. If the person's lower extremity is supported by the ground, do not move it. Rather, use rolled towels or blankets to support the leg in the position in which you found it.
- Control any external bleeding with direct pressure, unless the bleeding is located directly over a suspected fracture. With a fracture, apply pressure around the area. Always wear disposable gloves or use another protective barrier.
- Call 9-1-1 or the local emergency number immediately.
- If you must transport or move the person, and it does not cause more pain, you can create an anatomic splint by securing the injured lower extremity to the uninjured lower extremity with several wide cravats placed above and below the site of the injury:
  - If one is available, place a pillow or rolled blanket between the lower extremities and bind them together above and below the site of the injury.
- Apply ice or a cold pack.
- Take steps to minimize shock.

Ankle and Foot Injuries

The foot consists of many small bones—the tarsals, metatarsals and phalanges. The ankle is a joint formed by the foot and the lower leg. Ankle and foot injuries are commonly caused by twisting forces. Injuries range from minor sprains with little swelling or pain to fractures and dislocations.

Many common ankle and foot injuries are caused by severe twisting forces that occur when the foot turns in or out at the ankle as a person steps down from a height, such as a curb or step. Fractures of the feet and ankles can occur from forcefully landing on the heel. The force of the impact may also be transmitted up the lower extremities. This transmitted force can result in an injury elsewhere in the body. Always suspect that a person who has fallen or jumped from a height may also have additional injuries to the thigh, pelvis, head, neck or spine. Foot injuries may also involve the toes. Although toe injuries are painful, they are rarely serious.

FIGURE 12-15 *Splint for an ankle or foot injury.*

What if...

A person has a musculoskeletal injury to the ankle? Should I remove his or her shoe?

The decision for or against removing a shoe is not based on specific scientific evidence. There are just as many reasons to remove the shoe as there are for leaving it in place. If the footwear is supporting the injury, leave it in place and allow it to act as splint. If a person has a suspected broken bone, consider calling EMS and allowing them to decide (in conjunction with the responsive person's requests) whether to remove the footwear or not.

Care for Ankle and Foot Injuries

To care for an ankle or foot injury:

- Do not move or straighten the injured area. Stabilize the injury in the position found.
- Control any external bleeding with direct pressure, unless the bleeding is located directly over a suspected fracture. With a fracture, apply pressure around the area. Always wear disposable gloves or use another protective barrier.
- If you must transport or move the person, and it does not cause more pain, immobilize the entire foot and ankle by using a soft splint, such as a pillow or rolled blanket **(Figure 12-15)**. Wrap the injured area with the soft splint, and secure it with two or three cravats.
- Apply ice or a cold pack.
- Take steps to minimize shock.

SUMMARY

You can care for musculoskeletal and soft tissue injuries to the extremities by giving care that focuses on minimizing pain, further damage to the injured area and shock. Remember: it is not always possible to distinguish between minor and severe injuries. Injuries to the pelvis and femur are potentially critical because of the major blood vessels running through these parts of the body. In addition, a force strong enough to cause injury to an extremity may also have been strong enough to cause other injuries.

With any injury to an extremity, first, care for any life-threatening conditions and call 9-1-1 or the local emergency number if necessary. Be sure to control any severe external bleeding. Then, immobilize the injured area, apply ice or a cold pack and take steps to minimize shock. Only use a splint if you must move or transport the person, and can do so without causing more pain. If you do apply a splint, be sure to follow the guidelines contained in this chapter, including splinting injuries in the position found, splinting the bones or joints above and below an injury, using padding for comfort and support, and checking for adequate circulation before and after splinting.

READY TO RESPOND?

Think back to Sue in the opening scenario, and use what you have learned to respond to these questions:

1. Could Sue have sustained a serious injury? Why or why not?
2. What steps should you take to help Sue?

STUDY QUESTIONS

1. Match each term with the correct definition.

    a. Upper arm
    b. Forearm
    c. Femur
    d. Lower leg

_____ The part of the lower extremity from the pelvis to the knee

_____ The part of the upper extremity from the elbow to the wrist

_____ The part of the lower extremity from the knee to the ankle

_____ The part of the upper extremity from the shoulder to the elbow

2. Identify the most frequent cause of upper extremity injuries.

Base your answers for questions 3 through 5 on the scenario below.

A person attempting to leap a 4-foot gate catches one foot on the gate and falls hard on the other side. He appears to be unable to get up. He says his left leg and arm both hurt. When you check him, you find that he is unable to move the leg, which is beginning to swell. The left arm looks deformed at the shoulder, and he has no sensation in the fingers of that arm. The arm is beginning to look bruised and is painful. He says he feels a little nauseated and dizzy, and he has a scrape on his hand.

3. What type of injury does the person likely have?

4. Identify the signals that support your answer.

5. Describe the steps you would take to help the person.

6. List two specific signals of a fractured femur.

7. List three types of splints used to immobilize an extremity.

In questions 8 and 9, circle the letter of the correct answer.

8. A man who has fallen down a steep flight of stairs is clutching his right arm to his chest. He says his shoulder hurts, and he cannot move his arm. How should you care for him?

    a. Give him some ice and tell him to go home.
    b. Immobilize the arm in the position you found it.
    c. Tell him to move the arm back to its normal position.
    d. Check the stairs to see what caused him to trip.

9. A child has fallen from a bicycle onto the pavement and landed on her elbow. The elbow is bent and the girl says she cannot move it. What do you do after calling 9-1-1 or the local emergency number?

    a. Straighten the elbow and splint it.
    b. Drive her to the hospital.
    c. Immobilize the elbow in the bent position.
    d. Ask her to continue to try to move the elbow.

10. You just finish mountain biking on a little-used local nature path when your friend unexpectedly hits a loose patch of dirt and slams down hard on the ground. She is lying on the ground, conscious and breathing. Her lower leg is bleeding profusely from a gash and seems to be bent at an odd angle. With no one around, and no cell phone, you think you might need to transport her to the hospital yourself. List the guidelines you should follow in applying a splint to immobilize the injury.

Answers are listed in Appendix B.

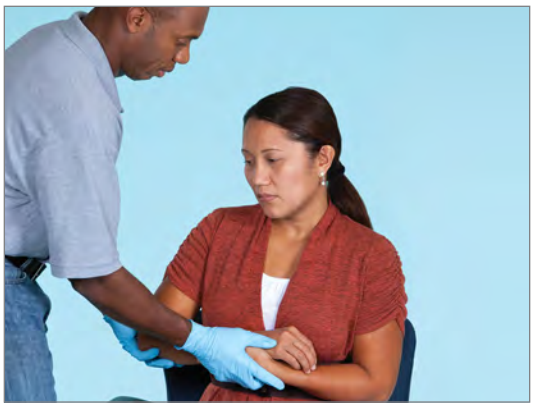
APPLYING A SLING AND BINDER

AFTER CHECKING THE SCENE AND THE INJURED PERSON:

1 GET CONSENT

2 SUPPORT INJURED PART

Support both above and below the site of the injury.



3 CHECK CIRCULATION

Check for feeling, warmth and color beyond the injury.

4 POSITION SLING

Place a triangular bandage under the injured arm and over the uninjured shoulder to form a sling.

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5 SECURE SLING

Tie the ends of the sling at the side of the neck.

TIP: *Pad the knots at the neck and side of the binder for comfort.*

6 BIND WITH BANDAGE

Bind the injured body part to the chest with a folded triangular bandage.

7 RECHECK CIRCULATION

Recheck for feeling, warmth and color.

APPLYING A RIGID SPLINT

AFTER CHECKING THE SCENE AND THE INJURED PERSON:

1 GET CONSENT

2 SUPPORT INJURED PART

Support both above and below the site of the injury.

3 CHECK CIRCULATION

Check for feeling, warmth and color beyond the injury.

4 PLACE SPLINT

Place an appropriately sized rigid splint (e.g., padded board) under the injured body part.

TIP: *Place padding such as roller gauze under the palm of the hand to keep it in a natural position.*

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5 SECURE BANDAGES

Tie several folded triangular bandages above and below the injured body part.

6 RECHECK CIRCULATION

Recheck for feeling, warmth and color.

> **TIP:** *If a rigid splint is used on an injured forearm, immobilize the wrist and elbow. Bind the arm to the chest using folded triangular bandages or apply a sling. If splinting an injured joint, immobilize the bones on either side of the joint.*

APPLYING AN ANATOMIC SPLINT

AFTER CHECKING THE SCENE AND THE INJURED PERSON:

1 GET CONSENT

2 SUPPORT INJURED PART

Support both above and below the site of the injury.

3 CHECK CIRCULATION

Check for feeling, warmth and color beyond the injury.

4 POSITION BANDAGES

Place several folded triangular bandages above and below the injured body part.

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5 ALIGN BODY PARTS

Place the uninjured body part next to the injured body part.

6 TIE BANDAGES SECURELY

7 RECHECK CIRCULATION

Recheck for feeling, warmth and color.

TIP: *If you are not able to check warmth and color because a sock or shoe is in place, check for feeling.*

APPLYING A SOFT SPLINT

AFTER CHECKING THE SCENE AND THE INJURED PERSON:

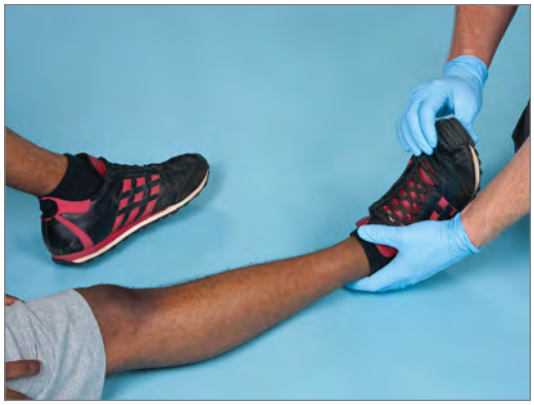
1 GET CONSENT

2 SUPPORT INJURED PART

Support both above and below the site of the injury.

3 CHECK CIRCULATION

Check for feeling, warmth and color beyond the injury.



4 POSITION BANDAGES

Place several folded triangular bandages above and below the injured body part.

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5 WRAP WITH SOFT OBJECT

Gently wrap a soft object (e.g., a folded blanket or pillow) around the injured body part.

6 TIE BANDAGES SECURELY

7 RECHECK CIRCULATION

Recheck for feeling, warmth and color.

TIP: *If you are not able to check warmth and color because a sock or shoe is in place, check for feeling.*

Injuries to the Head, Neck and Spine

13

You and your friends are having a great time playing a game of touch football in the park. The score is tied when your quarterback throws a long pass. As the intended receiver jumps to grab the pass, the guy on defense gets over-zealous, grabbing onto the receiver's back and sending them both crashing headfirst into the ground. One player stands up quickly and offers a hand to the other. You are all alarmed when that player says he cannot move his arms.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Identify the most common causes of head, neck and spinal injuries.
- List 10 situations that might indicate serious head, neck and spinal injuries.
- List the signals of head, neck and spinal injuries.
- Describe how to effectively minimize movement of the person's head, neck and spine.
- Know the situations in which you would hold the person's head in the position found.
- Describe how to care for specific injuries to the head, face, neck and lower back.
- Know how to prevent head, neck and spinal injuries.

KEY TERMS

Concussion: A temporary loss of brain function caused by a blow to the head.

Manual stabilization: A technique used to achieve spinal motion restriction by manually supporting the person's head and neck in the position found *without* the use of any equipment.

Spine: The series of vertebrae extending from the base of the skull to the tip of the tailbone (coccyx); also referred to as the spinal column or the vertebral column.

Vertebrae: The 33 bones of the spine.

INTRODUCTION

Although injuries to the head, neck and spine account for only a small percentage of all injuries, they cause more than half of the fatalities. Each year, nearly 2 million Americans suffer a head, neck or spinal injury serious enough to require medical care. Most of those injured are males between the ages of 15 and 30. Motor-vehicle collisions account for about half of all head, neck and spinal injuries **(Figure 13-1)**. Other causes include falls, sports-related mishaps, accidents related to recreational activities and violent acts such as assault.

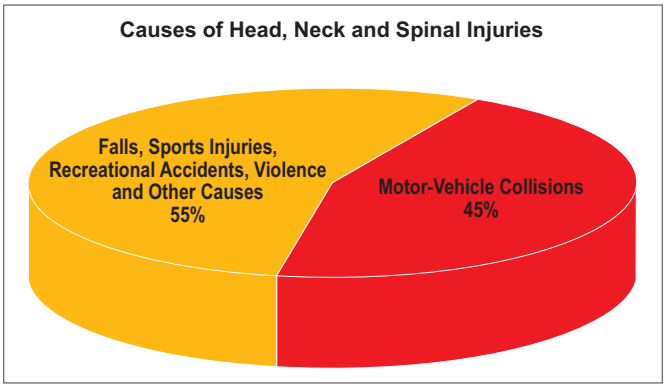


FIGURE 13-1 *Motor vehicle accidents account for nearly half of all head, neck and spinal injuries.*

Besides those who die each year in the United States from head, neck and spinal injury, nearly 80,000 people become permanently disabled. These survivors have a wide range of physical and mental impairments, including paralysis, speech and memory problems and behavioral disorders.

Fortunately, prompt, appropriate care can help minimize the damage from most head, neck and spinal injuries. In this chapter, you will learn how to recognize a serious head, neck or spinal injury. You will also learn how to provide appropriate care to minimize these injuries.

RECOGNIZING SERIOUS HEAD, NECK AND SPINAL INJURIES

Injuries to the head, neck or spine often damage both bone and soft tissue, including brain tissue and the spinal cord. It is usually difficult to determine the extent of damage in head, neck and spinal injuries, so treat all such injuries as serious.

The Head

The head contains the brain, special sense organs, the mouth and nose and related structures **(Figure 13-2)**. It is easily injured because it lacks the padding of muscle and adipose that are found in other areas of the body. The head is formed by the skull and the face. The broad, flat bones of the skull are fused together to form a hollow shell. This hollow shell, the cranial cavity, contains the brain. The face is on the front of the skull. The bones of the face include the bones of the cheek, forehead, nose and jaw.

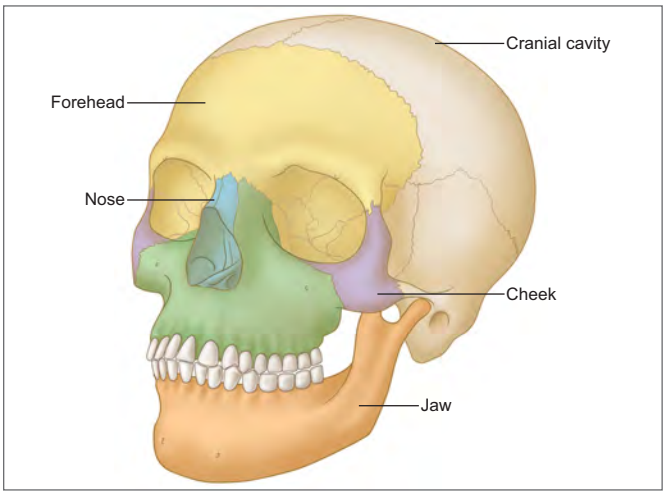


FIGURE 13-2 *The head*

The Brain

Injuries to the head can affect the brain. The brain can be bruised or lacerated when extreme force causes it to move in the skull, stretching and tearing tissue or bumping against the skull. Extreme force, or trauma, can fracture the thick bones of the skull. The major concern with skull fractures is damage to the brain.

Swelling and bleeding from a ruptured vessel in the brain can accumulate within the skull **(Figure 13-3)**. Because the skull contains very little free space, bleeding can build pressure that can further damage brain tissue. Bleeding within the skull can occur rapidly or slowly over a period of days. This bleeding will affect the brain, resulting in changes in consciousness. Unconsciousness, semi-consciousness or drifting in and out of consciousness is often the first and most important signal of a serious head injury.

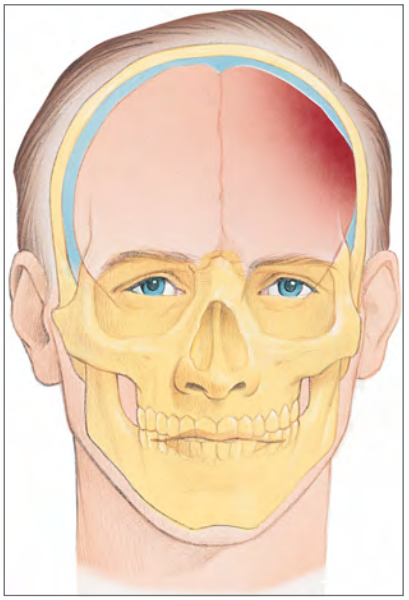


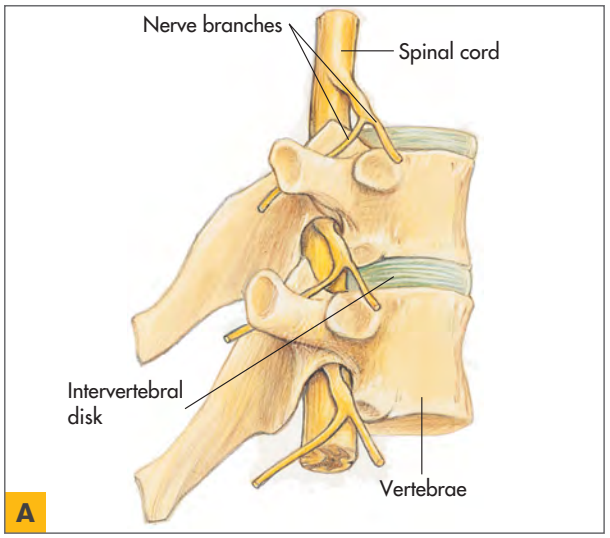
FIGURE 13-3 *Injuries to the head can rupture blood vessels in the brain. Pressure builds within the skull as blood accumulates, causing brain injury.*

The Face

The face contains both bones and soft tissues. Although some injuries to the face are minor, many can be life threatening. With a facial injury, consider whether the force that caused the injury may have been sufficiently strong to fracture facial bones and damage the brain or the spine. Facial injuries can also affect the airway and the person's ability to breathe.

The Neck

The neck contains the esophagus, larynx and part of the trachea. It also contains major blood vessels, muscles and tendons and the cervical bones of the spine. Any injury to the neck must be considered serious. Crushing, rotating, tension or penetrating forces that cause the neck to stretch or bend too far can injure the neck. Sharp-edged objects can lacerate the neck's soft tissues and blood vessels.



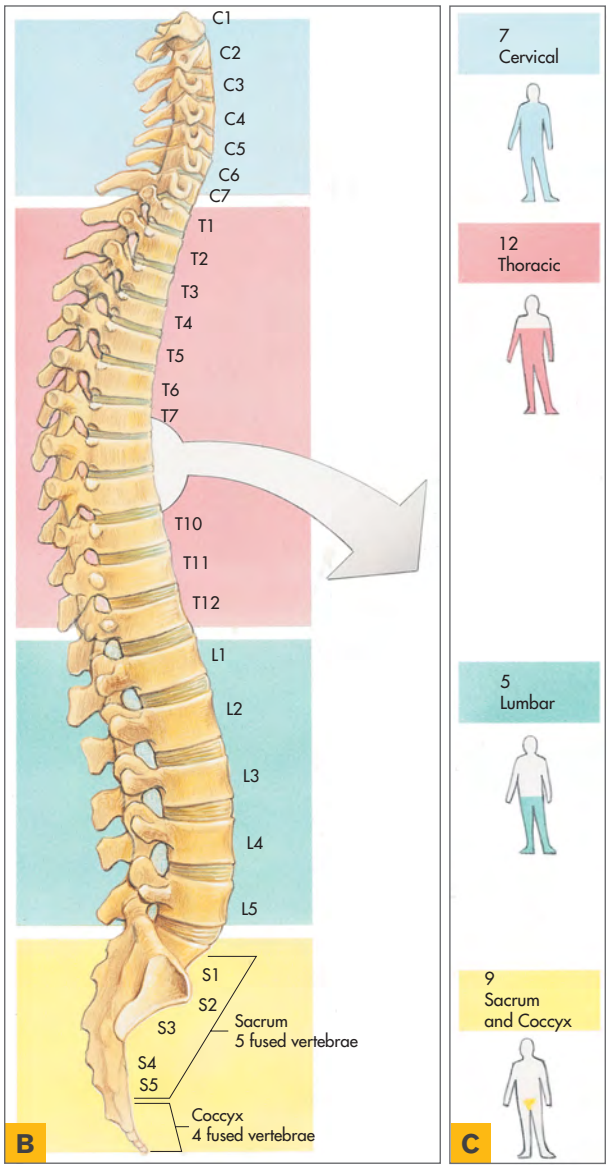


FIGURE 13-4, A–C **A,** *Vertebrae are separated by cushions of cartilage called disks.* **B,** *The spine is divided into five regions.* **C,** *Traumatic injury to a region of the spine can paralyze specific body areas.*

The Spine

The ***spine***, which is also called the **spinal column** or **vertebral column**, is a strong, flexible column of small bones called ***vertebrae***, extending from the base of the skull to the tip of the tailbone. The spine supports the head and the trunk and protects the spinal cord. The vertebrae are separated from each other by cushions of cartilage called disks **(Figure 13-4, A)**. This cartilage acts as a shock absorber when a person walks, runs or jumps. The **spinal cord**, which is a bundle of nerves that originate in the brain, runs through circular openings in the vertebrae. Nerve branches extend to various parts of the body through openings on the sides of the vertebrae.

The spine is divided into five regions: the cervical (neck) region, the thoracic (upper and middle back) region, the lumbar (lower back) region, the sacrum (triangular bone at the lower end of the spinal column) and the coccyx (tailbone), which is the small final segment of the spinal column **(Figure 13-4, B)**.

Injuries to the spine can fracture the vertebrae and sprain or tear the ligaments. These injuries usually heal without problems. With severe injuries, however, the vertebrae may shift and compress or sever the spinal cord, causing temporary or permanent paralysis, or even death. The parts of the body that are paralyzed depend on which area of the spinal cord is damaged **(Figure 13-4, C)**.

Checking the Scene and the Person

When you encounter an injured person, you will evaluate the scene for clues as to whether a head, neck or spinal injury may have occurred during the **CHECK** phase of the emergency action steps. As you evaluate the scene, think about the forces involved in the injury. Strong forces are likely to cause severe injury to the head, neck and spine. For example, a driver whose head hits and breaks a car windshield in a crash may receive a potentially serious head, neck or spinal injury. Similarly, a swimmer who dives into shallow water and strikes his or her head on the bottom may sustain a serious injury.

In general, you should consider the possibility of a serious head, neck or spinal injury if the injured person:

- Is unconscious.
- Was involved in a motor vehicle crash or subjected to another significant force.
- Was injured as a result of a fall from greater than the person's standing height.
- Is wearing a safety helmet that is broken.

- Complains of neck or back pain.
- Has tingling or weakness in the extremities.
- Is not fully alert.
- Appears to be intoxicated.
- Appears to be frail or older than 65 years.
- Is a child younger than 3 years with evidence of a head or neck injury.

Approach the person from the front so he or she can see you without turning his or her head, and tell the person to respond verbally to your questions. Ask the responsive person the following questions, while maintaining manual stabilization, to further assess the situation:

- Does your neck or back hurt?
- What happened?
- Where does it hurt?
- Can you move your hands and feet?
- Can you feel where I am touching?

Manual stabilization is covered in detail later in this chapter.

Signals of Serious Head, Neck or Spinal Injuries

When you are checking a person with a suspected head, neck or spinal injury, look for any swollen or bruised areas, but do not put direct pressure on any area that is swollen, depressed or soft. You may also find certain signals that indicate a serious injury. These signals include:

- Changes in the level of consciousness.
- Severe pain or pressure in the head, neck or spine.
- Tingling or loss of sensation in the extremities.
- Partial or complete loss of movement of any body part.
- Observable, unusual bumps or depressions on the head or neck.
- Sudden loss of memory.
- Blood or other fluids in the ears or nose.
- Profuse external bleeding of the head, neck or back.
- Seizures in a person who does not have a seizure disorder.
- Impaired breathing or impaired vision as a result of injury.
- Nausea or vomiting.
- Persistent headache.
- Loss of balance.
- Bruising of the head, especially around the eyes or behind the ears **(Figure 13-5, A–B)**.

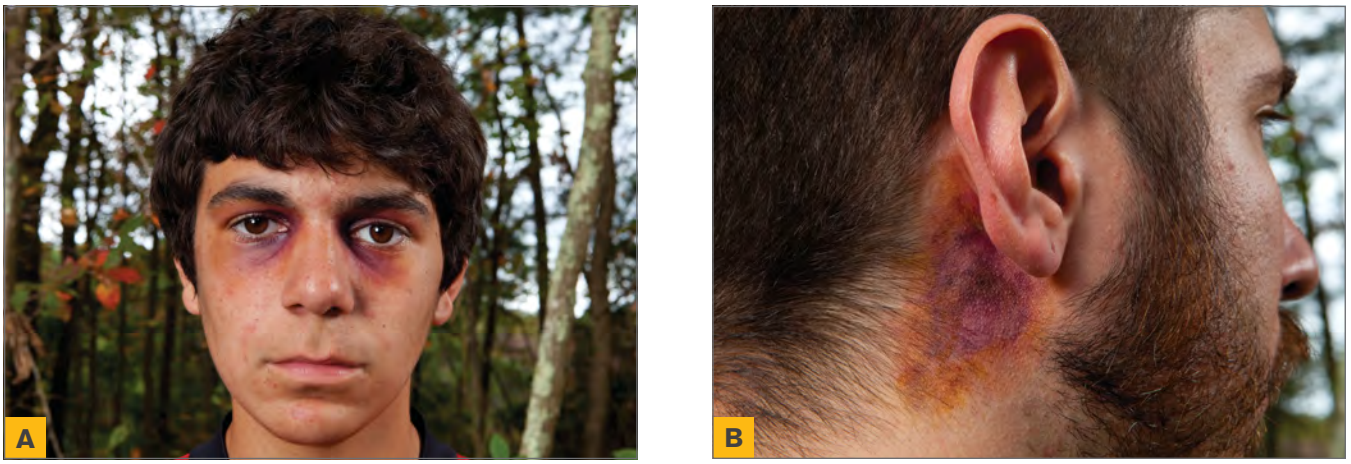


FIGURE 13-5, A–B **A,** *Bruising around the eyes or* **B,** *bruising behind the ears indicates a serious head injury.*

These signals may be obvious or develop later. Alone, these signals do not always suggest a serious head, neck or spinal injury, but they may when combined with the cause of the injury. Regardless of the situation, always call 9-1-1 or the local emergency number when you suspect a serious head, neck or spinal injury.

Care for Serious Head, Neck or Spinal Injuries

Head, neck and spinal injuries can become life-threatening emergencies. A serious injury to the head or neck can cause a person to stop breathing. It is essential to maintain an open airway. When such an injury is suspected, always call 9-1-1 or the local emergency number. Give the following care while waiting for emergency medical services (EMS) personnel to arrive:

- Use ***manual stabilization*** to minimize movement of the head, neck and spine. Because excessive movement of the head, neck or spine can damage the spinal cord irreversibly, keep the person as still as possible until EMS personnel arrive and take over. See below for the steps for manual stabilization.
- If the person is wearing a helmet, do *not* remove it unless you are *specifically* trained to do so *and* it is necessary to assess or access the person's airway. Minimize movement using the same manual stabilization technique you would use if the person was not wearing headgear.
- Check for life-threatening conditions. Be sure to maintain an open airway.
- Monitor consciousness and breathing.
- Control any external bleeding with direct pressure unless the bleeding is located directly over a suspected fracture. Do *not* apply direct pressure if there are any signs of an obvious skull fracture.
- Do *not* attempt to remove a penetrating object; rather, stabilize it with a bulky dressing.
- Wear disposable gloves or use another barrier.
- Take steps to minimize shock. Keep the person from becoming chilled or over heated.

Perform Manual Stabilization

Manual stabilization can be performed on persons who are lying down, sitting or standing. To perform manual stabilization and help prevent further damage to the spinal column:

- Place your hands on both sides of the person's head in the position in which you found it **(Figure 13-6)**.

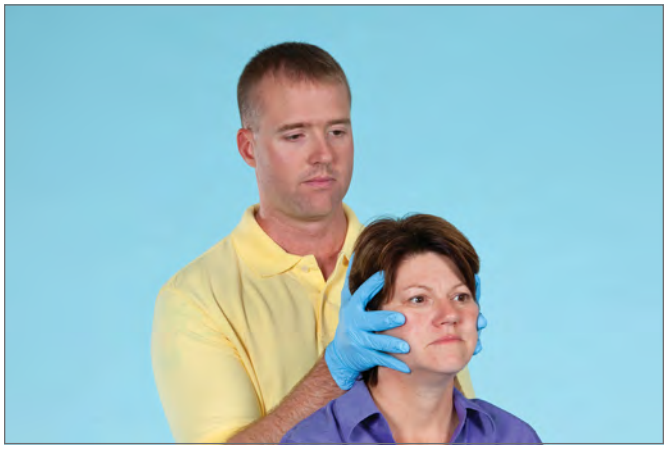


FIGURE 13-6 *To perform manual stabilization, place hands on both sides of the person's head in the position in which you found it.*

- Gently support the person's head in that position until EMS personnel arrive and take over.
- Try to keep the person from moving his or her lower body, since this movement will change the position of the head and neck.
- *Do not* attempt to align the head and lower body. If the head is sharply turned to one side, *do not* move it. Support it in the position found.

If you are unable to maintain an open airway, or if you have to leave to get help or an automated external defibrillator (AED), place the person in a modified H.A.IN.E.S. (High Arm in Endangered Spine) recovery position. This is more easily done by two people in order to maintain manual stabilization and minimize movement of the person's head, neck and spine. Ask another

responder to help move the person's body while you maintain manual stabilization **(Figure 13-7)**.

Check for Life-Threatening Conditions

You do not always have to put a person onto his or her back to check breathing. A cry of pain, chest movement as a result of inhaling and exhaling or the sound of breathing tells you the person is breathing, so you do not need to move him or her to check. If the person is breathing normally, support him or her in the position found. If the person is not breathing or you cannot tell, roll the person gently onto his or her back, but avoid twisting the spine. Carefully tilt the head and lift the chin just enough to open the airway or give rescue breaths if needed.

If the person begins to vomit, carefully roll him or her into the modified H.A.IN.E.S. recovery position as described above to keep the airway clear.

Monitor Consciousness and Breathing

While stabilizing the head and neck, observe the person's level of consciousness and breathing. A serious injury can result in changes in consciousness. The person may give inappropriate responses to name, time, place or when describing what happened. He or she may speak incoherently (in a way that cannot be understood). The person may be drowsy, appear to lapse into sleep and then suddenly awaken or completely lose consciousness. Breathing may become rapid or irregular. Because injury to the head or neck can paralyze chest nerves and muscles, breathing can stop. If breathing stops, give CPR immediately.

Control External Bleeding

Some head and neck injuries involve soft tissue damage. Because many blood vessels are located in the head and two major arteries (the carotid arteries) and the jugular veins are located in the neck, the person can lose a significant amount of blood quickly. If the person is bleeding externally, control it promptly with dressings, direct pressure and bandages. Do *not* apply pressure to both carotid arteries simultaneously, and do *not* put a bandage around the neck. Doing so could cut off or seriously diminish the oxygen supply to the brain.

Take Steps to Minimize Shock

A serious injury to the head or spine can disrupt the body's normal heating or cooling mechanism. When this disruption occurs, the person is more susceptible to shock. For example, a person suffering a serious head, neck or spinal injury while outside on a cold day will be

What if...

A person has a suspected spinal injury and I have access to a cervical collar? Should I use it instead of manual stabilization? I have seen EMS personnel apply them before.

The short answer is no. Immobilization devices, such as cervical collars, should not be used by lay responders. The reason for this is two-fold. As a lay responder, your training does not include the appropriate use of such devices, and you should not give care for which you are not trained. The second reason is that the benefit of using immobilization devices has not been proven, and in fact using such devices may be harmful if they are applied incorrectly.

FIGURE 13-7 *Maintain manual stabilization while rolling the person's body.*

What if...

I suspect an injury to the spine and the person is not breathing? Which is more important—stabilizing the spine or opening the airway?

While the general rule is to always maintain a person's head, neck and spine in the position found without any movement or alignment with the body, if the person is not breathing, establishing an airway must take precedence over the manual stabilization. If you must move the person to open the airway, slowly and cautiously extend the head and neck until an airway can be established, then continue to manually stabilize in that position. Continue with CPR as necessary.

more likely to develop hypothermia because the normal shivering response to re-warm the body may not work. For this reason, it is important to take steps to minimize shock by keeping the person from becoming chilled or overheated.

SPECIFIC INJURIES

The head is easily injured because it lacks the padding of muscle and fat found in other areas of the body. You can feel bone just beneath the surface of the skin over most of the head, including the chin, cheekbones and scalp. When you are checking a person with a suspected head injury, look for any swollen or bruised areas, but do not put direct pressure on any area that is swollen, depressed or soft.

Concussions

A ***concussion*** is a type of brain injury that involves a temporary loss of brain function resulting from a blow to the head. A person with a concussion may not always lose consciousness. The effects of a concussion can appear immediately or very soon after the blow to the head and include sleep, mood and cognitive disturbances, and sensitivity to light and noise. However, some effects do not appear for hours or even days and may last for several days or even longer.

Signals of Concussions

Signals of a concussion include:

- Confusion, which may last from moments to several minutes.
- Headache.
- Repeated questioning about what happened.
- Temporary memory loss, especially for periods immediately before and after the injury.
- Brief loss of consciousness.
- Nausea and vomiting.
- Speech problems (patient is unable to answer questions or obey simple commands).
- Blurred vision or light sensitivity.

Care for Concussions

Every suspected concussion should be treated seriously. Always call 9-1-1 or the local emergency number. While waiting for help to arrive, give care as follows:

- Support the head and neck in the position in which you found it.
- Maintain an open airway.
- Control any bleeding and apply dressings to any open wounds.
- Do *not* apply direct pressure if there are any signs of an obvious skull fracture.
- If there is clear fluid leaking from the ears or a wound in the scalp, cover the area loosely with a sterile gauze dressing.
- Monitor the person for any changes in condition.
- Try to comfort and reassure the person. Encourage the person to talk with you to help keep the person calm.

Scalp Injuries

Scalp bleeding can be minor or severe. However, minor lacerations can bleed heavily because the scalp contains many blood vessels.

Care for Scalp Injuries

If the person has an open wound to the scalp, control the bleeding with direct pressure:

- Apply several dressings and hold them in place with your gloved hand. If gloves are not available, use a protective barrier.
- Be sure to press gently at first because the skull may be fractured. If you feel a depression, spongy area or bone fragments, do *not* put direct pressure on the wound. Attempt to control bleeding with pressure on the area *around* the wound **(Figure 13-8)**.
- Secure the dressings with a roller bandage or triangular bandage.

FIGURE 13-8 *To avoid putting pressure on a deep scalp wound, apply pressure around the wound.*

Examine the injured area carefully because the person's hair may hide part of the wound. Call 9-1-1 or the local emergency number if you are unsure about the extent of the injury. EMS personnel will be better able to evaluate the injury. Severe bleeding from the scalp can cause shock in young children and infants.

Cheek Injuries

Injury to the cheek usually involves only soft tissue. You may have to control bleeding on either the outside, inside or both sides of the cheek depending on the severity of the injury. The person can swallow blood with bleeding inside the cheek, so maintaining an open and clear airway will be necessary. If the person swallows enough blood, nausea or vomiting can result, which would complicate the situation.

Care for Cheek Injuries

Begin care by examining both the outside and inside of the cheek:

- To control bleeding inside the cheek, place several dressings, folded or rolled, inside the mouth, against the cheek. The person may be able to hold these dressings in place, or you may have to hold them with your gloved hand.
- If there is external bleeding, place dressings on the outside of the cheek and apply direct pressure.

If an object passes completely through the cheek and becomes embedded, and you cannot control bleeding with the object in place, the object should be removed so that you can control bleeding and keep the airway clear. *This circumstance is the only exception to the general rule not to remove embedded objects from the body*. An embedded object in the cheek cannot be easily stabilized, makes control of bleeding more difficult and may become dislodged and obstruct the airway. To care for a person with an embedded object in the cheek:

- Remove the object by pulling it out in the same direction it entered.
- Fold or roll several dressings and place them inside the mouth. Also, apply dressings to the outside of the cheek. Be sure not to obstruct the airway.
- Place the person in a seated position leaning slightly forward so that blood will not drain into the throat.
- As with any serious bleeding or embedded object, call 9-1-1 or the local emergency number.

FIGURE 13-9 *To control a nosebleed, have the person lean forward and pinch the nostrils together until bleeding stops (about 10 minutes).*

Nose Injuries

Nose injuries are usually caused by a blow from a blunt object. A nosebleed often results. High blood pressure, changes in altitude or dry air can also cause nosebleeds. A broken nose may be deformed and will swell.

Care for Nose Injuries

In most cases, you can control a nosebleed by following these steps:

- Have the person sit with his or her head slightly forward while pinching the nostrils together for about 10 minutes **(Figure 13-9)**.
- If pinching the nostrils together does not control the bleeding, you can try applying an ice pack to the bridge of the nose. Remember ice should not be applied directly to the skin since it can damage the skin. Or, put pressure on the upper lip just beneath the nose.
- Keep the person leaning slightly forward so that blood does not drain into the throat and cause the person to vomit.
- If you think an object is in the nose, do *not* try to remove it as special lighting and instruments are required. Instead, reassure the person and call for more advanced medical care.

Once you have controlled the bleeding, tell the person to avoid rubbing, blowing or picking the nose, which could restart the bleeding. You may suggest applying a little petroleum jelly inside the nostril later to help keep the mucous membranes in the nostril moist. You should seek additional medical care if the nosebleed continues after you use the techniques described, if bleeding recurs or if the person says the bleeding is the result of high blood pressure. If the person loses consciousness, place the person in the modified H.A.IN.E.S. recovery position to allow blood to drain from the nose and mouth. Call 9-1-1 or the local emergency number immediately.

Eye Injuries

Injuries to the eye can involve the bone and soft tissue surrounding the eye or the eyeball. Blunt objects, such as a fist or a baseball, may injure the eye area, or a smaller object may penetrate the eyeball. Injuries that penetrate the eyeball are very serious and can cause blindness. Foreign bodies, such as dirt, sand or slivers of wood or metal that get in the eye are irritating and can cause significant damage. The eye immediately produces tears in an attempt to flush out such objects. Pain from the irritation is often severe. The person may have difficulty opening the eye because light further irritates it.

Care for Eye Injuries

Care for open or closed wounds around the eyeball as you would for any other soft tissue injury. Never put direct pressure on the eyeball.

To care for a foreign body in the eye:

- Try to remove the foreign body by telling the person to blink several times, then try gently flushing the eye with water.
- If the object remains, the person should receive more advanced medical care. The eye should be flushed continuously until EMS personnel arrive.

- Flushing the eye with water is also appropriate if the person has any chemical in the eye **(Figure 13-10)**. Flush the eye continuously until advanced medical personnel arrive. If only one eye is affected, make sure you do *not* let the water run into the unaffected eye.

Follow these guidelines when giving care for an eye with an embedded object:

- Place the person in a face-up position and enlist someone to help stabilize the person's head.
- Do *not* attempt to remove any object embedded in the eye.
- Stabilize the object by encircling the eye with a gauze dressing or soft sterile cloth, being careful *not* to apply any pressure to the area.
- Position bulky dressings, such as roller gauze, around the impaled object and then cover it with a shield such as a paper cup. Do *not* use Styrofoam®-type materials, as small particles can break off and get into the eye.
- The shield should *not* touch the object. Bandage the shield and dressing in place with a self-adhering bandage and roller bandage covering the person's injured eye, as well as the uninjured eye, to keep the object stable and minimize movement.
- Comfort and reassure the person. Do *not* leave the person unattended.

FIGURE 13-10 *Gently flush an eye with a foreign object or one that has been exposed to chemicals by placing the involved eye on the bottom.*

What if...

A person has a relatively large object embedded in the eye and I do not have a paper cup to stabilize it with?

As with all embedded objects, your goal is to attempt to stabilize the object as best you can. If no paper cup is readily available, consider the use of bulky dressings to secure the object. As discussed in this chapter, be careful to avoid placing direct pressure on the eye itself. Bandage the dressings loosely and seek immediate medical attention.

Ear Injuries

External injuries to the ear are common. Open wounds, such as lacerations or abrasions, can result from recreational injuries, such as being struck by a racquetball or falling off a bike. An avulsion of the ear may occur when a pierced earring catches on something and tears away from the ear.

The ear can also be injured internally. A foreign object, such as dirt, an insect or cotton, can easily become lodged in the ear canal. A direct blow to the head may rupture the eardrum. Sudden pressure changes, such as those caused by an explosion or a deep-water dive, can also injure the ear internally. The person may lose hearing or balance or experience inner ear pain. These injuries require more advanced medical care.

Care for Ear Injuries

You can control bleeding from the soft tissues of the ear by applying direct pressure to the affected area with a gloved hand or other barrier.

For a foreign object in the ear:

- If you can easily see and grasp the object, remove it.
- Do not try to remove any object by using a pin, toothpick or a similar sharp item. You could force the object farther back or puncture the eardrum.

- Sometimes you can remove the object if you pull down on the earlobe, tilt the head to the side and shake or gently strike the head on the affected side.
- If you cannot easily remove the object, the person should seek more advanced medical care.

If the person has a serious head injury, blood or other fluid may be in the ear canal or may be draining from the ear. Do *not* attempt to stop this drainage with direct pressure. Instead, just cover the ear lightly with a sterile dressing. Call 9-1-1 or the local emergency number.

Mouth, Jaw and Neck Injuries

Your primary concern for any injury to the mouth, jaw or neck is to ensure that the airway is open. Such injuries may cause trouble breathing if blood or loose teeth obstruct the airway. Injuries serious enough to fracture or dislocate the jaw can also cause other head or neck injuries. A soft tissue injury to the neck can produce severe bleeding and swelling that may result in airway obstruction. Because the spine may also be involved, care for a serious neck injury as you would a possible spinal injury. If the person has struck his or her neck on a steering wheel or had some other direct trauma to the neck, the injury can be devastating. The trachea may be crushed or collapsed, causing an airway obstruction that requires immediate medical attention.

Care for Mouth, Jaw and Neck Injuries

In general, if you do not suspect a serious head, neck or spinal injury, place the person bleeding from the mouth in a seated position with the head tilted slightly forward to allow any blood to drain. If this position is not possible, place the person on his or her side to allow blood to drain from the mouth.

For injuries that penetrate the lip:

- Place a rolled dressing between the lip and the gum. You can place another dressing on the outer surface of the lip.
- If the tongue is bleeding, apply a dressing and direct pressure with a gloved hand.
- Applying ice or a cold pack to the lips or tongue can help reduce swelling and ease pain. Place gauze between the source of cold and the tongue.
- If the bleeding cannot be controlled easily, the person should seek medical attention.

FIGURE 13-11 *If a tooth is knocked out, place a sterile dressing directly in the space left by the tooth. Tell the person to bite down.*

If the injury knocked out one or more of the person's teeth, you will need to control the bleeding and save the tooth or teeth for re-plantation:

- If the person is conscious and able to cooperate, rinse out the mouth with cold tap water, if available.
- To control the bleeding, roll a sterile dressing and insert it into the space left by the missing tooth or teeth. Have the person gently bite down on the dressing to maintain pressure **(Figure 13-11)**.
- To save the tooth, carefully pick it up by the crown (*not at the root end*). Place the tooth in a closed container of milk.
- If the injury is severe enough to call 9-1-1 or the local emergency number, give the tooth to EMS personnel when they arrive. If the injury is not severe enough to call 9-1-1 or the local emergency number, the person

should seek dental or emergency care as soon as possible after the injury. Generally, the sooner the tooth is replaced, the better the chance is that it will survive.

- Leave intact dentures in position to support the mouth structure. Remove broken dentures and send them with the person to assist the oral surgeon with jaw alignment.

For a suspected jaw fracture or dislocation:

- Call 9-1-1 or the local emergency number.
- Be sure to maintain an open airway.
- Check inside the mouth for bleeding, and control bleeding as you would for other head injuries.
- Minimize movement of the head, neck or spine with manual stabilization.

For a serious soft tissue injury to the neck, provide care as you would for a serious spinal injury:

- Call 9-1-1 or the local emergency number.
- While waiting for EMS personnel to arrive, try to keep the person from moving, and encourage him or her to breathe slowly.
- Control any external bleeding with direct pressure, wearing a glove or using another barrier.
- Be careful not to apply pressure that constricts both carotid arteries.
- For a large laceration to the neck, apply an occlusive dressing to avoid the possibility of air getting into a vein.

Lower Back Injuries

Certain injuries to the neck and back are not life threatening but can be extremely painful and temporarily disabling and may occur without warning. These injuries usually occur from forcing the back beyond its limits in strength or flexibility. Using improper lifting techniques when lifting or moving heavy objects is one way to injure the back. Working in a cramped space in a bent-over or awkward position may cause back pain, as can sitting or standing in one position for a long period of time. Often acute back pain that develops suddenly is a result of one of the following causes:

- Ligament pulls and muscle strains: violent movement or unaccustomed effort stretches or tears muscles in the back or neck, or the ligaments that bind together or surround each section of the spine.
- Vertebrae displacement: twisting movement causes two vertebrae to slip out of place, and facets (bony projections) lock in a position that puts pressure on a nerve or irritates the joint, often causing muscles to go into spasm.
- Slipped (prolapsed) disk: pressure and wear and tear on one of the cartilage disks that separate the vertebrae cause the soft center of the disk to protrude through the disk's outer layer. This center part presses on a nerve, often causing muscles to spasm.

Signals of Lower Back Injuries

Signals of a lower back injury include:

- Shooting pain in the lower back.
- Sharp pain in one leg.
- Sharp pain and tightness across the lower back.
- A sudden, sharp pain in the back and a feeling that something snapped.
- Inability to bend over without pain.

Regardless of the possible cause of back pain, call 9-1-1 or the local emergency number immediately if the person has any of the following accompanying signals:

- Numbness or tingling in any extremity
- Difficulty moving
- Loss of bladder or bowel control

These signals indicate possible damage to the spinal cord. Wait for EMS personnel to arrive and keep the person warm and quiet.

A person with pain on one side of the small of the back who also has a fever or feels ill should call a physician. The person may have a kidney infection. Older adults with back pain may have a life-threatening emergency called an aortic **aneurysm**. For older adults with severe back pain, call 9-1-1 or the local emergency number.

Care for Lower Back Injuries

Because the care for lower back injuries varies depending on the nature of the injury, the person should consult a physician. As indicated above, there are also instances where you should always call 9-1-1, including:

- Signals of possible spinal cord damage.
- An older adult with severe back pain.

Cold treatment is usually recommended for musculoskeletal injuries initially. Bed rest and pain-relieving medications, such as acetaminophen or ibuprofen, generally provide relief for strains and muscle spasms. Exercises are frequently recommended to strengthen the back and abdominal muscles after the pain has gone and should only be done at the direction of a physician or rehabilitation specialist.

SMART MOVES: PREVENTING HEAD, NECK AND SPINAL INJURIES

While some injuries are unavoidable, many others are preventable by being aware of potential dangers in the environment and taking appropriate safety measures. These measures include:

- Correctly wear safety belts (including lap and shoulder restraints), and place children in car safety seats.
- Correctly wear approved helmets, eyewear, faceguards and mouthguards for activities for which they are recommended.
- Take steps to prevent falls such as ensuring that hallways and stairways in your home are well lit, and stairways have handrails and nonslip treads. Rugs should be secured with double-sided tape or appropriate mats.
- Use non-slip mats in the bathtub or use handrails.
- Always use a step stool or step ladder to reach objects that are up high. Do not attempt to pull heavy objects that are out of reach over your head.
- Use proper lifting techniques when lifting and carrying heavy objects.
- Obey rules in sports and recreational activities.
- Avoid inappropriate use of alcohol and other drugs.
- Inspect work and recreational equipment periodically.
- Do not dive into a body of water if you are unsure of the depth.
- Think and talk about safety and use good common sense.

SUMMARY

In this chapter, you have learned how to recognize and care for serious head, neck and spinal injuries; specific injuries to the head and neck; and lower back problems. Like injuries elsewhere on the body, injuries to the head, neck and spine often involve both soft tissue and bone. Often the cause of the injury is the best indicator of whether or not it is serious. If you have any doubts about the seriousness of a head, neck or spinal injury, call 9-1-1 or your local emergency number.

READY TO RESPOND?

Think back to the touch football game in the opening scenario, and use what you have learned to respond to these questions:

1. Is it safe to assume that the football player who stands up right away does not have a head, neck or spinal injury? Why or why not?
2. While one of the other players runs off to alert a police officer he sees patrolling the park, you head over to the person who is lying there, conscious and alert. What should your priority be?

STUDY QUESTIONS

1. Match each term with the correct definition.

   a. Concussion
   b. Manual stabilization
   c. Spine
   d. Vertebrae

_____ The 33 bones of the spine

_____ A technique used to achieve spinal motion restriction by manually supporting the person's head and neck in the position found *without* the use of any equipment

_____ A temporary loss of brain function caused by a blow to the head

_____ Series of vertebrae extending from the base of the skull to the tip of the tailbone

2. List five situations that might indicate the possibility of a serious head, neck or spinal injury.

3. List six signals of head, neck or spinal injuries.

4. List the steps of care for an eye injury in which the eyeball has been penetrated.

In questions 5 through 11, circle the letter of the correct answer.

5. Which are among the most common causes of serious head, neck and spinal injury?

   a. Motor vehicle accidents
   b. Sports-related injuries
   c. Falls
   d. All of the above

6. Serious injuries to the head, neck or spine can damage—

   a. Soft tissues.
   b. Nerve tissues.
   c. Bones.
   d. All of the above

7. Which of the following situations would cause you to suspect a serious head, neck or spinal injury?

   a. A man complains of lower back pain after working out in the gym.
   b. Two people bump their heads together while reaching for a piece of paper on the floor.
   c. A high school football player is holding his neck after making a tackle head first.
   d. A child trips and falls onto her hands and knees.

8. Which should you do when caring for a person with a suspected head, neck or spinal injury?

   a. Help support the injured area by walking the person to the nearest wall.
   b. Call the person's physician for additional care.
   c. Provide manual stabilization while checking for life-threatening conditions, and maintain an open airway.
   d. Have the person lie flat and elevate the legs 8 to 12 inches.

9. At the scene of a car crash, a person has blood seeping from his ears. Which should you do?
   a. Loosely cover the ears with a sterile dressing.
   b. Do nothing; this is a normal finding in a head injury.
   c. Collect the fluid in a sterile container for analysis.
   d. Pack the ears with sterile dressings to prevent further fluid loss.

10. Which is your primary concern when caring for an injury to the mouth or neck?
   a. Infection
   b. Airway obstruction
   c. Swelling
   d. Scarring

11. Which is a signal of an injured ear?
   a. Hearing loss
   b. Loss of balance
   c Inner ear pain
   d. All of the above

12. As you begin to apply direct pressure to control bleeding for a scalp injury, you notice a depression of the skull in the area of the bleeding. What should you do next?

Answers are listed in Appendix B.

Injuries to the Chest, Abdomen and Pelvis

14

You are traveling home when you witness an accident. As debris falls off of a speeding truck, a bicyclist quickly swerves to avoid it, but falls in the road from the sudden movement. The car traveling behind him does get hit by the debris, but the driver manages to break before hitting the man in the road. It looks like everyone is okay from a distance, but as you approach to help, you can see that the bicyclist is holding his chest and his breathing sounds shallow as if it is painful to breath. Another bystander has called 9-1-1 and is setting up hazard signals to alert traffic. You are the only person trained in first aid, so you begin to check the bicyclist after getting his consent.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Explain why injuries to the chest, abdomen and pelvis can be fatal.
- List the signals of chest injury.
- Describe how to care for rib fractures.
- Describe how to care for a sucking chest wound.
- List the signals of abdominal and pelvic injuries.
- Describe the care for open and closed abdominal and pelvic injuries.
- Describe how to care for injuries to the genitals.

KEY TERMS

Abdomen: The middle part of the trunk, containing the stomach, liver, intestines and spleen.

Chest: The upper part of the trunk, containing the heart, major blood vessels and lungs.

Genitals: The external reproductive organs.

Pelvis: The lower part of the trunk, containing the intestines, bladder and internal reproductive organs.

Rib cage: The cage of bones formed by the 12 pairs of ribs, the sternum and the spine.

Sternum: The long, flat bone in the middle of the front of the rib cage; also called the breastbone.

INTRODUCTION

Many injuries to the chest, abdomen and pelvis involve only soft tissues. Often these injuries, like those that occur elsewhere on the body, are only minor cuts, scrapes, burns and bruises. Occasionally, a violent force or mechanism known as trauma results in more severe injuries. These include fractures and injuries to organs that cause severe bleeding or impair breathing. Fractures and lacerations often occur in motor vehicle collisions to occupants not wearing seat belts. Falls, sports mishaps and other forms of trauma may also cause such injuries.

Because the chest, abdomen and pelvis contain many organs important to life, injury to any of these areas can be fatal. You may recall from Chapter 13 that a force capable of causing severe injury in these areas may also cause injury to the spine.

This chapter describes the signals of different injuries to the chest, abdomen and pelvis and the care you would give for them. In all cases, follow the emergency action steps as well as these basic guidelines:

- Call 9-1-1 or the local emergency number.
- Limit movement.
- Monitor breathing and signs of life.
- Control bleeding.
- Take steps to minimize shock.

CHEST INJURIES

The ***chest*** is the upper part of the trunk. The chest is shaped by 12 pairs of ribs. Ten of the pairs attach to the ***sternum*** (breastbone) in front and to the spine in back. Two pairs, the floating ribs, attach only to the spine. The ***rib cage***, formed by the ribs, the sternum and the spine, protects vital organs, such as the heart, major blood vessels and the lungs **(Figure 14-1)**. Also in the chest are the esophagus, the trachea and the muscles of respiration.

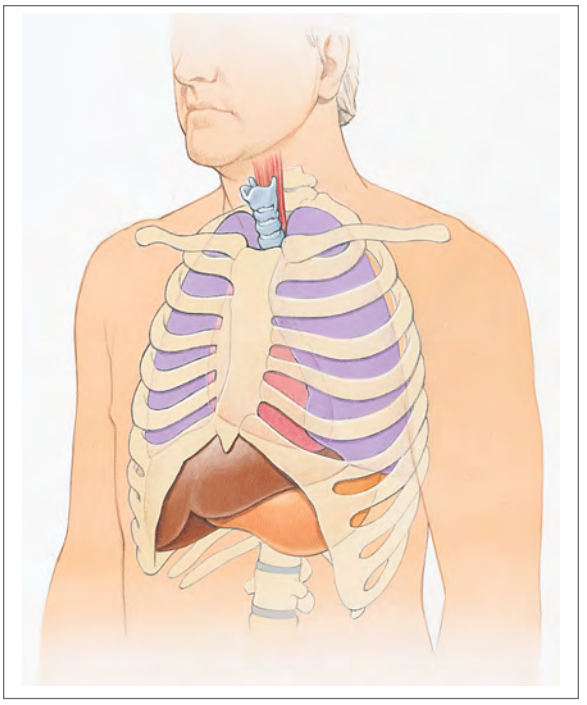


FIGURE 14-1 *The rib cage surrounds and protects several vital organs.*

Chest injuries are the second leading cause of trauma deaths each year in the United States. Injuries to the chest may result from a wide variety of causes, such as motor vehicle accidents, falls, sports mishaps and crushing or penetrating forces **(Figure 14-2, A–C)**. About 35 percent of deaths from motor-vehicle collisions involve chest injuries. Chest injuries may involve the bones that form the chest cavity or they may involve the organs or other structures in the cavity itself.

Chest wounds are either open or closed. Open chest wounds occur when an object, such as a knife or bullet, penetrates the chest wall. Fractured ribs may break through the skin to cause an open chest injury. A closed chest wound does not break the skin. Closed chest wounds are generally caused by blunt objects, such as steering wheels.

Signals of Chest Injuries

You may recognize some of the signals of a serious chest injury from previous discussions of respiratory distress, soft tissue injuries and musculoskeletal injuries. They include:

- Trouble breathing or no breathing.
- Severe pain at the site of the injury.
- Flushed, pale, ashen or bluish skin.

FIGURE 14-2, A–C **A,** *Crushing forces,* **B,** *direct blows and* **C,** *falls can all lead to chest injuries.*

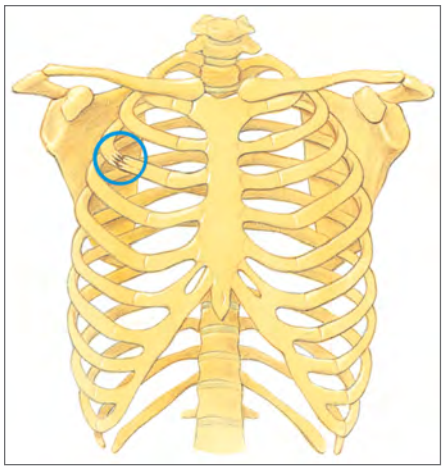


FIGURE 14-3 *A simple rib fracture is painful but rarely life threatening.*

FIGURE 14-4 *A person with a rib injury usually attempts to ease the pain by creating an anatomical splint with his or her hand or arm and leaning toward the side of the injury.*

- Obvious deformity, such as that caused by a fracture.
- Coughing up blood (may be bright red or dark like coffee grounds).
- Bruising at the site of a blunt injury, such as that caused by a seat belt.
- A "sucking" noise or distinct sound when the person breathes.

Rib Fractures

Rib fractures are usually caused by direct force to the chest. Although painful, a simple rib fracture is rarely life threatening **(Figure 14-3)**. A person with a fractured rib generally remains calm, but his or her breathing is shallow because normal or deep breathing is painful. The person will usually attempt to ease the pain by supporting the injured area with a hand or arm and leaning toward the side of the fracture **(Figure 14-4)**. When ribs are fractured, suspect the possibility of internal injuries.

Rib fractures are less common in children because children's ribs are so flexible that they bend rather than break. However, the forces that can cause a rib fracture in adults can severely bruise the lung tissue of children, which can be a life-threatening injury. Look for signals, such as what caused the injury, bruising on the chest and trouble breathing, to determine if a child has a potential chest injury.

Care for Rib Fractures

If you suspect a fractured rib, follow these care steps:

- Have the person rest in a position that will make breathing easier. Encourage the person to take deep, slow breaths if tolerated. Do *not* move the person if you suspect a head, neck or spinal injury.
- Call 9-1-1 or the local emergency number.
- Give the person a blanket or pillow to hold against the fractured ribs to support and immobilize the area **(Figure 14-5)**.
- Use a sling and binder to hold the person's arm and/or blanket or pillow against the injured side of the chest.
- Monitor breathing.
- Take steps to minimize shock.

What if...

A person coughs violently and thinks she fractured a rib? Is this really possible?

Believe it or not … the answer is yes! Blunt chest trauma is not the only cause of acute rib fractures. Cough-induced rib fractures, while rare, can and do occur, causing a person acute chest pain. This is more likely in women with a chronic cough. If a person experiences the signals of rib fractures after coughing, give care as you would for any rib fracture—including calling 9-1-1 or the local emergency number.

Puncture Wounds

Puncture wounds to the chest range from minor to life threatening and cause varying degrees of internal or external bleeding. Stab and gunshot wounds are examples of puncture injuries.

If the injury penetrates the rib cage, air can pass freely in and out of the chest cavity, and the person cannot breathe normally **(Figure 14-6)**. With each breath the person takes, you hear a sucking sound coming from the wound (although the sound might not be easily heard in a noisy environment). This sound is the primary signal of a penetrating chest injury called

FIGURE 14-5 *When a rib fracture occurs, have the person use a pillow or folded blanket to support and immobilize the injured area.*

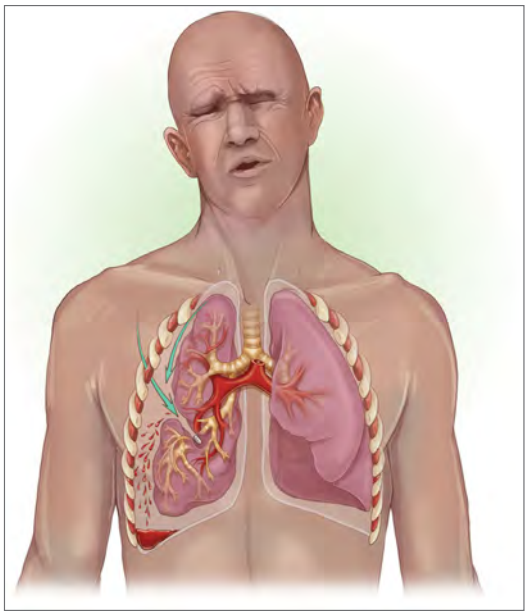


FIGURE 14-6 *When a puncture wound penetrates the rib cage, air can pass freely in and out of the chest cavity and the person cannot breathe normally.*

a sucking chest wound. Without proper care, the person's condition will worsen. The affected lung or lungs will fail to function, and breathing will become more difficult.

Care for Puncture Wounds

To care for a sucking chest wound:

- Call 9-1-1 or the local emergency number.
- Cover the wound with a large **occlusive dressing**, a dressing that does not allow air to pass through it **(Figure 14-7, A)**. A piece of plastic wrap or a plastic bag folded several times and placed over the wound makes an effective occlusive dressing. If these materials are not available to use as dressings, use a folded cloth.
- Tape the dressing in place, except for one side or corner that remains loose **(Figure 14-7, B)**. A taped-down dressing keeps air from entering the wound when the person inhales, and having an open corner allows air to escape when the person exhales.
- Monitor the person's breathing.
- Take steps to minimize shock.

To care for an impaled object in the chest:

- Call 9-1-1 or the local emergency number.
- Do *not* remove the object, unless it interferes with chest compressions.
- Stabilize the object to prevent further damage.
- Remove clothing to expose the wound.

FIGURE 14-7, A–B **A,** *An occlusive dressing helps keep air from entering a chest wound when the person inhales.* **B,** *Having an open corner allows air to escape when the person exhales.*

- Control bleeding by applying direct pressure to the edges of the wound (but avoid placing direct pressure on the object).
- Use a sterile bulky dressing or gauze around the object to hold it in place. Carefully pack the dressing around the object.
- Secure the sterile bulky dressing in place with gauze, a cravat or tape.

ABDOMINAL INJURIES

The ***abdomen*** is the area immediately under the chest and above the pelvis. It is easily injured because it is not surrounded by bones, although it is partially protected at the back by the lower ribs and spine and in the front by the lower ribs. The muscles of the back and abdomen also help protect vital internal organs such as the liver, spleen and stomach **(Figure 14-8)**. These vital organs are easily injured and tend to bleed profusely when injured. The liver and spleen are less protected in children because the major parts of the organs are positioned below the rib cage and the abdominal muscles in children are not as strong as those of adults.

Located in the upper right part of the abdomen, the liver is protected somewhat by the lower ribs. However, it is delicate and can be torn by blows from blunt objects or penetrated by a fractured rib. The resulting bleeding can be severe and can quickly be fatal. When the liver is injured, bile (a yellow-green fluid that is made by the liver) can also leak into the abdomen, which can cause severe irritation and infection.

The spleen is located behind the stomach and is protected somewhat by the lower left ribs. Like the liver, this organ is easily damaged. The spleen may rupture when the abdomen is struck forcefully by a blunt object. Because the spleen stores blood, an injury to the spleen can cause a severe loss of blood in a short time and can be life threatening.

The stomach is one of the main digestive organs. The upper part of the stomach changes shape depending on its contents, the stage of digestion and the size and strength of the stomach muscles. The stomach can bleed severely when injured, and food contents may leak into the abdominal cavity and possibly cause infection.

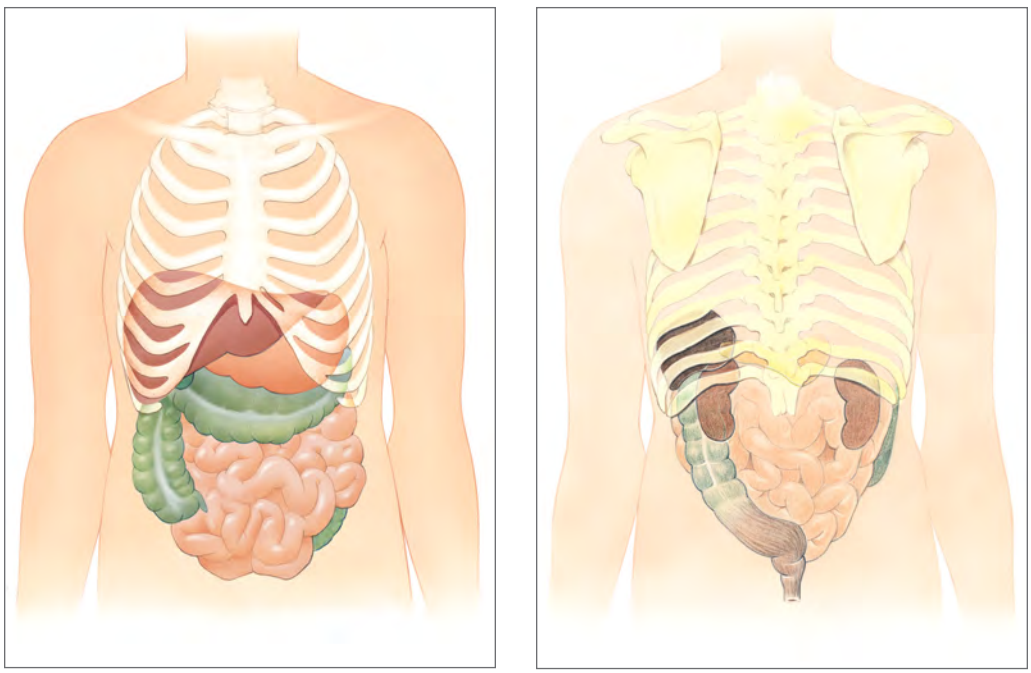


FIGURE 14-8 *Unlike the organs of the chest or pelvis, organs in the abdominal cavity are relatively unprotected by bones.*

Like a chest injury, an injury to the abdomen may be either open or closed. Injuries to the abdomen can be very painful. Even with a closed wound, the rupture of an organ can cause serious internal bleeding that results in shock. It is especially difficult to determine if a person has an internal abdominal injury if he or she is unconscious.

Signals of Abdominal Injuries

Always suspect an abdominal injury in a person who has multiple injuries. Signals of serious abdominal injury include:

- Severe abdominal pain.
- Bruising.
- External bleeding.
- Nausea and vomiting (sometimes vomit containing blood).
- Pale, or ashen, cool, moist skin.
- Weakness.
- Thirst.
- Pain, tenderness or a tight feeling in the abdomen.
- Organs protruding from the abdomen.
- Rigid abdominal muscles.
- Other signals of shock.

Care for Abdominal Injuries

Call 9-1-1 or the local emergency number for *any* serious abdominal injury. With a severe open injury, abdominal organs sometimes protrude through the wound **(Figure 14-9, A)**.

To care for an open wound to the abdomen, follow these steps:

- Put on disposable gloves or use another barrier.
- Do *not* apply direct pressure.
- Do *not* push any protruding organs back into the open wound.
- Remove clothing from around the wound **(Figure 14-9, B)**.
- Apply a moist (clean, warm tap water can be used), sterile or clean dressing loosely over the wound **(Figure 14-9, C)**.
- Cover the dressing loosely with plastic wrap, if available.
- Cover the dressing lightly with a folded towel to maintain warmth **(Figure 14-9, D)**.
- Keep the person from getting chilled or overheated.

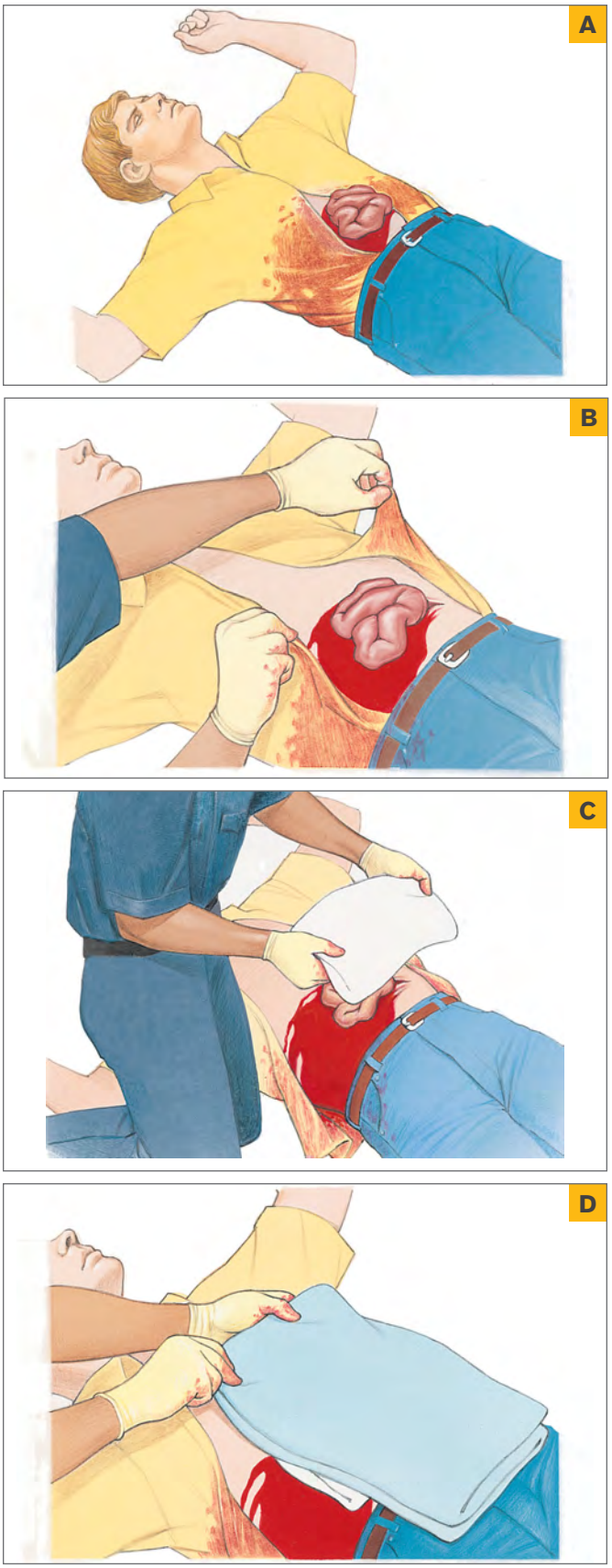


FIGURE 14-9, A–D **A,** *Severe injuries to the abdominal cavity can result in protruding organs.* **B,** *Carefully remove clothing from around the wound.* **C,** *Apply a large, moist, sterile dressing over the wound and cover it with plastic wrap.* **D,** *Place a folded towel over the dressing to maintain warmth.*

What if...

I am giving care to someone with an open abdominal injury in which the organs are protruding, but I have only a small dressing available with which to cover the area?

In the event of protruding abdominal organs, your small sterile dressings are most likely not going to adequately cover the open wound. In this situation consider the use of clean sheets or blankets if they are available. Another option is using the lining of a jacket to cover the open wound and maintain warmth.

To care for a closed abdominal injury:

- Carefully position the person on his or her back with the knees bent, if that position does not cause pain. Bending the knees allows the muscles of the abdomen to relax.
- Avoid putting direct pressure on the area.
- Place rolled-up blankets or pillows under the person's knees if available.

Shock is likely to occur with any serious abdominal injury. Call 9-1-1 or the local emergency number immediately, and take steps to minimize shock. Keep the person from becoming chilled or overheated, and monitor breathing and how the skin looks and feels until emergency medical services (EMS) personnel arrive.

To care for an impaled object in the abdomen:

- Do *not* remove the object.
- Dress the wound around the object to control bleeding.
- Stabilize the object with bulky dressings to prevent movement.

PELVIC INJURIES

The ***pelvis*** is the lower part of the trunk. It contains the bladder, reproductive organs and part of the large intestine, including the rectum. Major arteries (the femoral arteries) and nerves pass through the pelvis. It includes a group of large bones that form a protective girdle around the organs inside on a person's sides and back, but not in front **(Figure 14-10)**. A great force is required to cause serious injury to the pelvic bones.

Injuries to the pelvis may include fractures to the pelvic bone and damage to structures within. Fractured bones may puncture or lacerate these structures, or they can be injured when struck a forceful blow by blunt or penetrating objects. An injury to the pelvis sometimes involves the ***genitals***, the external reproductive organs. Genital injuries are

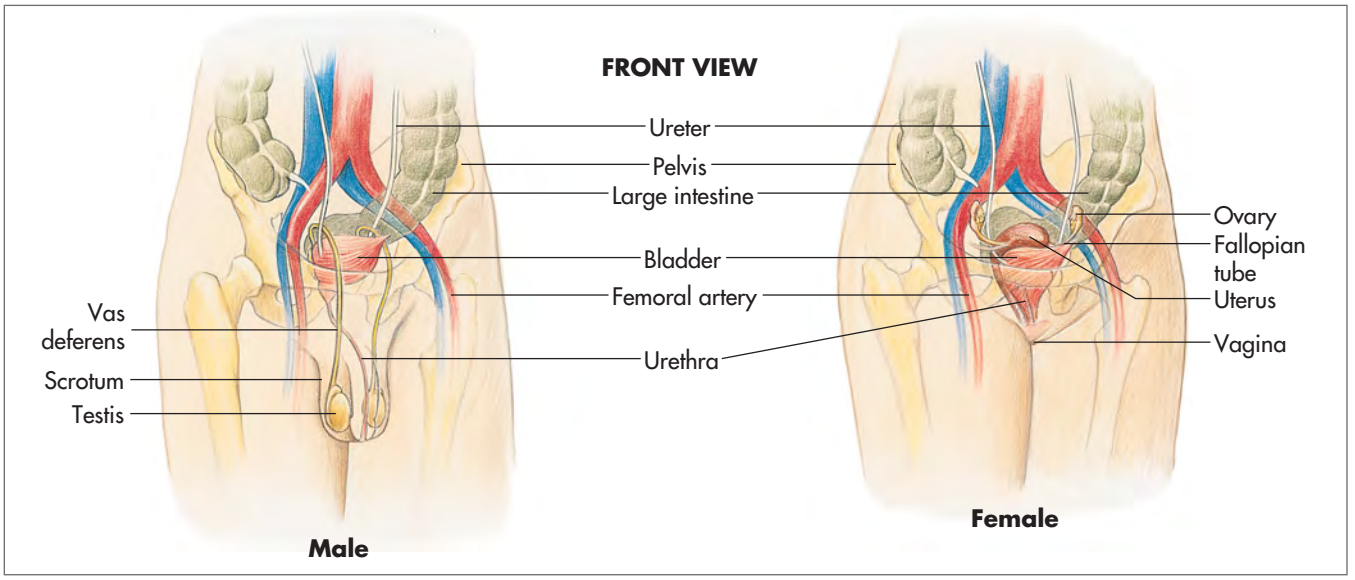


FIGURE 14-10 *The internal structures of the pelvis are well protected on the sides and back, but not in front.*

either closed wounds, such as a bruise, or open wounds, such as an avulsion or laceration. Any injury to the genitals is extremely painful.

Signals of Pelvic or Genital Injuries

Signals of pelvic injury are the same as those for an abdominal injury. These signals include:

- Severe pain.
- Bruising.
- External bleeding.
- Nausea and vomiting (sometimes containing blood).
- Weakness.
- Thirst.
- Pain, tenderness or a tight feeling in the area.
- Organs protruding from the area.
- Rigid abdominal muscles.
- Other signals of shock.

Care for Pelvic or Genital Injuries

Always call 9-1-1 or the local emergency if you suspect a pelvic injury. Because an injury to the pelvis also can involve injury to the lower spine, it is best not to move the person. If possible, try to keep the person lying flat. Watch for signals of internal bleeding and take steps to minimize shock until EMS personnel take over.

Any injury to the genitals is extremely painful. Care for a closed wound to the male genitals as you would for any closed wound. Wrap the penis in a soft, sterile dressing moistened with saline solution, and apply a cold compress to reduce pain and swelling. As with any injury, *never* remove an impaled object. Stabilize the object and bandage it in place.

If the injury is an open wound, apply a sterile dressing and direct pressure with your gloved hand or the patient's hand, or use a protective barrier to avoid contact. If the penis is partially or completely amputated, apply a sterile pressure dressing to help stop bleeding, which may be significant. Aggressive direct pressure may also be needed if bleeding is excessive. If any parts are avulsed or completely amputated, wrap them in sterile gauze, moistened in sterile saline if available. Then place them in a plastic bag, labeled with the person's name and the time and date they were placed in the bag. Keep the bag cool by placing it in a larger bag or container of ice and water slurry, *not* on ice alone and *not* on dry ice. Give the bag to the EMS personnel when they arrive.

It is also possible for injuries to affect the scrotum and testicles. A blow to this area can rupture the scrotum and can cause pooling of blood, which is extremely painful. A ruptured testicle requires surgery. Apply an ice pack to the area to reduce swelling and pain and, if the scrotal skin has become avulsed, try to find it. Wrap the skin in sterile dressing and transport it with the person. The scrotum should be dressed with gauze sterilized and moistened with saline. Apply pressure to control bleeding.

To give care for injury to the female genitals, control bleeding with pressure using compresses moistened with saline. Use a diaper-like dressing for the wound and stabilize any impaled objects with a bandage. Use ice packs over the dressing to reduce swelling and ease pain. *Never* place anything in the vagina, including dressing. Treat the person for shock as required.

What if...

I am in a situation where a person has an open wound to the genitals, but is a minor?

This can be a difficult situation, not because the care given is any different from the care given to an open wound to the forearm, but simply because of the age of the person and the location of the injury. To manage this situation, first, take time to slowly and clearly explain to the minor what care needs to occur. If the minor does not want you to help, and can follow your directions, walk him or her through the care steps. If the minor is of the opposite sex, consider seeking assistance from a same-sex bystander to either give care or to be witness to your actions. Of course, if the minor's parents are available, you should also consider soliciting their assistance in giving care. Finally, while this can be an embarrassing situation for both the person and the first aid provider, remember to always act confidently.

Take care to provide the person with privacy by clearing the area of onlookers and draping a sheet or blanket over the person. Do *not* touch the genitals. Ask if the person has suffered any other injuries, such as to the head. Be aware that if you are caring for a genital injury, sexual assault may be involved and you may be at a crime scene. If bleeding is life threatening, this will take priority over maintaining the integrity of a crime scene.

SUMMARY

Injuries to the chest, abdomen or pelvis can be serious. They can damage soft tissues, bones and internal organs. Although many injuries are immediately obvious, some may be detected only as the person's condition worsens over time. Watch for the signals of serious injuries that require medical attention.

Care for any life-threatening conditions, and then give any additional care needed for specific injuries. Always call 9-1-1 or the local emergency number as soon as possible. Have the person remain as still as possible. For open wounds to the chest, abdomen or pelvis, control bleeding. If you suspect a fracture, immobilize the injured part. Use occlusive dressings for sucking chest wounds and open abdominal wounds when these materials are available. Your actions can make the difference in the person's chance of survival.

READY TO RESPOND?

Think back to the bicyclist in the opening scenario, and use what you have learned to respond to these questions:

1. What signals of injury does the bicyclist have, and what type of injury do they likely point to?
2. What steps should you take to help the man until EMS personnel arrive?

STUDY QUESTIONS

1. Match each term with the correct definition.

    a. Abdomen
    b. Chest
    c. Genitals
    d. Pelvis
    e. Sternum

_____ External reproductive organs

_____ The middle part of the trunk, containing the stomach, liver and spleen

_____ The upper part of the trunk, containing the heart, major blood vessels and lungs

_____ Long, flat bone in the middle of the front of the rib cage, also called the breastbone

_____ The lower part of the trunk, containing the intestines, bladder and reproductive organs

2. List five general guidelines for care for injuries to the chest, abdomen and pelvis.

3. List seven signals of chest injury.

4. List six signals of abdominal or pelvic injury.

In question 5, circle the letter of the correct answer.

5. Care for injuries to the chest, abdomen and pelvis includes—

    a. Watching for changes in a person's breathing.
    b. Controlling internal bleeding.
    c. Giving the person fluids.
    d. Minimizing bystander activity.

Base your answers for questions 6 through 8 on the scenario below.

You arrive at the local convenience store late Saturday night to satisfy your frozen yogurt craving. As you enter, you notice drops of blood on the floor. A robbery has just occurred—the store clerk appears to have been beaten and stabbed. He is conscious but in considerable pain and is having trouble breathing. You hear a sucking sound coming from his chest when he breathes.

6. What type of injury does the person have?

7. Identify the signals that support your answer to question 6.

8. Describe the steps you would take to help this person.

Answers are listed in Appendix B.

Part Five

MEDICAL EMERGENCIES

15

Sudden Illnesses

You've been asked to meet with Paul, a recruiter from a company you are interested in joining. When you arrive right on time at 1:00 pm, his receptionist leads you to an open door, where you are both surprised to find Paul with his head down on his desk. He does not look up when the receptionist calls his name. With a look of panic on her face, she says something about diabetes and the fact that Paul ran out of time for lunch after going to the gym for a vigorous workout during his lunch break.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Recognize the signals of a sudden illness.
- List the general guidelines for giving care to a person with a sudden illness.
- Describe how to care for a person who faints.
- Describe how to care for a person having a diabetic emergency.
- Describe how to care for a person having a seizure.
- Describe how to care for a person having a stroke.
- Identify ways to reduce the risk of a stroke or transient ischemic attack (TIA).

KEY TERMS

Absence seizure: A type of generalized seizure in which there are minimal or no movements; the person may appear to have a blank stare; also known as a petit mal or non-convulsive seizure.

Aura phase: The first stage of a generalized seizure, during which the person experiences perceptual disturbances, often visual or olfactory in nature.

Clonic phase: The third phase of a generalized seizure, during which the person experiences the seizure itself.

Complex partial seizure: A type of partial seizure in which the person may experience an altered mental status or be unresponsive.

Diabetes: A disease in which there are high levels of blood glucose due to defects in insulin production, insulin action or both.

Diabetic emergency: A situation in which a person becomes ill because of an imbalance of insulin and sugar (glucose) in the bloodstream.

Epilepsy: A brain disorder characterized by recurrent seizures.

Fainting: Temporary loss of consciousness; usually related to temporary insufficient blood flow to the brain; also known as syncope, "blacking out" or "passing out."

Febrile seizure: Seizure activity brought on by an excessively high fever in a young child or an infant.

Generalized tonic-clonic seizure: A seizure that affects most or all of the brain; types include petit mal and grand mal seizures.

Glucose: A simple sugar that is the primary source of energy for the body's tissues.

Grand mal seizure: A type of generalized seizure that involves whole body contractions with loss of consciousness.

Hyperglycemia: A condition in which too much sugar (glucose) is in the bloodstream, resulting in higher than normal blood glucose levels; also known as high blood glucose.

Hypoglycemia: A condition in which too little sugar (glucose) is in the bloodstream, resulting in lower than normal blood glucose levels; also known as low blood glucose.

Insulin: A hormone produced by the pancreas to help glucose move into cells; in persons with diabetes, it may not be produced at all or may not be produced in sufficient amounts.

Partial seizure: A seizure that affects only part of the brain; may be simple or complex.

Post-ictal phase: The fourth and final phase of a generalized seizure, during which the person becomes extremely fatigued.

Simple partial seizure: A seizure in which a specific body part experiences muscle contractions; does not affect memory or awareness.

Stroke: A disruption of blood flow to part of the brain that may cause permanent damage to brain tissue; also called a cerebrovascular accident (CVA).

Tonic phase: The second phase of a generalized seizure, during which a person becomes unconscious and muscles become rigid.

Transient ischemic attack (TIA): A condition that produces stroke-like symptoms but causes no permanent damage; may be a precursor to stroke; sometimes called a mini-stroke.

INTRODUCTION

While some illnesses develop over time, others can strike without a moment's notice. If a person suddenly becomes ill, it is important to respond quickly and effectively. However, when illness happens suddenly, it can be hard to determine what is wrong and what you should do to help.

In this chapter, you will learn about the signals of some common sudden illnesses, such as fainting, diabetic emergencies, seizures and strokes. You will also learn how to use the emergency action steps **CHECK—CALL—CARE** to help someone who becomes suddenly ill—whether or not you know the exact cause.

SUDDEN ILLNESSES

It usually is obvious when someone is injured and needs care. The person may be able to tell you what happened and what hurts. Checking the person also gives you clues about what might be wrong. However, when someone becomes suddenly ill, it is not as easy to tell what is physically wrong.

Sudden illness may result from a condition that has a rapid and severe onset **(acute)**, or it may result from a persistent condition that continues or develops over a long period of time **(chronic)**. Sometimes, there are no signals to give clues about what is happening. At other times, the signals only confirm that something is wrong, without being clear as to what is wrong. In either case, the signals of a sudden illness often are confusing. You may find it difficult to determine if the person's condition is an emergency and whether to call 9-1-1 or the local emergency number.

Ultimately, if a person looks and feels ill, there could be a medical emergency that requires immediate care. If you have any doubts about the severity of a person's sudden illness, call 9-1-1 or the local emergency number.

Signals of Sudden Illnesses

When a person becomes suddenly ill, he or she usually looks and feels sick. Common signals include:

- Changes in level of consciousness, such as feeling lightheaded, dizzy, drowsy or confused, or becoming unconscious.
- Breathing problems (i.e., trouble breathing or no breathing).
- Signals of a possible heart attack, including persistent chest pain, discomfort or pressure lasting more than a few minutes that goes away and comes back or that spreads to the shoulder, arm, neck, jaw, stomach or back. Refer to Chapter 6 for more about heart attack.
- Signals of a stroke, including sudden weakness on one side of the

face (facial droop); sudden weakness, often on one side of the body; sudden slurred speech or trouble forming words; or a sudden, severe headache.
- Loss of vision or blurred vision.
- Signals of shock, including rapid breathing, changes in skin appearance and cool, pale or ashen (grayish) skin. Refer to Chapter 9 for more about shock.
- Sweating.
- Persistent abdominal pain or pressure.
- Nausea or vomiting.
- Diarrhea.
- Seizures.

Be sure to survey the scene to identify clues that might tell you what is wrong with the person. This may help you to find out what the person was doing when the illness started. For example, if someone suddenly feels ill or acts strangely and is attempting to take medication, the medication may be a clue as to what is wrong.

Care for Sudden Illnesses

Although you may not know the exact cause of the sudden illness, you should still give care based on your level of training and what you observe. Unless you know for sure what is wrong with a person, initially you will care for the signals and not for any specific condition. Care for sudden illnesses by following the same general guidelines as you would for any emergency. After checking the scene and then the person for any life-threatening conditions:

- Do no further harm.
- Monitor the person's level of consciousness and breathing. A change in the person's condition may be a signal of a more serious illness or injury. A condition that may not appear serious at first may become serious over time.
- Help the person rest in the most comfortable position.
- Keep the person from getting chilled or overheated.
- Comfort and reassure the person, but do not give false hope.
- Give any specific care as needed.

In addition, if the person you are helping is conscious, ask if he or she has any medical conditions or is taking any medication. If you know the person is having a severe allergic reaction or a diabetic emergency, assist the person with his or her prescribed medication, if asked. Do *not* give the person anything to eat or drink unless he or she is fully conscious, is able to swallow and does not show any signals of a stroke (see the section on Stroke below). If the person vomits and is unconscious and lying down, position the person on his or her side in the modified high arm in endangered spine (H.A.IN.E.S.) recovery position so that you can clear the mouth. Finally, remember that depending on the condition in which you find the person, you may be able to do little more than help him or her rest comfortably and provide reassurance until emergency medical services (EMS) personnel arrive. However, knowing enough about sudden illness to recognize when to call 9-1-1 or the local emergency number is your top priority as a lay responder.

SPECIFIC SUDDEN ILLNESSES

Some sudden illnesses may be linked with chronic conditions. These conditions include degenerative diseases, such as heart and lung diseases. There may be a hormone imbalance, such as in diabetes. The person could have epilepsy, a condition that causes seizures. An allergy can cause a sudden and sometimes dangerous reaction to certain substances. When checking a person, look for a medical alert tag, bracelet, necklace or anklet indicating that the person has a chronic condition or allergy.

Having to deal with a sudden illness can be frightening, especially when you do not know what is wrong. Do not hesitate to give care. Remember, you do not have to know the cause to help; recognizing when to call 9-1-1 or the local emergency number is just as important. Signals for sudden illnesses are similar to those for other conditions and the care probably involves skills that you already know.

Fainting

One common signal of sudden illness is a loss of consciousness. ***Fainting*** (also known as **syncope**) is a temporary loss of consciousness caused by a temporary reduction of blood flow to the brain, such as when blood pools in the legs and lower body. When the brain is suddenly deprived of its normal blood flow, it momentarily shuts down and the person faints.

Fainting usually is not harmful. The person usually recovers quickly with no lasting effects. However, what appears to be a simple case of fainting actually may be a signal of a more serious condition. For example, fainting can be triggered by an emotionally stressful event, such as the sight of blood, or by standing for long periods of time. Some people, such as pregnant women or the elderly, are more likely than others to faint when suddenly changing positions, such as moving from sitting or lying down to standing. Yet fainting may also be caused by pain and specific medical conditions such as heart disease. Any time changes inside the body momentarily reduce the blood flow to the brain, fainting may occur.

Signals of Fainting

Fainting may occur with or without warning. A person who is about to faint often becomes pale or will have ashen, cool moist skin, begins to sweat and then loses consciousness and collapses. A person who feels lightheaded, weak or dizzy may prevent a fainting spell by lying down or sitting with his or her head level with the knees.

Care for Fainting

Usually, fainting is a self-correcting condition. When the person collapses, normal circulation to the brain typically resumes and the person regains consciousness within a minute. Fainting itself does not usually harm the person, but related injuries, such as those from falling (e.g., striking the head on the ground), may occur. If you can reach the person as he or she is starting to collapse, lower him or her to the ground or other flat surface. Then give care as follows:

- Position the person on his or her back, lying flat.
- Loosen any tight or restrictive clothing, such as a tie or a collar **(Figure 15-1)**.
- Check that the person is breathing.
- If the person vomits, roll him or her onto one side.

FIGURE 15-1 *To care for a person who has fainted, place the person on his or her back lying flat and loosen any restrictive clothing, such as a tie or collar.*

If you are unsure of the person's condition once he or she regains consciousness, or if moving is painful for the person, keep him or her lying flat. Do *not* give the person anything to eat or drink. Also, do not slap the person or splash water on his or her face. Splashing water could cause the person to **aspirate** the water.

As long as the fainting person recovers quickly and has no lasting signals, you may not need to call 9-1-1 or the local emergency number. However, you should make the call if you are in doubt about the condition of the person who has fainted or if he or she has sustained an injury as a result

of the sudden illness. If you do not call for help, it is always appropriate to have a bystander or family member take the person to a health care provider or emergency department to determine if the fainting episode is linked to a more serious condition.

Diabetic Emergencies

A total of 23.6 million people in the United States (7.8% of the population) have diabetes. Among this group, more than 5 million people are unaware that they have the disease. Overall, the risk for death among people with diabetes is about twice that of people without diabetes.

The American Diabetes Association defines ***diabetes*** as the inability of the body to change sugar (glucose) from food into energy. This process is regulated by insulin, a hormone produced in the pancreas. Diabetes can lead to other medical conditions such as blindness, periodontal (gum) disease, nerve disease, kidney disease, heart disease and stroke.

The cells in your body need sugar (***glucose***) as a source of energy. The cells receive this energy during digestion or from stored forms of sugar. The sugar is absorbed into the bloodstream with the help of ***insulin*** **(Figure 15-2)**. Insulin is produced in the pancreas. For the body to function properly, there has to be a balance of insulin and sugar. People who have diabetes may become suddenly ill because there is too much or too little sugar in their bloodstream.

There are two major types of diabetes: type 1 and type 2 diabetes.

Type 1 diabetes, formerly called juvenile diabetes, affects about 1 million Americans. This type of diabetes, which usually begins in childhood, occurs when the body produces little or no insulin. People with type 1 diabetes must inject insulin into their bodies daily **(Figure 15-3)**. Type 1 diabetes is a chronic disease that currently has no cure.

The exact cause of type 1 diabetes is not known. Warning signals include:

- Frequent urination.
- Increased hunger and thirst.
- Unexpected weight loss.
- Irritability.
- Weakness and fatigue.

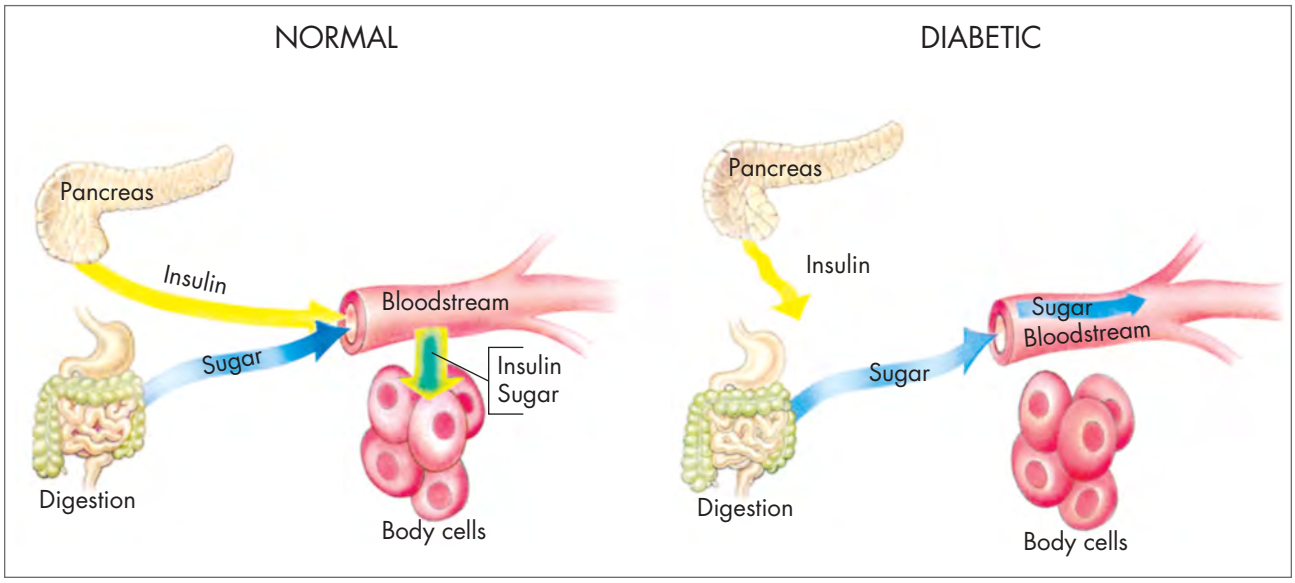


FIGURE 15-2 *Insulin is needed to take sugar from the bloodstream into the body cells. For the body to function properly, there has to be a balance of insulin and sugar.*

Type 2 diabetes is the most common type, affecting about 90 to 95 percent of people with diabetes. This condition usually occurs in adults but can also occur in children. With type 2 diabetes, the body does not produce enough insulin to meet the body's needs or the body becomes resistant to the insulin it produces. Since type 2 diabetes is a progressive disease, people with this type of diabetes eventually may need to use insulin.

People from certain racial and ethnic backgrounds are known to be at greater risk for diabetes. Type 2 diabetes is more common among African-Americans, Latinos, Asians, certain Native Americans and Pacific Islanders. Although genetics and other factors increase the risk for diabetes, being overweight or obese also is a risk factor for developing the disease in adults and children.

FIGURE 15-3 *People with type 1 diabetes must inject insulin into their bodies daily.*

People with type 2 diabetes often do not experience any warning signals. Possible warning signals of type 2 diabetes include:

- Any signals of type 1 diabetes.
- Frequent infections, especially involving the skin, gums and bladder.
- Blurred vision.
- Numbness in the legs, feet and fingers.
- Cuts or bruises that are slow to heal.
- Itching.

People with type 2 diabetes can regulate their blood glucose levels sufficiently through diet and sometimes through oral medications, without the need for insulin injections. People must carefully monitor their blood glucose levels, diet and exercise. If insulin-dependent, type 2 diabetics also must monitor their use of insulin. If the person with diabetes does not control these factors, he or she can have a ***diabetic emergency***. A diabetic emergency is caused by an imbalance between sugar and insulin in the body **(Figure 15-4)**.

When the insulin level in the body is too low, the sugar level in the blood begins to rise too high. This condition is called ***hyperglycemia***. Sugar is present in the blood, but it cannot be transported from the blood into the cells without insulin. In this condition, body cells become starved for sugar. The body attempts to meet its need for energy by using other stored food and energy sources, such as fats. However, converting fat to energy is less efficient, produces waste products and increases the acidity level in the blood, causing a condition called **diabetic ketoacidosis**. As this occurs, the person with diabetic ketoacidosis becomes ill. He or she may have flushed, hot, dry skin and a sweet, fruity breath odor that can be mistaken for the smell of alcohol. The person also may appear restless or agitated. If the condition is not treated promptly, **diabetic coma**, a life-threatening emergency, can occur.

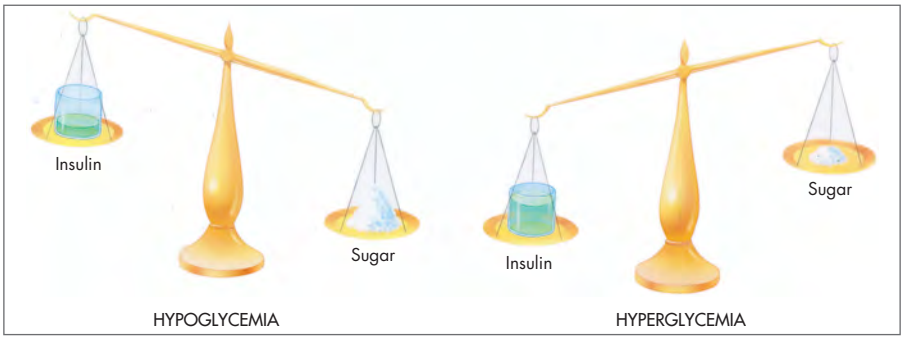


FIGURE 15-4 *Hypoglycemia and hyperglycemia are diabetic emergencies that result from an imbalance between sugar and insulin within the body.*

On the other hand, when the insulin level in the body is too high, the

person has a low blood sugar level. This condition is known as ***hypoglycemia***. The blood sugar level can become too low if the diabetic:

- Takes too much insulin.
- Fails to eat adequately or due to sudden illness cannot keep food or liquids down.
- Over-exercises and burns off sugar faster than normal.
- Experiences great emotional stress.

In this situation, sugar is used up rapidly, so not enough sugar is available for the brain to function properly. If left untreated, hypoglycemia may result in a life-threatening condition called **insulin shock**.

Many people who have diabetes have blood glucose monitors that can be used to check their blood sugar level if they are conscious. Many hyperglycemic and hypoglycemic episodes are now managed at home because of the rapid information these monitors provide.

Signals of Diabetic Emergencies

Although hyperglycemia and hypoglycemia are different conditions, their major signals are similar. These include:

- Changes in level of consciousness.
- Changes in mood.
- Irregular breathing.
- Feeling and looking ill.
- Abnormal skin appearance.
- Dizziness and headache.
- Confusion.

It is not important for you to differentiate between hyperglycemia and hypoglycemia because the basic care for both of these diabetic emergencies is the same.

Care for Diabetic Emergencies

If you know someone experiencing the signals listed above, you may know the person is a diabetic. A person who is conscious may also tell you he or she is a diabetic. You can also look for a medical alert tag or bracelet. Often diabetics know what is wrong and will ask for something with sugar in it. They may carry some form of sugar with them in case they need it.

FIGURE 15-5 *If a person having a diabetic emergency is conscious and able to swallow, give him or her a form of sugar.*

If the diabetic person is conscious and able to swallow, and advises you that he or she needs sugar:

- Give sugar in the form of several glucose tablets or glucose paste, or a 12-ounce serving of fruit juice (e.g., orange juice), milk, nondiet soft drink or table sugar dissolved in a glass of water **(Figure 15-5)**. Most fruit juices and nondiet soft drinks have enough sugar to be effective.
- If the problem is too much sugar, this amount of sugar will not cause further harm.

Diabetics also may carry glucagon, which they can self-administer to counter hypoglycemia. People who take insulin to control diabetes may have injectable medication with them to care for hyperglycemia. Do *not* try to assist a person by administering insulin to them.

Always call 9-1-1 or the local emergency number if:

- The person is unconscious or about to lose consciousness. In this situation, do not give the person anything by mouth. After calling 9-1-1 or the local emergency number, care for the person in the same way you would care for an unconscious person. This includes making sure the person's airway is clear of vomit, checking for breathing and giving care until advanced medical personnel take over.
- The person is conscious but unable to swallow. (In this case, do not put anything, liquid or solid, into the person's mouth.)
- The person does not feel better within about 5 minutes after taking some form of sugar.
- You cannot find any form of sugar immediately. Do not spend time looking for it.

For more information about diabetes, contact the American Diabetes Association at 800-DIABETES, go to diabetes.org or visit the National Diabetes Education Program website at ndep.nih.gov. For specific information about type 1 diabetes, contact the Juvenile Diabetes Research Foundation at 800-533-CURE or at jdrf.org.

Seizures

When the normal functions of the brain are disrupted by injury, disease, fever, infection, metabolic disturbances or conditions causing a decreased oxygen level, a seizure may occur. The seizure is a result of abnormal electrical activity in the brain and causes temporary involuntary changes in body movement, function, sensation, awareness or behavior.

Types of Seizures

Generalized Seizures

Generalized tonic-clonic seizures, also called ***grand mal seizures***, are the most well-known type of seizure. They involve both hemispheres (halves) of the brain and usually result in loss of consciousness. The seizure activity is known as tonic-clonic, which refers to the initial rigidity (tonic phase) followed by rhythmic muscle contractions (clonic phase), or convulsions.

Before a generalized seizure occurs, the person may experience an unusual sensation or feeling called an aura. An aura can include a strange sound, taste, or smell or an urgent need to get to safety. If the person recognizes the aura, there may be time to warn bystanders and to sit or lie down before the seizure occurs.

What if...

I am helping person having a diabetic emergency, but do not know whether he or she has type 1 or type 2 diabetes?

You do not need to identify what type of diabetes the person has; rather, you simply need to know if the person has diabetes (remember to look for a medical alert tag or bracelet if the person cannot tell you) and whether or not the person is exhibiting signals of a diabetic emergency. A responsive person with a history of diabetes will normally be able to tell you what is wrong and what care or assistance he or she requires. If the person is unresponsive, call 9-1-1 or the local emergency number and do *not* give him or her anything by mouth, including food, water, or commercially produced glucose (sugar) tablets or gel pastes.

What if...

A member of a group I am traveling with has diabetes, and the weather service is predicting a major storm event that could strand us for several days? How can I help make sure the person is prepared to avoid a diabetic emergency?

The American Diabetes Association believes that people with diabetes should always be ready for an emergency that has the potential to cause a major disruption one's life, such as a hurricane, earthquake, tornado or blizzard. The organization offers the following tips for emergency preparedness: A person with diabetes should always have adequate supplies on hand (the American Diabetes Association recommends storing 3 days worth), such as oral medication, insulin, insulin delivery supplies, lancets, extra batteries for the person's meter and/or pump, and a quick-acting source of glucose. In addition, there should be a plan in place before a situation such as the ones above arises; and a list of emergency contacts, including physicians and medical supply stores, should be stored with the emergency supplies. Finally, if you are aware that a member of your group has diabetes, ask the person to tell you where you can find his or her emergency supplies and contact information in case the person needs to rely on you for help.

Generalized seizures usually last 1 to 3 minutes and can produce a wide range of signals. When a seizure occurs, the person loses consciousness and can fall, causing injury. The person may become rigid, and then experience sudden, uncontrollable muscular contractions (convulsions), lasting several minutes. Breathing may become irregular and even stop temporarily. The person may drool and the eyes may roll upward. As the seizure subsides and the muscles relax the person may have a loss of bladder or bowel control.

The stages of most generalized seizures are as follows:

1. ***Aura phase:*** person may sense something unusual (not all persons will experience an aura)
2. ***Tonic phase:*** unconsciousness then muscle rigidity
3. ***Clonic phase:*** uncontrollable muscular contractions (convulsions)
4. ***Post-ictal phase:*** diminished responsiveness with gradual recovery and confusion (person may feel confused and want to sleep)

Partial Seizures

Partial seizures may be simple or complex. They usually involve only a very small area of one hemisphere of the brain. Partial seizures are the most common type of seizure experienced by people with epilepsy (see the related section on Epilepsy below). Partial seizures can spread and become a generalized seizure.

In ***simple partial seizures***, the person usually remains aware. There may be involuntary, muscular contractions in one area of the body, such as the arm, leg or face. Some people cannot speak or move during a simple partial seizure, although they may remember everything that occurred. Simple partial seizures may produce a feeling of fear or a sense that something bad is about to happen. Simple partial seizures can also produce odd sensations such as strange smells or hearing voices. Rarely, feelings of anger and rage or joy and happiness can be brought on by the seizure. Auras are a form of simple partial seizure.

Complex partial seizures usually last for 1 to 2 minutes, though they may last longer, and awareness is either impaired or lost while the person remains conscious. Complex partial seizures often begin with a blank stare followed by random movements such as smacking the lips or chewing. The person appears dazed, the movements are clumsy and the person's activities lack direction. He or she may be unable to follow directions or answer questions. The person cannot remember what happened after the seizure is over, and may be confused. This is called the post-ictal phase.

Absence (Petit Mal) Seizures

Individuals may also experience an ***absence seizure***, also known as a petit mal seizure. These are most common in children. During an absence seizure, there is brief, sudden loss of awareness or conscious activity that may be mistaken for daydreaming. There may be minimal or no movement and the person may appear to have a blank stare. Most often these seizures last only a few seconds.

Absence seizures may also be referred to as non-convulsive seizures, because the body remains relatively still during the episode, though eye fluttering and chewing movements may be seen.

Febrile Seizures

Young children and infants may be at risk for ***febrile seizures***, which are seizures brought on by a rapid increase in body temperature. They are most common in children under the age of 5.

Febrile seizures are often caused by ear, throat or digestive system infections and are most likely to occur when a child or an infant runs a rectal temperature of over 103° F. An individual experiencing a febrile seizure may experience some or all of the following symptoms:

- Sudden rise in body temperature
- Change in consciousness
- Rhythmic jerking of the head and limbs
- Loss of bladder or bowel control
- Confusion
- Drowsiness
- Crying out
- Becoming rigid
- Holding the breath
- Rolling the eyes upward

Epilepsy

Epilepsy is a common neurological disorder, estimated to affect approximately 3 million people in the United States alone. Epilepsy is not a specific disease but a term used to describe a group of disorders in which the individual experiences recurrent seizures as the main symptom. In about one-third of all cases, seizures occur as a result of a brain abnormality or neurological disorder, but in two-thirds of cases there is no known cause.

In young people (up to the age of 20), the risk for having epilepsy is approximately 1 percent, with the greatest likelihood occurring during the first year of life. People ages 20 to 55 may also develop epilepsy, but have a somewhat lower risk. The risk increases again after the age of 65, and in fact, the highest rate of new epilepsy diagnoses is in this age group. The prevalence of epilepsy, or the number of individuals suffering with it at any time, is estimated to be approximately 5 to 8 in every 1000 people. By age 75, approximately 3 percent of people will have been diagnosed with epilepsy.

Persons who have epilepsy often can control the seizures with medication. Those with seizures that are difficult to control may also be treated with surgical resection, which can be curative, or with implanted devices, such as the vagus nerve stimulator, that help reduce seizure frequency. While some people require lifelong medical therapy, sometimes medication may be reduced or even eliminated over time. Some childhood epilepsies may resolve with age.

Care for Seizures

Seeing someone have a seizure may be intimidating, but you can easily care for the person. The person cannot control any muscular contractions that may occur and it is important to allow the seizure to run its course, because attempting to stop it or restrain the person can cause musculoskeletal injuries.

Protecting the person from injury and managing the airway are your priorities when caring for a person having a seizure. To help avoid injury, you should move nearby objects, such as furniture, away from the person. People having seizures rarely bite the tongue or cheeks with enough force to cause any significant bleeding. Do *not* place anything in the mouth to prevent this type of injury. Foreign bodies in the mouth may cause airway obstruction. Do *not* put fingers into the mouth of an actively seizing person to clear the airway. After the seizure passes, position the person on his or her side in a modified H.A.IN.E.S recovery position so that fluids (saliva, blood, vomit) can drain from the mouth.

What if...

A person starts having a seizure, and another individual at the scene insists that something should be put between the person's teeth to prevent them from biting the tongue? Should I stop them?

Yes! Trying to insert an object into a person's mouth when he or she is having a seizure is dangerous, and in fact may cause dental damage or aspiration of foreign materials into the lungs. If the person seems to doubt your stance, let him or her know you are trained in first aid and explain that there is no current evidence that recommends taking this step to care for a person having a seizure.

In many cases, the seizure will be over by the time you arrive. In this case, the person may be drowsy and disoriented; this is the post-ictal phase. Check to see if the person was injured during the seizure. Offer comfort and reassurance, especially if the seizure occurred in public, as the person may feel embarrassed and self-conscious. If this is the case, keep bystanders well back to provide maximum privacy and stay with the person until he or she is fully conscious and aware of the surroundings.

Care for a child or an infant who experiences a febrile seizure is similar to the care for any other person experiencing a seizure. Immediately after a febrile seizure, cool the body by removing excess clothing and giving the person a sponge bath in *lukewarm* water. Ensure the water is lukewarm; cold water could lead to a rapid drop in body temperature, which could cause shivering and/or stimulation of the nervous system, which could bring on another seizure. Rapid cooling with cold water could bring on other complications as well. Contact a health care provider before administering any medication, such as acetaminophen, to control fever. Do *not* give aspirin to a feverish child under 18 years of age or to an infant, as this has been linked to **Reye's syndrome**, an illness that affects the brain and other internal organs.

When to Call 9-1-1

The person will usually recover from a seizure in a few minutes. If you discover the person has a medical history of seizures that are medically controlled, there may be no need for medical attention. However, in the following cases, advanced medical care should be provided:

- The seizure lasts more than 5 minutes or the person has repeated seizures with no sign of slowing down **(status epilepticus)**.
- The person appears to be injured.
- You are uncertain about the cause of the seizure.
- The person is pregnant.
- The person is known to have diabetes.
- The person is a child or an infant.
- The seizure takes place in water.
- The person fails to regain consciousness after the seizure.
- The person is a young child or an infant who experienced a febrile seizure brought on by a high fever.
- The person is elderly and could have suffered a stroke.
- This is the person's first seizure.

Status epilepticus is an epileptic seizure (or repeated seizures) that lasts longer than 5 minutes without any sign of slowing down. A status epilepticus seizure is a true medical emergency that may be fatal. If you suspect the person is experiencing this type of seizure, call 9-1-1 or the local emergency number immediately.

Stroke

Stroke is the third leading killer and a leading cause of long-term disability in the United States. Nearly 800,000 Americans will have a stroke this year.

A ***stroke***, also called a cerebrovascular accident (CVA) or "brain attack," is caused when blood flow to a part of the brain is cut off or when there is bleeding into the brain. A stroke can cause permanent brain damage (if not treated appropriately within several hours), but sometimes the damage can be stopped or reversed.

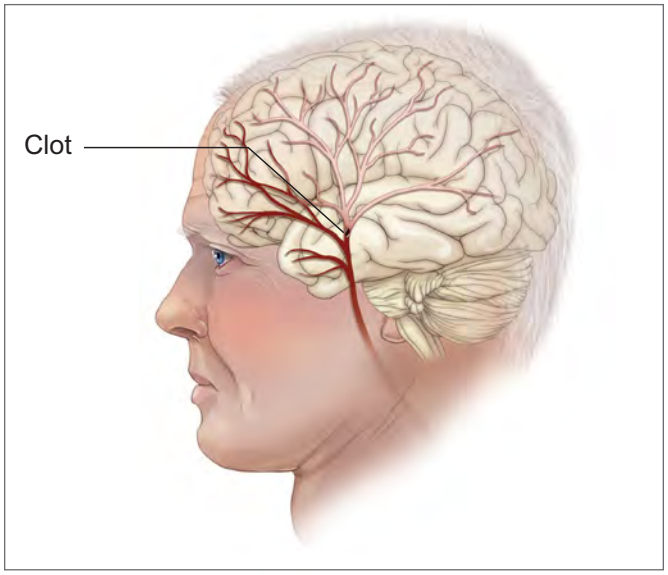


FIGURE 15-6 *Strokes are most commonly caused by a blood clot in the arteries that supply blood to the brain.*

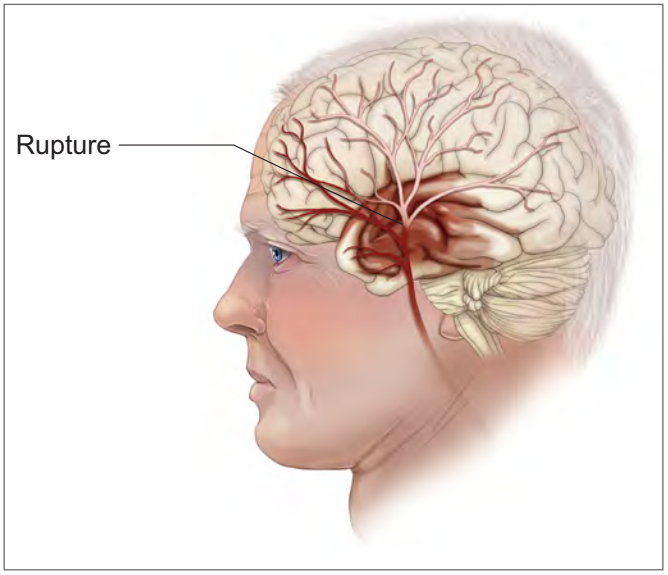


FIGURE 15-7 *A less common cause of stroke is bleeding from a ruptured artery in the brain.*

Most commonly, a stroke is caused by a blood clot, called a **thrombus** or **embolus**, that forms or lodges in the arteries that supply blood to the brain **(Figure 15-6)**. Another common cause of stroke is bleeding from a ruptured artery in the brain caused by a head injury, high blood pressure or an **aneurysm**—a weak area in the wall of an artery that balloons out and can rupture **(Figure 15-7)**. Fat deposits lining an artery **(atherosclerosis)** may also cause stroke. Less commonly, a tumor or swelling from a head injury may compress an artery and cause a stroke.

A ***transient ischemic attack (TIA)***, often referred to as a "mini-stroke," is a temporary episode that, like a stroke, is caused by a disruption in blood flow to a part of the brain. However, unlike a stroke, the signals of TIA disappear within a few minutes or hours of its onset. Although the indicators of TIA disappear quickly, the person is not out of danger at that point. In fact, someone who experiences TIA has a greater chance (10 times) of having a stroke in the future than someone who has not had a TIA. Because you cannot distinguish a stroke from a TIA, remember to call 9-1-1 or the local emergency number immediately when any signals of stroke appear.

Risk Factors for Stroke

The risk factors for stroke are similar to those for heart disease. Some risk factors are beyond one's control, such as age, gender and family history of stroke or cardiovascular disease. Other risk factors can be controlled through diet, changes in lifestyle or medication. The chances of having a stroke are increased in persons with a history of high blood pressure, previous stroke or mini-stroke, diabetes or heart disease.

Uncontrolled high blood pressure is the number one risk factor for stroke. If you have high blood pressure, you are approximately seven times more likely to have a stroke compared with someone who does not have high blood pressure. High blood pressure puts added pressure on the arteries and makes them stiffer. The excess pressure also damages organs, including the brain, heart and kidneys. Even mildly elevated blood pressure can increase one's risk of a stroke. Diabetes is another major risk factor for stroke. If uncontrolled, the resulting elevated blood sugar levels can damage blood vessels throughout the body. See Smart Moves: Preventing Stroke to learn strategies for controlling the risk factors for stroke.

SMART MOVES: PREVENTING STROKE

While some risk factors for stroke are beyond your control, there are steps that can be taken to decrease the role other risk factors play—and live a healthier lifestyle all around.

- **Control your blood pressure.** This is the most important of the controllable risk factors. Have your blood pressure checked regularly. If it is high, follow the advice of your health care provider about how to lower it. Often, high blood pressure can be controlled by losing weight, changing diet, exercising routinely and managing stress. If those measures are not sufficient, your health care provider may prescribe medication.
- **Control diabetes.** If you have been diagnosed with diabetes, follow the advice of your health care provider about how to control it.
- **Do not smoke,** which increases your blood pressure, damages blood vessels and makes blood more likely to clot. If you smoke and would like to quit, many techniques and support systems are available to help, including seeking help from your health care provider or local health department. The benefits of quitting smoking begin as soon as you stop, and some of the damage from smoking actually may be reversible. Approximately 10 years after a person has stopped smoking, his or her risk for stroke is about the same as the risk for a person who has never smoked.
- **Avoid second-hand smoke.** Even if you do not smoke, it is important to avoid long-term exposure to second-hand cigarette smoke and to protect children from this danger as well.
- **Eat a healthy diet.** Limiting your intake of foods high in cholesterol and saturated fat can help to prevent stroke as these can cause fatty materials to build up on the walls of your blood vessels. Foods high in cholesterol include egg yolks and organ meats, such as liver and kidneys. Saturated fats are found in beef, lamb, veal, pork, whole milk and whole-milk products.
- **Exercise regularly.** Regular exercise reduces your chance of having a stroke by strengthening the heart and improving blood circulation. Exercise also helps in weight control. Being overweight increases the chance of developing high blood pressure, heart disease and atherosclerosis.

Signals of a Stroke

By paying attention to the signals of stroke and reporting them to your physician, you can prevent damage before it occurs. Experiencing a TIA is the clearest warning that a stroke may occur. Do not ignore its stroke-like signals, even if they disappear completely within minutes or hours.

As with other sudden illnesses, looking or feeling ill and behaving in a strange way are common, general signals of a stroke or mini-stroke. Other specific signals of stroke have a sudden onset, including:

- Facial droop or drooling **(Figure 15-8, A)**.
- Weakness or numbness of the face, arm or leg. This usually happens on only one side of the body **(Figure 15-8, B)**.
- Trouble with speech. The person may have trouble talking, getting words out or being understood when speaking, and may have trouble understanding.
- Loss of vision or disturbed (blurred or dimmed) vision in one or both eyes. The pupils may be of unequal size.
- Sudden severe headache. The person will not know what caused the headache and may describe it as “the worst headache ever.”
- Dizziness, confusion, agitation, loss of consciousness or other severe altered mental status.

- Loss of balance or coordination, trouble walking or ringing in the ears.
- Incontinence.

See Think FAST for Stroke to learn more about spotting the signals and acting quickly to get the person advanced medical care.

Care for a Stroke

Call 9-1-1 or the local emergency number immediately if you encounter someone who is having or has had a stroke, or if the person had a mini-stroke (even if the signals have gone away). In addition:

- Note the time of onset of signals and report it to the call taker or EMS personnel when they arrive.
- If the person is unconscious, make sure that he or she has an open airway and care for any life-threatening conditions:
  - If fluid or vomit is in the person's mouth, position him or her in a modified H.A.IN.E.S recovery position.
  - You may have to remove some fluids or vomit from the mouth by using one of your fingers (use precautions when possible).
  - Stay with the person and monitor his or her breathing and for changes in his or her condition.

FIGURE 15-8, A–B *Signals of stroke include:* **A,** *facial drooping and* **B,** *weakness on one side of the body.*

THINK FAST FOR STROKE

For a stroke, think FAST to identify the signals, and get the person advanced medical care in the most timely manner possible. FAST stands for:

Face: Weakness, numbness or drooping on one side of the face. Ask the person to smile. Does one side of the face droop?

Arm: Weakness or numbness in one arm. Ask the person to raise both arms. Does one arm drift downward?

Speech: Slurred speech or difficulty speaking. Ask the person to repeat a simple sentence (e.g., Ask the person to say something like, "The sky is blue.") Are the words slurred? Can the person repeat the sentence correctly?

Time: Try to determine when the signals began. If the person shows any signals of stroke, time is critical. Call 9-1-1 or the local emergency number right away.

The FAST mnemonic is based on the Cincinnati Pre-Hospital Stroke Scale, which was developed in 1997 to help EMS personnel to identify strokes in the field. The FAST method for public awareness has been in use in the community in Cincinnati, Ohio, since 1999. Researchers at the University of North Carolina validated it in 2003 as an appropriate tool for helping lay persons to recognize and respond quickly to the signals of stroke.

What if...

I think a person is having a stroke, but I am not really sure?

A stroke is a significant medical emergency requiring timely advanced medical care. Even if you are not 100% sure a stroke is the cause of a person's sudden illness, always immediately call 9-1-1 or the local emergency number if you think a person may be having, or may have already experienced, a stroke. The person's greatest chance for recovery from stroke begins when emergency care is started immediately. The sooner physicians can determine the cause of the stroke; the sooner they can prescribe a plan of care.

- If the person is conscious, check for non-life-threatening conditions:
  - Offer comfort and reassurance as a stroke can make the person fearful and anxious. Often, he or she does not understand what has happened.
  - Have the person rest in a comfortable position.
  - Do not give him or her anything to eat or drink.

Although a stroke may cause the person to experience difficulty speaking, he or she can usually understand what you say. If the person is unable to speak, you may have to use nonverbal forms of communication, such as hand squeezing or eye blinking, and communicate in forms that require a yes-or-no response (squeeze or blink once for "yes," twice for "no").

In the past, a stroke almost always caused irreversible brain damage. Today, new medications and medical procedures can limit or reduce the damage caused by stroke. Many of these new treatments are time-sensitive; therefore, you should immediately call 9-1-1 or the local emergency number to get the best care for the person.

SUMMARY

Sudden illness can strike anyone at any time. When a person becomes suddenly ill, it can be frightening to that person, to you and to other bystanders. Unless a person can tell you what is wrong, such as a diabetic who knows he or she needs sugar, or the signals seem to clearly indicate a stroke according to the FAST mnemonic, it may be difficult to determine what is causing the sudden illness, and you might not know what care to give. However, even if you do not know the cause of the illness, you can still give proper care. Recognizing the signals of sudden illness, such as changes in consciousness; pale, cool or clammy skin; confusion and weakness, will help you determine the necessary care to give the person until EMS personnel arrive.

READY TO RESPOND?

Think back to Paul in the opening scenario, and use what you have learned to respond to these questions:

1. What type of sudden illness does Paul seem to have? Why do you think so?
2. What should you do after making sure the scene in the office is safe?
3. After calling 9-1-1, the receptionist comes in with a glass of juice to offer Paul. Should you allow her to give it to him?

STUDY QUESTIONS

1. Match each term with the correct definition.

a. Diabetic emergency	f. Insulin
b. Epilepsy	g. Generalized tonic-clonic seizure
c. Fainting	h. Stroke
d. Hyperglycemia	i. Transient ischemic attack (TIA)
e. Hypoglycemia	

_____ A hormone produced by the pancreas to help glucose move into cells

_____ Temporary loss of consciousness; usually related to temporary insufficient blood flow to the brain

_____ A disruption of blood flow to a part of the brain that may cause permanent damage to brain tissue

_____ Seizures that affect most or all of the brain; types include petit mal and grand mal seizures

_____ A condition in which too little sugar is in the bloodstream

_____ A condition in which too much sugar is in the bloodstream

_____ A brain disorder characterized by recurrent seizures

_____ A condition that produces stroke-like symptoms but causes no permanent damage; may be a precursor to stroke

_____ A situation in which a person becomes ill because of an imbalance of insulin and sugar (glucose) in the bloodstream

2. List six general signals of a sudden illness.

3. List four general guidelines of care that should be applied for any sudden illness.

4. Describe how to care for a seizure once the seizure is over.

In questions 5 through 12, circle the letter of the correct answer.

5. If you were caring for someone who looked pale, was unconscious and was breathing irregularly, what should you do?

   a. Call 9-1-1 or the local emergency number.
   b. Inject the person with insulin.
   c. Give sugar to the person.
   d. Let the person rest for a while.

6. A friend who has diabetes is drowsy and seems confused. He is not sure if he took his insulin today. What should you do?

    a. Suggest he rest for an hour or so.
    b. Tell him to take his insulin.
    c. Have him eat or drink something with sugar in it.
    d. Check for breathing and signs of life.

7. Your father has diabetes. He also suffered a stroke a year ago. You find him lying on the floor, unconscious. What should you do after calling 9-1-1 or the local emergency number?

    a. Call his physician.
    b. Lift his head up and try to give him a sugary drink.
    c. Check for breathing, signs of life and severe bleeding.
    d. Inject him with insulin yourself, while waiting for EMS personnel to arrive.

8. In caring for the person having a seizure, you should—

    a. Move any objects that might cause injury.
    b. Try to hold the person still.
    c. Place a spoon between the person's teeth.
    d. Splash the person's face with water.

9. To reduce the risk of aspiration for blood or other fluids in a person who has a seizure —

    a. Place an object between the person's teeth.
    b. Position the person on his or her side after the seizure ends.
    c. Place a thick object, such as a rolled blanket, under the person's head.
    d. Move the person into a sitting position.

10. Controlling high blood pressure reduces your risk for—

    a. Heart disease, stroke and TIA.
    b. Seizure.
    c. Diabetes.
    d. Epilepsy.

11. At the office, your boss complains that she has had a severe headache for several hours. Her speech suddenly becomes slurred. She loses her balance and falls to the floor. What should you do?

    a. Give her two aspirin.
    b. Help her find and take her high blood pressure medication.
    c. Call 9-1-1 or the local emergency number.
    d. Tell her to rest for a while.

12. Which of the following is (are) included in the care you give for fainting?

    a. If possible, help to lower the person to the floor or other flat surface.
    b. If possible, elevate the legs.
    c. Give the person something to eat or drink.
    d. a and c

Answers are listed in Appendix B.

16 Poisoning

You stop by your cousin's house to drop off some things for a family party she's having later that evening. She answers the door and explains that she's in the middle of cleaning the bathroom. After directing you to drop the things you've brought in the kitchen, she heads back upstairs to finish. That's when you hear her cry out, "Oh no! Sophia!" Sophia is her 3-year-old daughter, and when you run up to see what's wrong your cousin is wiping something from Sophia's mouth and looking distressed. Sophia is seated next to the cleaning supplies that were left on the floor.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Understand when to call the poison control center and when to call 9-1-1 or the local emergency number.
- Identify the general guidelines for care for any poisoning emergency.
- List the four ways poisons enter the body.
- Identify the signals of each type of poisoning.
- Describe how to care for a person based on the type of poisoning.
- Identify the signals of and care for anaphylaxis.
- List the ways to prevent poisoning.

KEY TERMS

Absorbed poison: A poison that enters the body through the skin.

Anaphylaxis: A form of distributive shock caused by an often sudden severe allergic reaction, in which air passages may swell and restrict breathing; also referred to as anaphylactic shock.

Ingested poison: A poison that is swallowed.

Inhaled poison: A poison that is breathed into the lungs.

Injected poison: A poison that enters the body through a bite, sting or syringe.

Poison: Any substance that can cause injury, illness or death when introduced into the body, especially by chemical means.

Poison Control Center (PCC): A specialized health center that provides information on poisons or suspected poisoning emergencies.

INTRODUCTION

A ***poison*** is any substance that causes injury, illness or death when introduced into the body. In 2008, poison control centers (PCCs) received more than 2.4 million calls from people who had come into contact with a poison. Over 93 percent of these poisonings took place in the home and 50 percent involved children under age 6. Poisoning deaths in children under age 6 represented about 2 percent of the total deaths from poisoning, while the 20- to 59-year-old age group represented about 76 percent of all deaths from poisoning. Child-resistant packaging for medications and preventive actions by parents and others who care for children have resulted in a decline in child poisonings. At the same time, there has been an increase in adult poisoning deaths, which is linked to an increase in both suicides and drug-related poisonings. See Common Causes of Poisoning (by Age Group) for more information.

In this chapter, you will learn about the four ways in which poisons can enter the body—ingestion, inhalation, absorption and injection. You will also learn about the types of poisons that fall into each of these categories, how to recognize the signals of each type of poisoning and how to give care for each. You will learn about how and when to contact your local or regional PCC or summon more advanced medical personnel.

COMMON CAUSES OF POISONING (BY AGE GROUP)

Younger than age 6

Analgesic medications ("painkillers")
Cleaning substances
Cosmetics and personal care products
Cough and cold remedies
Gastrointestinal medications
Plants
Topical medications
Vitamins

Ages 6 to 19

Analgesic medications
Bites and stings
Cleaning substances
Cosmetics
Cough and cold remedies
Food products and food poisoning
Plants
Stimulants and street drugs

Older than age 19

Analgesic medications
Antidepressant drugs
Bites and stings
Chemicals
Cleaning substances
Food products and food poisoning
Fumes and vapors
Insecticides
Sedatives and hallucinogenic drugs

Later chapters cover additional types of poisoning emergencies, including bites and stings (Chapter 17) and substance abuse and misuse (Chapter 18).

POISONING

Poisonings can be accidental or intentional. Some poisons—including many medications—are not deadly or harmful in small doses, but become dangerous if taken into the body in larger amounts. The severity of a poisoning depends on three factors:

- The type and amount of the substance
- The time that has elapsed since the poison entered the body
- The person's age, size (build), weight and medical conditions

How will you know if someone who is ill has been poisoned? Look for clues about what has happened. Try to get information from the person or from bystanders. As you check the scene, be aware of unusual odors, flames, smoke, open or spilled containers, an open medicine cabinet or an overturned or a damaged plant. Also, notice if the person is showing any of the signals in the sections that follow on types of poisoning.

You also may suspect a poisoning based on information from or about the person. If you suspect someone has swallowed a poison, try to find out:

- The type of poison.
- The quantity taken.
- When it was taken.
- How much the person weighs.

This information can help you and others to give the most appropriate care.

General Care for Poisoning

After you have checked the scene and determined that there has been a poisoning, you should follow these general care guidelines:

- Remove the person from the source of poison if the scene is dangerous. Do this only if you are able to do so without endangering yourself or bystanders.
- Check the person's level of consciousness and breathing:
  - For life-threatening conditions, such as if the person is unconscious or is not breathing, or if a change in the level of consciousness occurs, call 9-1-1 or the local emergency number immediately.
  - Care for any life-threatening conditions.
- If the person is conscious, ask questions to get more information about the current situation.
- Look for any containers and/or packaging and take them with you to the telephone.
- Call the National Poison Control Center Hotline at 800-222-1222 and follow any directions the call taker gives.

Poison Control Centers

Poison control centers (PCCs) are specialized health centers that provide information on poisons and suspected poisoning emergencies. A network of PCCs exists throughout the United States. Some PCCs are located in the emergency departments of large hospitals. Medical professionals in these centers have access to information about virtually all poisonous substances, and can tell you how to care for someone who has been poisoned. The American Association of Poison Control Centers also has a 24-hour Poison Help Hotline, which is staffed by pharmacists, physicians, nurses and toxicology specialists and can be reached at 800-222-1222.

PCCs answer over 2 million calls about poisoning each year. Since many poisonings can be treated without the help of emergency medical services (EMS) personnel, PCCs help prevent overburdening of the EMS system. More than 70 percent of poison exposure cases can be managed over the phone. For more information, visit the American Association of Poison Control Centers website at www.aapcc.org.

You should call 9-1-1 or the local emergency number for a poisoning if you are unsure about what to do, you are unsure about the severity of the problem or it is a life-threatening condition. In general, call 9-1-1 or the local emergency number instead of the PCC if a person:

- Is unconscious, confused or seems to be losing consciousness.
- Has trouble breathing.
- Has persistent chest pain or pressure.
- Has pressure or pain in the abdomen that does not go away.
- Is vomiting blood or passing blood in his or her stool or urine.
- Has a seizure, severe headache or slurred speech.
- Acts aggressively or violently.

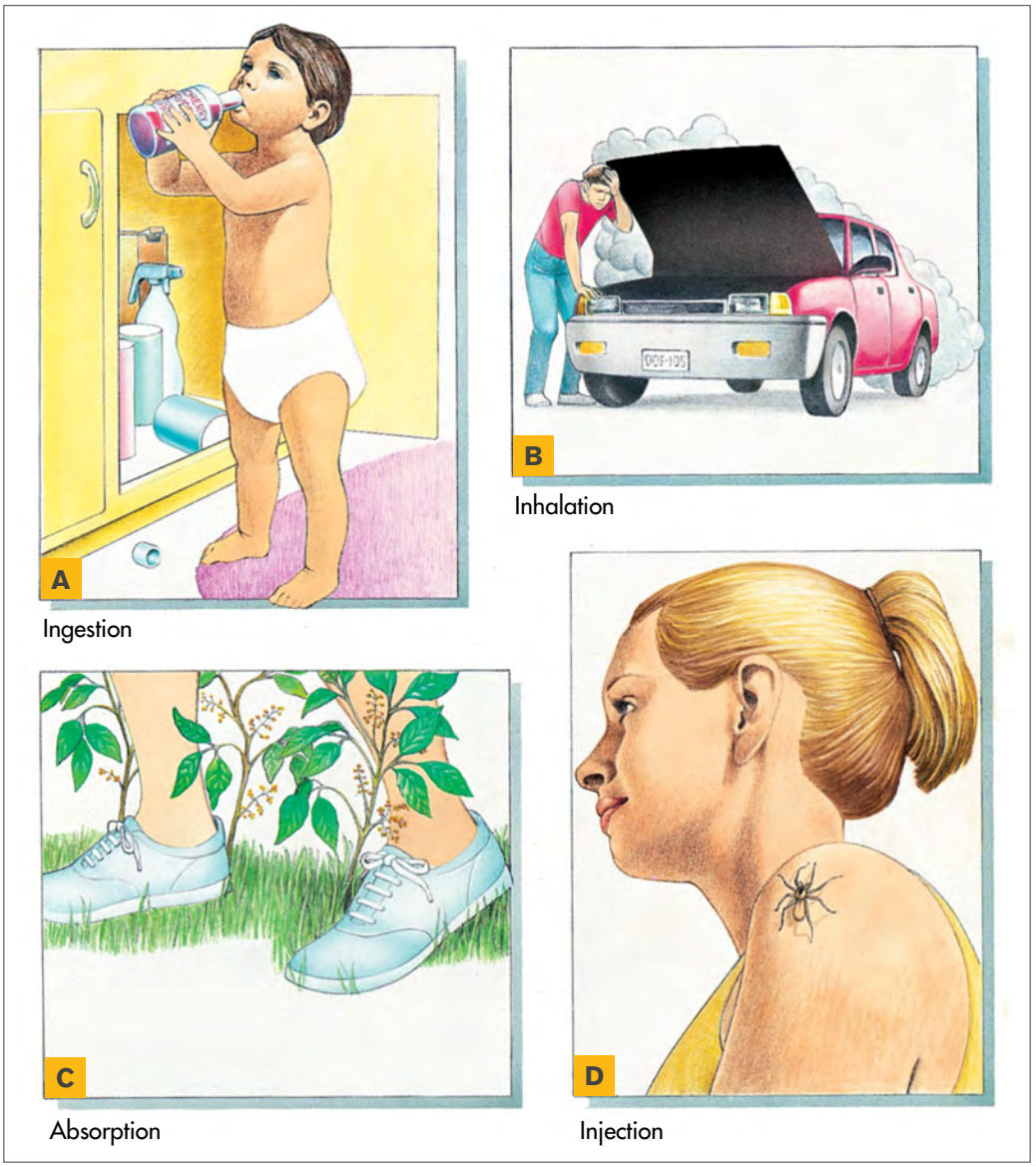


FIGURE 16-1, A–D *A poison can enter the body in four ways:* **A,** *ingestion,* **B,** *inhalation,* **C,** *absorption and* **D,** *injection.*

TYPES OF POISONING

Poisons are generally placed in four categories based on how they enter the body: ingestion, inhalation, absorption and injection **(Figure 16-1, A–D)**.

Ingested Poisonings

Ingested poisons are poisons that are swallowed and include items such as foods (e.g., certain mushrooms and shellfish), drugs (e.g., alcohol), medications (e.g., aspirin) and household items (e.g., cleaning products, pesticides and even household plants).

Young children tend to put almost everything in their mouths, so they are at a higher risk for ingesting poisons, including household cleaners and medications. Seniors may make

medication errors if they are prone to forgetfulness or have difficulty reading the small print on medicine container labels.

In addition, in 2007, the Centers for Disease Control and Prevention (CDC) estimated that 76 million people contract foodborne illnesses each year in the United States. Approximately 325,000 people are hospitalized and more than 5000 die from foodborne illness.

Two of the most common categories of food poisoning are bacterial and chemical food poisoning. Bacterial food poisoning typically occurs when bacteria grow on food that is allowed to stand at room temperature after being cooked, which releases toxins into the food. Foods most likely to cause bacterial food poisoning are meats, fish and dairy or dairy-based foods. Chemical food poisoning typically occurs when foods with high acid content, such as fruit juices or sauerkraut, are stored in containers lined with zinc, cadmium or copper or in enameled metal pans. Another primary source of chemical food poisoning is lead, which is sometimes found in older pipes that supply drinking and cooking water. Mercury, a heavy metal, can also be a source of food poisoning. Fish and shellfish, such as shark and swordfish, are a major dietary source of mercury. However, mercury can also come from other dietary items, dental fillings, pharmaceuticals and contact with mercury metal or its compounds (e.g., a mercury thermometer).

Two of the most common causes of food poisoning are *Salmonella* bacteria (most often found in poultry and raw eggs) and *Escherichia coli* (*E. coli*) (most often

SMART MOVES: PREVENTING FOOD POISONING

By following the steps Clean, Separate, Cook and Chill, you can reduce the likelihood of foodborne illnesses from occurring.

Clean

- Wash hands thoroughly (for 20 seconds) with soap and running water before and after preparing or handling food; between handling raw and cooked foods; and whenever handling food preparation surfaces, dishes and utensils.
- Wash all surfaces and utensils after each use.
- Wash fruits and vegetables, but not meat, poultry or eggs.

Separate

- Use separate cutting boards—one for produce and one for raw meat, poultry, seafood and eggs—as well as separate plates and utensils for cooked and raw foods.
- Keep meat, poultry, seafood and eggs separate from other food in your grocery cart, when bagging and later at home in the refrigerator.

Cook

- Use a food thermometer to make sure food is cooked to the proper temperature (see www.foodsafety.gov for more details). Clean the thermometer after each use.
- Keep food hot after cooking, at a temperature of at least 140° F.
- Follow microwave directions to cook food thoroughly (to 165° F). If the instructions say to let food sit after microwaving, do so as it allows the food to cook more completely.

Chill

- Refrigerate perishable foods within 2 hours.
- Make sure your refrigerator and freezer are at the right temperature: between 40° and 32° F and at 0° F or below, respectively.
- Never thaw or marinate foods on the counter.
- Know when to throw food out.

SOURCE: FoodSafety.gov, http://www.foodsafety.gov/keep/basics/index.html.

found in raw meats and unpasteurized milk and juices). The most deadly type of food poisoning is botulism, which is caused by a bacterial toxin usually associated with home canning. See Smart Moves: Preventing Food Poisoning to learn how to avoid foodborne illnesses.

Signals of Ingested Poisonings

A person who has ingested poison generally looks ill and displays symptoms common to other sudden illnesses. If you have even a slight suspicion that a person has been poisoned, seek immediate assistance from the PCC or by calling 9-1-1 or the local emergency number. Signals of ingested poisonings include:

- Nausea, vomiting or diarrhea.
- Chest or abdominal pain.
- Trouble breathing.
- Sweating.
- Changes in level of consciousness.
- Seizures.
- Headache or dizziness.
- Weakness.
- Irregular pupil size.
- Burning or tearing eyes.
- Abnormal skin color.
- Burn injuries around the lips or tongue or on the skin around the mouth.

The symptoms of food poisoning, which can begin between 1 and 48 hours after eating contaminated food, include nausea, vomiting, abdominal pain, diarrhea, fever and dehydration. Severe cases of food poisoning can result in shock or death, particularly in children, the elderly and those with an impaired immune system.

Care for Ingested Poisonings

For ingested poisons, immediately call the PCC and follow the call taker's directions. Do *not* give the person anything to eat or drink unless you are told to do so. If you do not know what the poison was and the person vomits, save some of the vomit. The hospital may analyze it later to identify the poison.

In some cases of ingested poisoning, the PCC may instruct you to induce vomiting. Vomiting may prevent the poison from moving to the small intestine, where most absorption takes place. However, vomiting should be induced only if advised by the PCC or a medical professional. The PCC or a medical professional will advise you exactly how to induce vomiting. In some instances, vomiting should not be induced. This includes when the person:

- Is unconscious.
- Is having a seizure.
- Is pregnant (in the last trimester).
- Has ingested a corrosive substance (such as drain or oven cleaner) or a petroleum product (such as kerosene or gasoline). Vomiting these corrosives could burn the esophagus, throat and mouth.
- Is known to have heart disease.

What if...

A person has ingested a poison and I have a bottle of syrup of ipecac? Should I give it to the person? That's what my mother used to keep on hand for such an emergency.

Although keeping a bottle of syrup of ipecac at home used to be widely recommended, that has changed and it is no longer suggested or promoted. In fact, these days there is no situation in which syrup of ipecac should be given for an ingested poison (except in rare cases as specifically recommend by a PCC) as there is a possibility of potentially significant harm. It can have serious contraindications, cause excessive and difficult to control vomiting, and can delay care given later in an advanced medical facility if needed. More generally, as taught in this chapter, you should never administer anything by mouth for any poison, or induce vomiting, unless advised to do so by a PCC or EMS personnel.

What if...

I suspect a person has food poisoning? Should I call 9-1-1 for that?

Maybe. It depends on the severity of person's condition. The great majority of foodborne illnesses are mild and cause symptoms for only a day or two. More severe cases tend to occur in the very old, the very young, those who have an illness already that reduces their immune system function, and healthy people exposed to a very high dose of an organism. If a person with food poisoning is unresponsive, not breathing or has changes in his or her level of consciousness, always call 9-1-1 or the local emergency number. Otherwise contact a local health care provider and/or the board or department of health.

Some people who have contracted food poisoning may require antibiotic or antitoxin therapy. Fortunately, most cases of food poisoning can be prevented by proper food handling and preparation.

Inhaled Poisonings

Inhaled poisons are those that are breathed into the lungs. Poisoning by inhalation occurs when a person breathes in poisonous gases or fumes. A commonly inhaled poison is carbon monoxide (CO), which is present in substances such as car exhaust and tobacco smoke. CO can also be produced by fires (gas and natural), defective gas cooking equipment, defective gas furnaces, gas water heaters and kerosene heaters. CO, which is a tasteless, odorless and colorless gas, is highly lethal and can cause death after only a few minutes of exposure.

Other common inhaled poisons include carbon dioxide, chlorine gas, ammonia, sulfur dioxide, nitrous oxide, chloroform, dry cleaning solvents, fire extinguisher gases, industrial gases and hydrogen sulfide. Paints and solvents produce fumes that some people deliberately inhale to get high, as do certain drugs, such as crack cocaine.

Signals of Inhaled Poisonings

Look for a substance (e.g., paint or solvent) around the mouth and nose of the person if you suspect deliberate inhalation. A pale or bluish skin color, which indicates a lack of oxygen, may signal CO poisoning. Other signals of inhaled poisonings include:

- Trouble breathing or a breathing rate that is faster or slower than normal.
- Chest pain or tightness.
- Nausea and vomiting.
- **Cyanosis**.
- Headaches, dizziness and confusion.
- Coughing, possibly with excessive secretions.
- Seizures.
- Altered mental status with possible unresponsiveness.

Care for Inhaled Poisonings

When giving care to a person who may have inhaled poison, follow appropriate safety precautions to ensure that you do not also become poisoned. Toxic fumes may or may not have an odor. If you notice clues at an emergency scene that lead you to suspect toxic fumes are present, such as a strong smell of fuel (sulfur or skunk smell) or a hissing sound (which could indicate gas escaping from a pipe or valve), you may not be able to reach the person without risking your own safety. In cases like this, call 9-1-1 or the local emergency number instead of entering the scene. Let EMS professionals know what you discovered, and only enter the scene if you are told it is safe to do so.

Anyone who has inhaled a poison needs oxygen as soon as possible. If you can remove the person from the source of the poison without endangering yourself, then do so. You can help a conscious person by getting him or her to fresh air and then calling for more advanced care personnel based on the situation. If you find an unconscious person, remove

FIGURE 16-2, A–C *Examples of absorbed poisons include:* **A,** *poison ivy,* Shutterstuck.com/Tim Mainiero; **B,** *poison oak,* Shutterstuck.com/Dwight Smith; *and* **C,** *poison sumac,* www.poison-ivy.org.

the person from the scene if it is safe to do so, and call 9-1-1 or the local emergency number. Then give care for any life-threatening conditions.

Absorbed Poisonings

Absorbed poisons enter through the skin or the mucous membranes in the eyes, nose and mouth. Absorbed poisons come from plants, as well as from chemicals and medications. Millions of people each year suffer irritating effects after touching or brushing against poisonous plants such as poison ivy, poison oak and poison sumac **(Figure 16-2, A–C)**. Other poisons absorbed through the skin include dry and wet chemicals, such as those used in flea collars for dogs and in yard and garden maintenance products, which may also burn the skin. Some medications, such as topical medications or transdermal patches, can also be absorbed through the skin.

Signals of Absorbed Poisonings

Some of the signals of absorbed poisonings include:

- Traces of the liquid, powder or chemical on the person's skin.
- Skin that looks burned, irritated, red or swollen.
- Blisters that may ooze fluid, or a rash.
- Itchy skin.

What if...

A person has poison ivy? Can she spread it to me while I'm helping care for it?

Poison ivy causes a rash when a person who is allergic comes into contact with the plant's urushiol, an oily resin produced by the plant that is responsible for irritating the skin. Urushiol does not dry easily and attaches to one's skin, clothing, tools, equipment or pet's fur. So yes, if there is still urushiol on a person or anything else you touch, it can spread poison ivy to you even if you do not have contact with the plant itself. As with the person you are helping, if you do come into contact with the urushiol, immediately wash the skin with soap and lukewarm water and wash all clothing and everything else that may have the oil on it.

FIGURE 16-3 *If the poisoning involves chemicals, flush the exposed area continuously with cool, running water for at least 20 minutes.*

Care for Absorbed Poisonings

To care for a person who has come into contact with a poisonous plant, follow standard precautions and then immediately rinse the affected area thoroughly with water. Using soap cannot hurt, but soap may not do much to remove the poisonous plant oil that causes the allergic reaction. Before washing the affected area, you may need to have the person remove any jewelry. This is only necessary if the jewelry is contaminated or if it constricts circulation due to swelling. Rinse the affected areas for at least 20 minutes, using a shower or garden hose if possible. If a rash or weeping lesion (an oozing sore) develops, advise the person to seek the opinion of a pharmacist or health care provider about possible treatment. Medicated lotions may help soothe the area.

Antihistamines may also help dry up the lesions and help stop or reduce itching. Over-the-counter antihistamines are available at pharmacies and grocery stores and should be used according to the manufacturer's directions. If the condition worsens or if large areas of the body or the face are affected, the person should see a health care provider, who may administer anti-inflammatory drugs, such as corticosteroids, or other medications to relieve discomfort.

If the poisoning involves dry chemicals, brush off the chemicals using gloved hands before flushing with tap water (under pressure). Take care not to inhale any of the chemical or get any of the dry chemical on you, your eyes or the eyes of the person or any bystanders. Many dry chemicals are activated by contact with water. However, if continuous running water is available, it will flush the chemical from the skin before the activated chemical can do harm. If wet chemicals contact the skin, flush the area continuously with large amounts of cool, running water. Running water reduces the threat to you and quickly and easily removes the substance from the person. Continue flushing for at least 20 minutes or until more advanced medical personnel arrive **(Figure 16-3)**.

If a poison has been in contact with the person's eye(s), irrigate the affected eye or eyes from the nose side of the eye, not directly onto the middle of the cornea, with clean water for at least 20 minutes. If only one eye is affected, make sure you do not let the water run into the unaffected eye by tilting the head so the water runs from the nose side of the eye downward to the ear side. Continue care as long as advised by the PCC or until EMS personnel take over.

Injected Poisonings

Injected poisons enter the body through the bites or stings of certain insects, spiders, aquatic life, animals and snakes or as drugs or misused medications injected with a hypodermic needle. Insect and animal bites and stings are among the most common sources

of injected poisons. See Chapter 17 for more information about bites and stings, and how to give care for them.

Signals of Injected Poisonings

Some of the signals of injected poisonings include:

- A bite or sting mark at the point of entry.
- A stinger, tentacle or venom sac in or near the entry site.
- Redness, pain, tenderness or swelling around the entry site.
- Signals of allergic reaction, including localized itching, hives or rash.
- Signals of a severe allergic reaction (anaphylaxis), including weakness, nausea, dizziness, swelling of the throat or tongue, constricted airway or trouble breathing.

Care for Injected Poisonings

When caring for injected poisons, check the person for life-threatening conditions and care for any found. If there are no life-threatening conditions, applying an ice pack or cold pack can reduce pain and swelling in the affected area. To give specific care for certain bites and stings, see Chapter 17. To learn about care for injected drugs, see Chapter 18. Call 9-1-1 or the local emergency number if the person has signals of anaphylaxis, which is discussed in greater detail starting on the next page.

THE DANGER IN THE GARDEN

By the time we are adults, most of us are aware that eating an unidentified mushroom can be a one-way ticket to the hospital. We are rarely aware of the other poisonous plants that are quietly sitting in our gardens and vases.

Lily-of-the-valley, mistletoe, philodendron, oleander, hyacinth, foxglove, mountain laurel and hemlock are just a few of the many common plants that can be highly toxic and even lethal if ingested. Surprisingly, even the seeds or leafy parts of things we eat every day can be poisonous, including seeds from castor plants, peaches, apricots, cherries, apples and other fruit, and rhubarb and tomato plant leaves.

What precautions can you take to ensure against plant poisoning? First, learn about the plants you have in your home, office, garden and neighborhood. Do not rely on those who sell plants to provide warnings. Keep plants you know are toxic out of reach of infants and small children; remove berries and leaves from the floor; and if in doubt, consult a PCC. In addition, do not store bulbs where they can be mistaken for onions; do not bite into an unfamiliar seed, no matter where you find it; never eat any plant you cannot positively identify; and clean up, but do not burn, any clippings and leaves from garden work as smoke from a poisonous plant can become an inhalation hazard as well.

Finally, if you have a yen to forage for wild plant foods, take a field identification course taught by someone credentialed in the subject. Do not rely on field guidebooks. Even the clearest photograph is no proof against mistaking a “safe” plant for an unsafe one.

ANAPHYLAXIS

Severe allergic reactions to poisons are rare, but when one occurs, it is truly a life-threatening medical emergency. This reaction, called ***anaphylaxis***, was introduced in Chapter 7. Anaphylaxis is a form of shock. It can be caused by an insect bite or sting or contact with certain drugs, medications, foods and chemicals. Anaphylaxis can result from any of the four modes of poisoning described in this chapter.

Every year in the United States, between 400 and 800 deaths are caused by anaphylaxis. Fortunately, some deaths can be prevented if anaphylaxis is recognized immediately and cared for quickly.

Allergic Reactions

Allergic reactions are caused by the activity of the immune system. The body recognizes and protects itself from antigens, or foreign substances that bring on an allergic reaction, by producing antibodies. These antibodies, which are found in the liver, bone marrow, spleen and lymph glands, fight antigens and eliminate them from the body.

Antigens that cause an allergic reaction are called allergens. Allergic reactions range from mild to very severe. A common mild reaction is skin irritation from contact with poison ivy. A severe, life-threatening reaction is swelling of the airway, trouble breathing and an obstructed airway.

Some common allergens include bee or insect venom, certain antibiotics, pollen, animal dander and sulfa drugs. Over 12 million people in the United States have food allergies. Every year there are over 30,000 cases of food-related anaphylaxis. Certain types of food commonly cause an allergic reaction in individuals with sensitivities to those foods. Peanuts and tree nuts cause the most cases of fatal and near-fatal allergic reactions to food. Other common food allergens include cow's milk, eggs, seafood (especially shellfish), soy and wheat.

Signals of Anaphylaxis

Anaphylaxis usually occurs suddenly, within seconds or minutes after the person comes into contact with the poisonous substance. The skin or area of the body that came in contact with the substance usually swells and turns red. Other signals include:

FIGURE 16-4 *In anaphylaxis, air passages can swell, restricting breathing. The person may develop hives.*

- Trouble breathing, wheezing or shortness of breath **(Figure 16-4)**.
- Tight feeling in the chest and throat.
- Swelling of the face, throat or tongue.
- Weakness, dizziness or confusion.
- Rash or hives.
- Low blood pressure.
- Shock.

Trouble breathing can progress to an obstructed airway as the lips, tongue, throat and larynx swell. Low blood pressure and shock may accompany these reactions. Death from anaphylaxis usually occurs because the person's breathing is severely impaired.

Care for Anaphylaxis

Call 9-1-1 or the local emergency number immediately if the person:

- Has trouble breathing.
- Complains of the throat tightening.
- Explains that he or she is subject to severe allergic reactions.
- Is or becomes unconscious.

If you suspect anaphylaxis, and have called for advanced medical help, follow these general guidelines for giving care:

- Monitor the person's airway and breathing for changes in his or her condition.
- Give care for life-threatening emergencies.
- Check a conscious person to determine:
  - The substance involved.
  - The route of exposure to the substance.
  - The effects of the exposure.
- If the person is conscious and able to talk, ask:
  - What is your name?
  - What happened?
  - How do you feel?
  - Do you feel any tingling in your hands, feet or lips?
  - Do you feel pain anywhere?
  - Do you have any allergies? Do you have prescribed medications to take in case of an allergic reaction?
  - Do you know what triggered the reaction?
  - How much and how long were you exposed?
  - Do you have any medical conditions or are you taking any medications?
- Quickly check the person from head to toe. Visually inspect the body:
  - Observe for signals of anaphylaxis, including respiratory distress.
  - Look for a medical alert tag, bracelet or necklace.
- Check the person's head:
  - Look for swelling of the face, neck or tongue.
  - Notice if the person is drowsy, not alert, confused or exhibiting slurred speech.
- Check skin appearance. Look at the person's face and lips. Ask yourself, is the skin:
  - Cold or hot?
  - Unusually wet or dry?
  - Pale, ashen, bluish or flushed?
- Check the person's breathing:
  - Ask if he or she is experiencing pain during breathing.
  - Notice rate, depth of breaths, wheezes or gasping sounds.
- Care for respiratory distress:
  - Help the person to rest in the most comfortable position for breathing, usually sitting.
  - Calm and reassure the person.

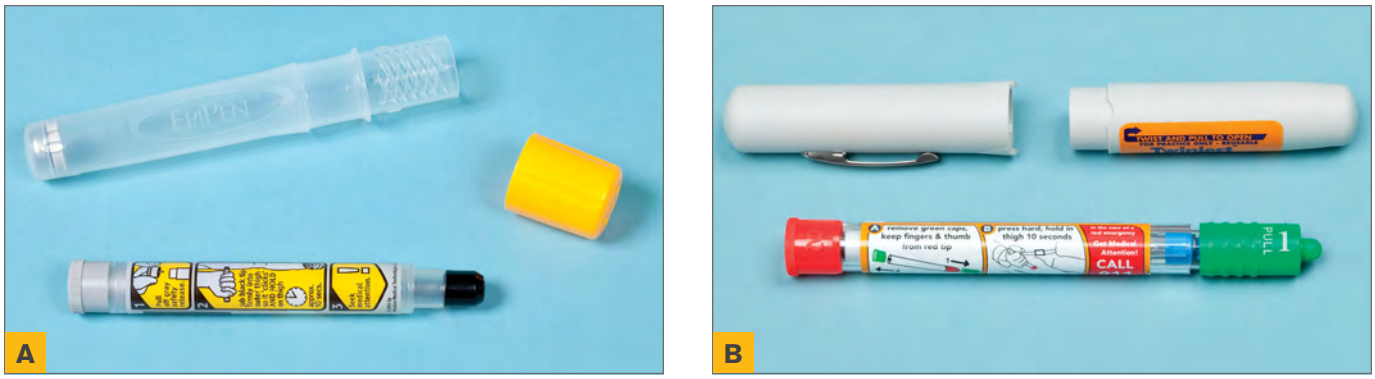


FIGURE 16-5, A–B **A,** *An Epi-Pen® is preloaded with a single dose of the drug epinephrine, while* **B,** *a Twinject® includes two doses of epinephrine.*

- Assist the person with using a prescribed epinephrine auto-injector, if available and if permitted by state regulations.
- Document any changes in the person's condition over time.

Assisting with an Epinephrine Auto-Injector

People who know they are extremely allergic to certain substances usually try to avoid them. However, sometimes this is impossible. These people may carry an anaphylaxis kit in case they have a severe allergic reaction.

These kits are available by prescription only. The kit contains a dose or two of the drug epinephrine (adrenaline) that can be injected into the body to counteract the anaphylactic reaction. Epinephrine helps keep the person's blood pressure normal and helps him or her breathe more easily. If you are allergic to a substance, contact a doctor to discuss whether you need such a kit.

Two injectable epinephrine systems are available: the Epi-Pen®, which includes one dose; and Twinject®, which includes two doses **(Figure 16-5, A–B)**. The instructions provided by the manufacturer and health care provider always should be followed when assisting someone with his or her prescribed epinephrine auto-injector. You may also need to assist with a second dose in a situation when signals of anaphylaxis persist after several minutes, or return, and EMS is delayed.

FIGURE 16-6 *Forcefully pushing the auto-injector against the skin activates the device. It should be used on a muscular area, usually the person's mid-outer thigh.*

An auto-injector contains a preloaded dose of 0.3 mg of epinephrine for adults or 0.15 mg of epinephrine for children weighing 33 to 66 pounds. The injector has a spring-loaded plunger. When activated, it injects the epinephrine. The auto-injector is activated when it is forcefully pushed against the skin. It should be used on a muscular area, usually the person's mid-outer thigh **(Figure 16-6)**. The injector needs to stay in place for 10 seconds. This allows the medication to fully empty. When the auto-injector is removed, handle it carefully and do not touch the needle if it is exposed.

If a person is conscious and able to use the auto-injector, help him or her in any way asked. This might include getting the pen or kit from a purse, car, home or out of a specially designed carrier or belt; taking it out of the plastic tube; or assisting the person with the injection.

SMART MOVES: PREVENTING POISONING

Preventing poisoning is a simple principle, but often people do not take enough precautions. For example, of all the child poisoning cases reported, the vast majority occurred when the child was under the direct supervision of a parent or guardian. By following these general guidelines, you will be able to prevent most poisoning emergencies:

- Keep all medications and household products well out of the reach of children. Special latches and clamps are available to keep children from opening cabinets. Use these or other methods to keep children from reaching any substances that may be poisonous. Consider all household or drugstore products to be potentially harmful.
- Use childproof safety caps on containers of medication and other potentially dangerous products.
- Keep products in their original containers, with the labels in place.
- Use poison symbols to identify dangerous substances, and teach children what the symbols mean.
- Dispose of outdated medications and household products properly and in a timely manner.
- Use potentially dangerous chemicals only in well-ventilated areas.
- Wear proper clothing when work or recreation may put you in contact with a poisonous substance. Your employer must follow strict guidelines to protect you from coming into contact with poisonous substances in the workplace.
- Immediately wash those areas of the body that you suspect may have come into contact with a poison.
- One of the best ways to prevent poisonings is to be aware of which common household items can be poisonous. These include, but are not limited to, acetaminophen, acids, ammonia, aspirin, bleach, cosmetics, detergents, drain cleaner, heating fuel, iodine, lye, lighter fluid, oven cleaner, paint, pesticides, toilet bowl cleaner, turpentine and weed killer. Some common household plants and garden shrubs are also poisonous.

If you know that a person has a prescribed auto-injector and is unable to administer it him- or herself, then you may help the person use it where allowed by state or local laws or regulations. See the related Skill Sheet: Assisting with an Epinephrine Auto-Injector at the end of the chapter for more information. Remember, for a person experiencing anaphylaxis, time is of the essence.

Some anaphylaxis kits also contain an antihistamine in pill form. An antihistamine is a type of medication. It lessens the effects of compounds released by the body during an allergic reaction. The person should read and follow all medication labels. It also is important for the person to follow any instructions given by the health care provider. Check state and local regulations about assisting someone with the use of prescription and over-the-counter medications.

SUMMARY

Poisoning can occur in any one of four ways: ingestion, inhalation, absorption and injection. The severity of a poisoning depends on the type and amount of the substance; how and where it entered the body; the time elapsed since the poison entered the body; and the person's size, weight and age. For suspected poisonings, call the National Poison Control Center at 800-222-1222. PCC personnel are specially trained to handle these types of emergencies. Call 9-1-1 or the local emergency number instead if the person has any life-threatening conditions. Follow the directions of PCC personnel or the EMS dispatcher.

Also, look for any signals of anaphylaxis, and assist the person with administering a prescribed auto-injector or antihistamine as needed.

Increasing your awareness and taking steps to reduce the risks is one of the best ways to prevent a poisoning emergency (see Smart Moves: Preventing Poisoning). Identify items in your environment, such as household cleaners, plants and medications that may pose a danger to you, your family or co-workers. Learn to handle and store these items properly by following the manufacturer's directions.

READY TO RESPOND?

Think back to Sophia in the opening scenario, and use what you have learned to respond to these questions:

1. What clues did you find at the scene to alert you that Sophia may have been poisoned?
2. What should you do to care for Sophia?

STUDY QUESTIONS

1. Match each term with the correct definition.

a. Absorbed poison	d. Inhaled poison
b. Anaphylaxis	e. Injected poison
c. Ingested poison	f. Poison control center

_____ A poison that enters the body through a bite, sting or syringe

_____ A form of distributive shock caused by an often sudden severe allergic reaction, in which air passages may swell and restrict breathing

_____ A specialized health center that provides information on poisons or suspected poisoning emergencies

_____ A poison that is swallowed

_____ A poison that enters the body through the skin

_____ A poison that is breathed into the lungs

2. List the general steps to care for a poisoning.

3. List three factors that determine the severity of poisoning.

4. Describe how to care for a person who has spilled a poisonous substance on his or her skin or has touched a poisonous plant, such as poison ivy.

5. List seven reasons to call 9-1-1 or the local emergency numbers instead of the PCC for a poisoning emergency.

Base your answers for questions 6 and 7 on the scenario below.

Beth was putting fertilizer on her favorite rose bush. She looked down and saw a strange plant that appeared to be a weed. She leaned over and plucked the plant out of the ground with her bare hand. A little while later, her hands started itching and burning. Her fingers became swollen, and red bumps began to appear all over her forearm.

6. Identify the signals that indicate that a poisoning emergency has occurred.

7. What could Beth have done to prevent this situation from happening?

In questions 8 through 10, circle the letter of the correct answer.

8. Signals of anaphylaxis include—

   a. Trouble breathing, wheezing or shortness of breath.
   b. Swelling of the face, throat or tongue.
   c. Rash or hives.
   d. All of the above

9. Your neighbor has accidentally swallowed some pesticide. He is conscious and alert. What should you do?

    a. Give him something to drink.
    b. Induce vomiting.
    c. Call the PCC.
    d. Have him lie down.

10. You walk into a room and find an unconscious child on the floor. There is an empty medicine bottle next to her. What should you do first?

    a. Call 9-1-1 or the local emergency number.
    b. Call the PCC.
    c. Give the child something to drink.
    d. Check the airway.

Answers are listed in Appendix B.

ASSISTING WITH AN EPINEPHRINE AUTO-INJECTOR

Determine whether the person has already taken epinephrine or antihistamine. If so, administer a second dose only when EMS personnel are not present or delayed and if signals of anaphylaxis persist after a few minutes. Check the label to confirm that the prescription of the auto-injector is for this person.

Check the expiration date of the auto-injector. If it has expired, DO NOT USE IT. If the medication is visible, confirm that the liquid is clear and not cloudy. If it is cloudy, DO NOT USE IT.

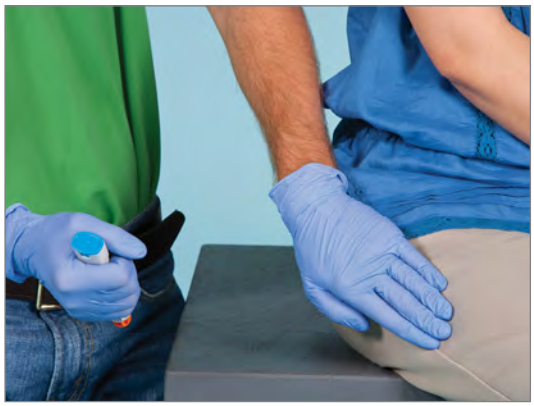
NOTE: ***If possible, help the person self-administer the auto-injector.***

TO CARE FOR A CONSCIOUS PERSON WHO IS UNABLE TO SELF-ADMINISTER THE AUTO-INJECTOR, AND LOCAL OR STATE REGULATIONS ALLOW:

1 LOCATE INJECTION SITE

Locate the outside middle of one thigh to use as the injection site.

NOTE: *If injecting through clothing, press on the area with a hand to determine that there are no obstructions at the injection site, such as keys, coins, the side seam of trousers, etc.*



2 REMOVE SAFETY CAP

Grasp the auto-injector firmly in your fist, and pull off the safety cap with your other hand.

3 POSITION AUTO-INJECTOR

Hold the tip (needle end) near the patient's outer thigh so that the auto-injector is at a 90-degree angle to the thigh.

Continued on next page

Continued

4 ADMINISTER INJECTION

Quickly and firmly push the tip straight into the outer thigh. You will hear a click.

5 HOLD IN PLACE

Hold the auto-injector firmly in place for **10** seconds, then remove it from the thigh and massage the injection site with a gloved hand for several seconds.

6 RECHECK BREATHING

Recheck the person's breathing and observe his or her response to the medication.

7 HANDLE USED AUTO-INJECTOR CAREFULLY

Handle the used auto-injector carefully, placing it in a safe container. Give it to EMS personnel when they arrive.

17 Bites and Stings

You are working as a summer day camp counselor when one of your campers tells you that you need to come see Sara. When you get over to the picnic table where she is sitting, you can see that she has developed a rash that is appearing in spots all over her body. She tells you that last week, she discovered a tick on her leg when she got home one night.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Identify the signals of the most common types of bites and stings.
- Describe how to care for insect stings.
- Describe how to care for tick bites.
- Identify the signals and care of tick-borne illnesses.
- Identify the signals and care of West Nile virus.
- Describe how to care for spider bites and scorpion stings.
- Describe how to care for venomous snake bites.
- Describe how to care for marine life stings.
- Describe how to care for domestic and wild animal bites.
- Describe how to care for human bites.
- Identify ways to protect yourself from bites and stings.

KEY TERMS

Antivenin: A substance used to counteract the poisonous effects of venom.

Lyme disease: A disease transmitted by the deer tick and black-legged tick.

Rabies: An infectious viral disease that affects the nervous system of humans and other mammals; has a high fatality rate if left untreated.

Rocky Mountain spotted fever: A disease caused by the transmission of microscopic bacteria from the wood tick or dog tick host.

INTRODUCTION

Bites and stings are among the most common form of **injected poisons**. People are bitten and stung every day by insects, spiders, snakes, marine life and animals. Most of the time, these bites and stings do not cause serious problems. However, in rare circumstances, certain bites and stings can cause serious illness or even death in people who are sensitive to the venom. In this chapter, you will learn how to recognize, care for and prevent some of the most common types of bites and stings.

INSECT STINGS

Between 0.5 and 5 percent of the American population is severely allergic to substances in the venom of bees, wasps, hornets and yellow jackets. For highly allergic people, even one sting can result in anaphylaxis, a life-threatening condition. Such highly allergic reactions account for the nearly 50 reported deaths that occur from insect stings each year. For most people, however, insect stings may be painful or uncomfortable but are not life threatening.

Signals of Insect Stings

Signals of an insect sting include:

- Presence of a stinger.
- Pain.

- Swelling.
- Redness.
- Signals of an allergic reaction.

Care for Insect Stings

If someone is stung by an insect:

- Remove any visible stinger. Scrape it away from the skin with the edge of a plastic card, such as a credit card, or use tweezers **(Figure 17-1)**. In the case of a bee sting, if you use tweezers, grasp the stinger, not the venom sac, to avoid causing the sac to burst and release more venom into the skin.
- Wash the site with soap and water.
- Cover the site with a dressing and keep it clean.
- Apply ice or a cold pack to the area to reduce pain and swelling. Place a layer of gauze or cloth between the source of cold and the skin to prevent skin damage.

FIGURE 17-1 *If someone is stung and a stinger is present, scrape it away from the skin with the edge of a plastic card or tweezers.*

Ask the person if he or she has had any prior allergic reactions to insect bites or stings and observe for signals of an allergic reaction, even if there is no known history. An allergic reaction can range from a minor localized skin rash to anaphylaxis. As you learned earlier, signals of anaphylaxis include:

- Trouble breathing, wheezing or shortness of breath.
- Tight feeling in the chest and throat.
- Swelling of the face, throat or tongue.
- Weakness, dizziness or confusion.
- Rash or hives.
- Low blood pressure.
- Shock.

If you observe any signals of anaphylaxis, call 9-1-1 or the local emergency number immediately, give care for life-threatening emergencies, continue to check the person and assist the person with using a prescribed epinephrine auto-injector as needed. See Chapter 16 for all of the care steps you should take for anaphylaxis.

TICK BITES

Ticks can contract, carry and transmit disease to humans. Some of the diseases spread by ticks include Rocky Mountain spotted fever, babesiosis, ehrlichiosis and Lyme disease.

General Care for Tick Bites

If you find an embedded tick, it must be removed as follows:

- With a gloved hand, grasp the tick with fine-tipped, pointed, non-etched, non-rasped tweezers as close to the skin as possible and pull slowly, steadily and firmly upward **(Figure 17-2)**. If you do not have tweezers, use a glove, plastic wrap, a piece of paper or a leaf to protect your fingers.
- Do *not* try to burn the tick off.

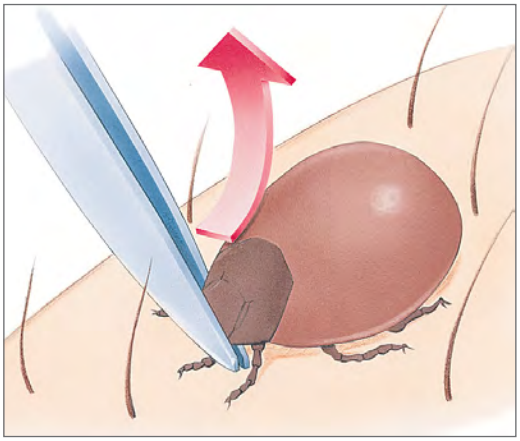


FIGURE 17-2 *Remove a tick by pulling slowly, steadily and firmly with fine-tipped tweezers.*

- Do *not* apply petroleum jelly or nail polish to the tick.
- Place the tick in jar containing rubbing alcohol to kill it.
- Wash the site with soap and water.
- Apply antiseptic or antibiotic ointment to help prevent infection.
- Wash your hands thoroughly.

If you cannot remove the tick, have the person seek medical care. Even if you can remove the tick, the person may want to let his or her health care provider know that a tick has bitten the person in case he or she becomes ill within the following month or two. The mouth parts of adult ticks may sometimes remain in the skin, but these will not cause disease. Check the site periodically thereafter. If a rash or flulike signals develop, seek medical care. Redness at the site of a tick bite does not necessarily mean a person is infected with a disease.

Rocky Mountain Spotted Fever

Rocky Mountain spotted fever is caused by the transmission of microscopic bacteria from the wood tick or dog tick host to other warm-blooded animals, including humans. Although the disease was first diagnosed in the western United States, cases of Rocky Mountain spotted fever continue to be reported throughout North and South America today. Rocky Mountain spotted fever is sometimes known by various regional names, such as black fever, mountain fever, tick fever, spotted fever or pinta fever. It occurs mostly in the spring and summer, and most cases occur in children.

Signals of Rocky Mountain Spotted Fever

Signals of Rocky Mountain spotted fever usually appear between 2 and 14 days after a tick bite. Initial signals include:

- Fever.
- Nausea and vomiting.
- Muscle aches or pain.
- Lack of appetite.
- Severe headache.

Later signals include:

- A spotted rash that usually starts a few days after fever develops. The rash first appears as small spots on the wrists and ankles, and then spreads to the rest of the body. However, about one-third of infected persons do not get a rash.
- Abdominal pain.
- Joint pain.
- Diarrhea.

Care for Rocky Mountain Spotted Fever

Call a health care provider if the person develops signals of Rocky Mountain spotted fever after a tick bite. The health care provider is likely to prescribe antibiotics. In most cases, the person will recover fully. If left untreated, complications of Rocky Mountain spotted fever can be life threatening.

Babesia Infection

Babesia infection, also called babesiosis, is a protozoal infection spread by black-legged ticks, also known as deer ticks. It is more common during warm months, and most cases happen in the northeast and upper midwest regions of the United States.

Signals of *Babesia* Infection

Many people infected with *Babesia* have no apparent symptoms. Some people may have flu-like symptoms, such as:

- Fever.
- Sweats.
- Chills.
- Body aches and headaches.
- No appetite.
- Nausea.
- Fatigue.

Others infected with *Babesia* develop a type of anemia that can cause jaundice and dark urine.

Care for *Babesia* Infection

In some people, babesiosis can be life threatening if untreated. The elderly and persons with no spleen, a weak immune system or a serious health condition are the most susceptible. If a person develops any of the signals described above, he or she should seek medical care. Most people with signals of the disease can be treated successfully with prescription medications.

Ehrlichiosis

Most cases of infection with the bacterium *Ehrlichia* in humans are caused by bites by an infected Lone Star tick, and occur mainly in the southern, eastern and south-central United States.

Signals of Ehrlichiosis

Many people with ehrlichiosis do not become ill. Some develop only mild signals that are seen 5 to 10 days after an infected tick bites the person. Initial signals include:

- Fever.
- Headache.
- Fatigue.
- Muscle aches.

Other signals that may develop include:

- Nausea or vomiting.
- Diarrhea.
- Cough.
- Joint pain.
- Confusion.
- Rash.

Care for Ehrlichiosis

If the person becomes ill with any of the above signals, he or she should seek medical care. Ehrlichiosis is treated with antibiotics.

Lyme Disease

Lyme disease is spreading throughout the United States. Although it is most prevalent on the East Coast and the upper Midwest, cases of Lyme disease have been reported in all 50 states.

Lyme disease is spread by the deer tick and black-legged tick, which attaches itself to field mice and deer. Deer ticks are tiny and difficult to see **(Figure 17-3)**. They are much smaller than the common dog tick or wood tick. They can be as small as a poppy seed or the head of a pin. Adult

FIGURE 17-3 *Deer ticks are tiny and difficult to see.* ©iStockphoto.com/Martin Pietak.

deer ticks are only as large as a grape seed. Because of the tick's tiny size, its bite usually is painless. Many people who develop Lyme disease cannot recall having been bitten.

The tick is found around branches and in wooded and grassy areas. Like all ticks, it attaches itself to any warm-blooded animal with which it comes into direct contact, including humans. Deer ticks are active any time the temperature is above about 45° F. However, most cases of infection happen between May and late August, when ticks are most active and people spend more time outdoors. Recent studies indicate that the tick must remain embedded in human skin for about 36 to 48 hours in order to transmit the disease. More information on Lyme disease may be available from your local or state health department, the American Lyme Disease Foundation (aldf.com), or the Centers for Disease Control and Prevention (CDC) (cdc.gov/features/lymedisease).

Signals of Lyme Disease

The first signal of infection may appear a few days or a few weeks after a tick bite. In 80 to 90 percent of all cases of Lyme disease, a rash starts as a small red area at the site of the bite. It may spread up to 7 inches across **(Figure 17-4)**. In fair-skinned people, the center may be a lighter color with the outer edges red and raised. This sometimes gives the rash a bull's-eye appearance. In some individuals, the rash may appear to be solid red. In dark-skinned people, the area may look black and blue, like a bruise. The rash may or may not be warm to the touch and usually is not itchy or painful. If a rash does appear, it will do so in about 1 to 2 weeks and may last for about 3 to 5 weeks. Some people with Lyme disease never develop a rash.

FIGURE 17-4 *A person with Lyme disease may develop a rash.* ©iStockphoto.com/Heike Kampe.

Other signals of Lyme disease include:

- Fever.
- Headache.
- Weakness.
- Joint and muscle pain.

These signals are similar to signals of flu and can develop slowly. They might not occur at the same time as the rash. Lyme disease can get worse if it is not treated. Signals can include severe fatigue; fever; a stiff, aching neck; tingling or numbness in the fingers and toes; and facial paralysis. In its advanced stages Lyme disease may cause painful arthritis; numbness in the arms, hands or legs; severe headaches; long- or short-term memory loss; confusion; dizziness; and problems seeing or hearing. Some of these signals could indicate problems with the brain or nervous system. Lyme disease may also cause heart problems such as an irregular or rapid heartbeat.

What if...

A person has a tick bite? With so many potential diseases that can form, should I consider calling 9-1-1 or the local emergency number?

Emergency medical services would only need to be contacted if you find an immediate danger, such as a person who is unresponsive, not breathing or has a change in his or her level of consciousness. Otherwise, you should just remove the tick as quickly and as carefully as possible, and advise the person to contact his or her local health care provider for follow-up care. Of course, the person should also seek advanced medical care if you cannot successfully remove the tick following the steps described in this chapter.

Care for Lyme Disease

If a rash or flu-like signals develop, the person should seek medical care immediately. A health care provider usually will prescribe antibiotics to treat Lyme disease. Antibiotics work quickly and effectively if taken as soon

as possible. Most people who get treated early make a full recovery. If you suspect Lyme disease, do not delay seeking treatment. Treatment time is longer and less effective when the person has been infected for a long period of time.

MOSQUITO BITES—WEST NILE VIRUS

West Nile virus (WNV) is passed on to humans and other animals by mosquitoes that bite them after feeding on infected birds. Recently, WNV has been reported in some mild climate areas of North America and Europe.

WNV cannot be passed from one person to another. Also, no evidence supports that humans can acquire the disease by handling live or dead birds infected with WNV. However, it is still a good idea to use disposable gloves when handling an infected bird. Contact your local health department for instructions on reporting and disposing of the bird's body.

For most people, the risk for infection with WNV is very low. Less than 1 percent of people who are bitten by mosquitoes develop any signals of the disease. In addition, relatively few mosquitoes actually carry WNV. People who spend a lot of time outdoors are at a higher risk for contracting the disease. Only about 1 in every 150 people who are infected with WNV will become seriously ill.

Signals of West Nile Virus

Most people infected with WNV have no signals. Approximately 20 percent develop mild signals, such as fever and aches, which pass on their own. The risk for severe disease is higher for people age 50 years and older. People typically develop signals of WNV between 3 and 14 days after an infected mosquito bites them. These include:

- High fever.
- Headache.
- Neck stiffness.
- Confusion.
- Coma.
- Tremors.
- Convulsions.
- Muscle weakness.
- Vision loss.
- Numbness.
- Paralysis.

These signals may last several weeks. In some cases, WNV can cause fatal encephalitis, which is a swelling of the brain that leads to death.

Care for West Nile Virus

If you suspect a person may have signals of severe WNV illness, such as unusually severe headaches or confusion, seek medical attention immediately. Pregnant women and nursing mothers are encouraged to talk to their doctors if they develop signals that could indicate WNV. There is no specific treatment for WNV infection or a vaccine to prevent it. In more severe cases, people usually need to go to the hospital, where they will receive intravenous fluids, assistance with breathing and nursing care.

SPIDER BITES AND SCORPION STINGS

Few spiders in the United States have venom that causes death. However, the bites of the black widow and brown recluse spiders can make you seriously ill and are occasionally fatal. Another dangerous spider is the northwestern brown, or hobo, spider.

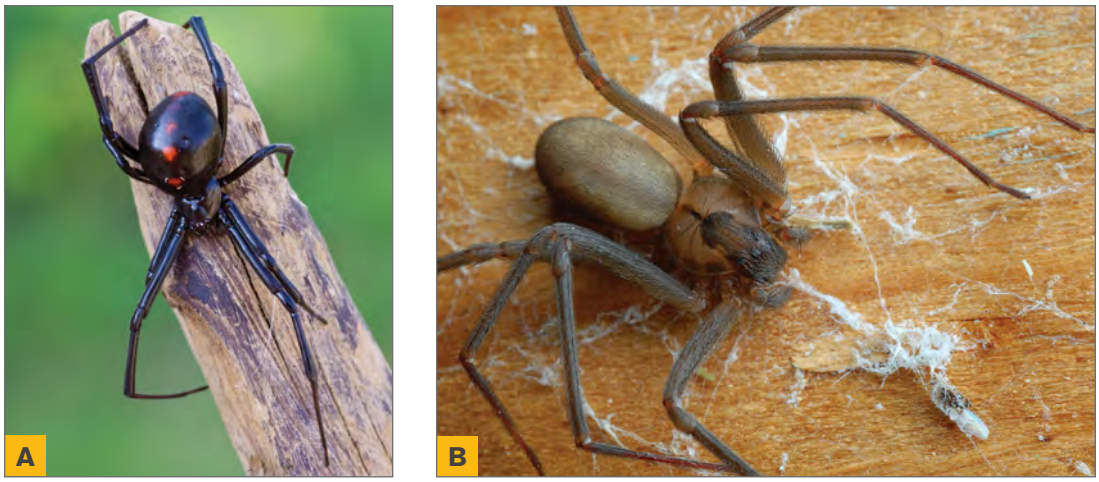


FIGURE 17-5, A–B **A,** *Black widow spider.* ©iStockphoto.com/Mark Kostich; **B,** *Brown recluse spider.* ©Miles Boyer, 2010, Used under license from Shutterstock.com

FIGURE 17-6 *A scorpion.* ©iStockphoto.com/John Bell

Black widow and brown recluse spiders live in most parts of the United States. You can identify them by the unique designs on their bodies. The black widow spider is black with a reddish hourglass shape on its underbody **(Figure 17-5, A)**. The brown recluse spider is light brown with a darker brown, violin-shaped marking on the top of its body **(Figure 17-5, B)**. Both spiders prefer dark, out-of-the-way places where they are seldom disturbed. Bites usually occur on the hands and arms of people reaching into places, such as wood, rock and brush piles or rummaging in dark garages and attics. Often, the person will not know that he or she has been bitten until signals develop.

Scorpions live in dry regions of the southwestern United States and Mexico **(Figure 17-6)**. They are usually about 3 inches long and have 8 legs and a pair of crablike pincers. At the end of the tail is a stinger, used to inject venom. Scorpions live in cool, damp places, such as basements, junk piles, woodpiles and under the bark of living or fallen trees. They are most active in the evening and at night, which is when most stings occur. Like spiders, only a few species of scorpions have a potentially fatal sting. However, because it is difficult to distinguish highly poisonous scorpions from nonpoisonous scorpions, all scorpion stings should be treated as medical emergencies.

Signals of Spider Bites and Scorpion Stings

Signals of spider bites depend on the amount of poison, called venom, injected and the person's sensitivity to the venom. Most spider bites heal with no adverse effects or scarring. Signals of venomous spider bites can seem identical to those of other conditions and therefore can be difficult to recognize. The only way to be certain that a spider has bitten a person is to have witnessed it.

The bite of the black widow spider is the most painful and deadly, especially in very young children and the elderly. The bite usually causes an immediate sharp pinprick pain, followed by a dull pain in the area of the bite. However, the

person often does not know that he or she has been bitten until he or she starts to feel ill or notices a bite mark or swelling. Other signals of a black widow spider bite include:

- Rigid muscles in the shoulders, chest, back and abdomen.
- Restlessness.
- Anxiety.
- Dizziness.
- Headache.
- Excessive sweating.
- Weakness.
- Drooping or swelling of the eyelids.

The bite of the brown recluse spider may produce little or no pain initially. Pain in the area of the bite develops an hour or more later. A blood-filled blister forms under the surface of the skin, sometimes in a target or bull's-eye pattern. Over time, the blister increases in size and eventually ruptures, leading to tissue destruction and a black scab.

The hobo spider also can produce an open, slow-healing wound.

General signals of spider bites and scorpion stings may include:

- A mark indicating a possible bite or sting.
- Severe pain in the sting or bite area.
- A blister, lesion or swelling at the bite or sting site.
- Nausea and vomiting.
- Stiff or painful joints.
- Chills or fever.
- Trouble breathing or swallowing or signals of anaphylaxis.
- Sweating or salivating profusely.
- Muscle aches or severe abdominal or back pain.
- Dizziness or fainting.
- Chest pain.
- Elevated heart rate.
- Infection at the site of the bite or sting.

Care for Spider Bites and Scorpion Stings

Call 9-1-1 or the local emergency number immediately if you suspect that someone has been bitten by a black widow or brown recluse spider, stung by a scorpion or if the person has any other life-threatening conditions. Health care professionals will clean the wound and give medication to reduce the pain and inflammation. An ***antivenin***, a substance used to counteract the poisonous effects of the venom, is available for black widow bites. Antivenin is used mostly for children and the elderly and is rarely necessary when bites occur in healthy adults.

While waiting for help to arrive:

- Wash the site thoroughly with soap and water.
- Bandage the wound. Apply an antibiotic ointment to the bandage first if the person has no known allergies or sensitivities to the medication.
- Apply ice or a cold pack to the site to reduce pain and swelling. Place a layer of gauze or cloth between the source of cold and the skin to prevent skin damage.

- If 9-1-1 or the local emergency number has not been called, encourage the person to seek medical attention.
- If you transport the person to a medical facility, keep the bitten area elevated and as still as possible.

VENOMOUS SNAKEBITES

Snakebites kill few people in the United States. Of the estimated 7000 to 8000 people reported bitten annually, fewer than five die. Most deaths occur because the person has an allergic reaction, is in poor health or because too much time passes before the person receives medical care. **Figure 17-7, A–D** shows the four kinds of venomous snakes found in the United States. Rattlesnakes account for most snakebites and nearly all deaths from snakebites.

Signals of Venomous Snakebites

Signals that indicate a venomous snakebite include:

- One or two distinct puncture wounds, which may or may not bleed. The exception is the coral snake, whose teeth leave a semicircular mark.

FIGURE 17-7, A–D *Four kinds of venomous snakes are found in the United States:* **A,** *Rattlesnake.* ©Audrey Snider-Bell, 2010, Used under license from Shutterstock.com; **B,** *Copperhead.* ©iStockphoto.com/Jake Holmes; **C,** *Cottonmouth.* ©Leighton Photography & Imaging, 2010, Used under license from Shutterstock.com; **D,** *Coral snake.* ©iStockphoto.com/Mark Kostich

- Severe pain and burning at the wound site immediately after or within 4 hours of the incident.
- Swelling and discoloration at the wound site immediately after or within 4 hours of the incident.

Care for Venomous Snakebites

If the bite is from a venomous snake such as a rattlesnake, copperhead, cottonmouth or coral snake, call 9-1-1 or the local emergency number immediately. To give care until help arrives:

- Wash the site with soap and water.
- Apply an elastic (pressure immobilization) bandage to slow the spread of venom through the lymphatic system by following these steps:
  - Check for feeling, warmth and color of the limb and note changes in skin color and temperature.
  - Place the end of the bandage against the skin and use overlapping turns.
  - The wrap should cover a long body section, such as an arm or a calf, beginning at the point farthest from the heart. For a joint, such as the knee or ankle, use figure-eight turns to support the joint.
  - Check above and below the injury for feeling, warmth and color, especially the fingers and toes, after you have applied an elastic roller bandage. By checking before and after bandaging, you may be able to tell if any tingling or numbness is from the elastic bandage or the injury.
  - Check the snugness of the bandaging—a finger should easily, but not loosely, pass under the bandage.
  - Keep the injured area still and lower than the heart. The person should walk *only* if absolutely necessary.
- For any snakebite:
  - Do *not* apply ice.
  - Do *not* cut the wound.
  - Do *not* apply suction.
  - Do *not* apply a tourniquet.
  - Do *not* use electric shock, such as from a car battery.

MARINE LIFE STINGS

The stings of some forms of marine life are not only painful but can also make you sick and, in some parts of the world, can kill you **(Figure 17-8, A–D)**. The side effects include allergic reactions that can cause breathing and heart problems, as well as paralysis and death. The lifeguards in your area should know the types of jellyfish that may be present.

Signals of Marine Life Stings

Signals of marine life stings include:

- Possible puncture marks.
- Pain.
- Swelling.
- Signals of a possible allergic reaction.

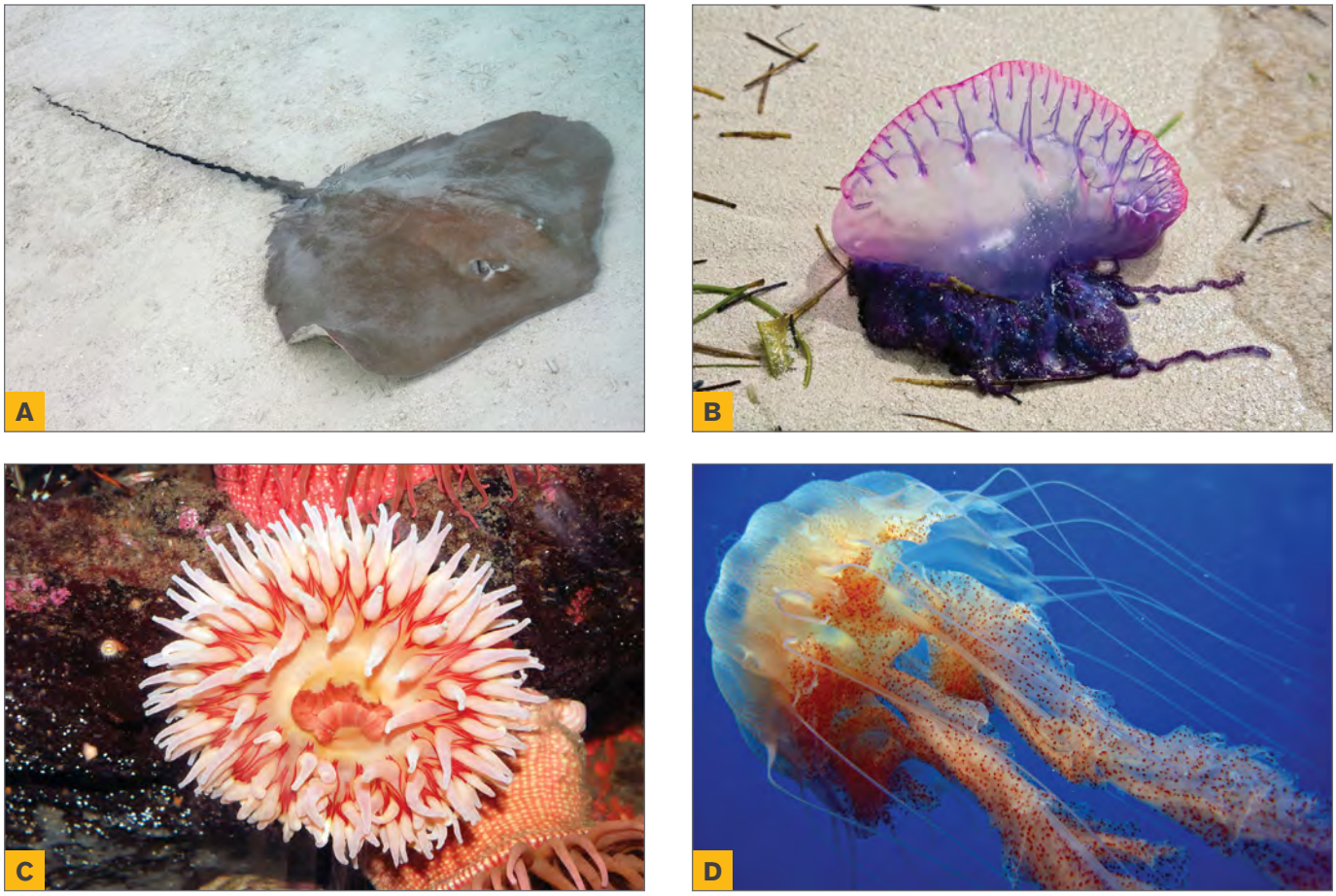


FIGURE 17-8, A–D *The painful sting of some marine animals can cause serious injuries:* **A,** *Stingray* ©iStockphoto.com/Dia Karanouh; **B,** *Bluebottle jellyfish/Portuguese man-of-war* ©iStockphoto.com/Mark Kostich; **C,** *Sea anemone* ©iStockphoto.com/Omers; **D,** *Jellyfish* ©Johan 1900, 2010, Used under license from Shutterstock.com

Care for Marine Life Stings

Call 9-1-1 or the local emergency number if the person does not know what stung him or her, has a history of allergic reactions to marine-life stings, is stung on the face or neck, or starts to have trouble breathing. Additional steps to take if you encounter someone who has sustained a marine-life sting include:

- Get a lifeguard to remove the person from the water as soon as possible. If a lifeguard is not available, use a reaching assist, if possible (see Chapter 20). Avoid touching the person with your bare hands, which could expose you to the stinging tentacles.
- Use gloves or a towel when removing any tentacles.
- If you know the sting is from a jellyfish, irrigate the injured part with large amounts of vinegar as soon as possible for at least 30 seconds. This can help to remove the tentacles and stop the injection of venom. Vinegar works best to offset the toxin, but a baking soda slurry also may be used if vinegar is not available.
- If the sting is known to be from a bluebottle jellyfish, also known as a Portuguese man-of-war, which are found in tropical water, use ocean water instead of vinegar. Vinegar triggers further envenomation (poisoning by venom).
- Do *not* rub the wound or apply a pressure immobilization bandage, fresh water, aluminum sulfate, meat tenderizer or other remedies because these may increase pain.
- Once the stinging action is stopped and tentacles removed, care for pain by hot-water immersion. Have the person take a hot shower if possible for at least 20 minutes.

The water temperature should be as hot as can be tolerated (nonscalding) or about 113° F if the temperature can be measured.

- If you know the sting is from a stingray, sea urchin or spiny fish, flush the wound with tap water. Ocean water also may be used. Keep the injured part still and soak the affected area in nonscalding hot water (as hot as the person can stand) for at least 20 minutes or until the pain goes away. If hot water is not available, packing the area in hot sand may have a similar effect if the sand is hot enough. Carefully clean the wound and apply a bandage. Watch for signals of infection and check with a health care provider to determine if a tetanus shot is needed.

What if...

I am with a person at the beach who has been stung by a jellyfish? Is it true that urine is effective for controlling the pain?

The use of urine to offset the toxin and reduce the pain of a jellyfish sting is not recommended; in fact urine can actually cause the stingers to release more venom. To inactivate the venom and prevent further envenomation, follow the care steps in this chapter by using vinegar or a baking soda slurry, followed, once tentacles are removed, by a hot-water shower or immersion for at least 20 minutes or for as long as pain persists.

DOMESTIC AND WILD ANIMAL BITES

The bite of a domestic or wild animal carries the risk for infection, as well as soft tissue injury. One of the most serious possible results of a bite is rabies. ***Rabies*** is an infectious disease that affects the nervous system and is caused by a virus transmitted commonly through the saliva of diseased mammals, such as skunks, bats, raccoons, cats, dogs, cattle and foxes.

Animals with rabies may act in unusual ways. For example, nocturnal animals, such as raccoons, may be active in the daytime. A wild animal that usually tries to avoid humans may not run away when you approach. Rabid animals may salivate; appear partially paralyzed; or act irritable, aggressive or strangely quiet. To reduce your risk of becoming infected with rabies, do not pet or feed wild animals and do not touch the body of a dead wild animal.

If not treated, rabies is fatal. *Anyone bitten by a domestic or wild animal must get professional medical attention as soon as possible*. To prevent rabies from developing, the person receives a series of vaccine injections to build up immunity. In the past, caring for rabies meant a lengthy series of painful injections that had many unpleasant side effects. The vaccines used today require fewer and less painful injections and have fewer side effects.

Tetanus is another potentially fatal infection that can result from a bite. Tetanus, caused by the transmission of bacteria that produce a toxin, can occur in wounds created by animal and human bites. The toxin associated with tetanus, which attacks the central nervous system, is one of the most deadly poisons known. Wounds to the face, head and neck are the most likely to be fatal because of the proximity of these areas to the brain. If someone is bitten, he or she may need an immunization to prevent this infection from occurring if his or her immunizations are not up-to-date.

Care for Domestic and Wild Animal Bites

If someone is bitten by a domestic or wild animal, try to get him or her away from the animal without endangering yourself. Do not try to restrain or capture the animal. Avoid coming into contact with the animal's saliva by wearing some form of protection such as disposable gloves.

Call 9-1-1 or the local emergency number if the wound is bleeding seriously or you suspect the animal might have rabies. If possible, try to remember the animal's appearance and where you last saw it. When you call 9-1-1 or the local emergency number, the dispatcher will direct the proper authorities, such as animal control, to the scene.

To care for an animal bite:

- Control bleeding first if the wound is bleeding seriously.
- Do *not* clean serious wounds. The wound will be cleaned at a medical facility.
- If bleeding is minor:
  - Wash the wound with soap and water, then irrigate with large amounts of clean running tap water to minimize the risk for infection.
  - Control any bleeding.
  - Cover the wound with a dressing. Apply an antibiotic ointment to the dressing first if the person has no known allergies or sensitivities to the medication.
- Watch for signals of infection.
- Advise the person to seek additional care from his or her health care provider or a medical facility, especially regarding the potential need for tetanus or rabies immunizations.

HUMAN BITES

Human bites are quite common and differ from other bites in that they may be more contaminated, tend to occur in higher-risk areas of the body (especially on the hands) and often receive delayed care. At least 42 different species of bacteria have been reported in human saliva, so it is not surprising that serious infection often follows a human bite. According to the CDC, however, human bites are not considered to carry a risk for transmitting human immunodeficiency virus (HIV), the virus that causes acquired immunodeficiency syndrome (AIDS). Children are often the inflictors and the recipients of human bite wounds.

Care for Human Bites

As with animal bites, it is important to get the person who has been bitten to professional medical care as soon as possible so that antibiotic therapy can be prescribed, if necessary. For a severe bite, call 9-1-1 or the local emergency number. Other care includes:

- Control bleeding first if the wound is bleeding seriously.
- Do *not* clean serious wounds. The wound will be cleaned at a medical facility.
- If bleeding is minor:
  - Wash the wound with soap and water, then irrigate with large amounts of clean running tap water to minimize the risk for infection.
  - Control any bleeding.
  - Cover the wound with a dressing. Apply an antibiotic ointment to the dressing first if the person has no known allergies or sensitivities to the medication.
- Watch for signals of infection.
- Advise the person to seek additional care from his or her health care provider or a medical facility.

SMART MOVES: PREVENTING BITES AND STINGS

You can prevent bites and stings from insects, ticks, mosquitoes, spiders, scorpions or snakes by following these guidelines when you are in wooded or grassy areas, or around your home:

- Wear long-sleeved shirts and long pants.
- Tuck your pant legs into your socks or boots.
- Use a rubber band or tape to hold pants against socks so that nothing can get under your clothing.
- Tuck your shirt into your pants.
- Wear light-colored clothing to make it easier to see tiny insects or ticks.
- When hiking in woods and fields, stay in the middle of trails. Avoid underbrush and tall grass.
- If you are outdoors for a long time, check yourself several times during the day. Especially check in hairy areas of the body such as the back of the neck and the scalp line.
- Inspect yourself carefully for insects or ticks after being outdoors, or have someone else do it.
- Consider staying indoors at dusk and dawn, when mosquitoes are most active. If you must be outside, follow the clothing suggestions above.
- Get rid of mosquito breeding sites by emptying sources of standing water outside the home, such as from flowerpots, buckets and barrels. Also, change the water in pet dishes and replace the water in bird baths weekly, drill drainage holes in tire swings so that water drains out and keep children's wading pools empty and on their sides when they are not being used.
- Avoid walking in areas where snakes are known to live.
- If you encounter a snake, look around for others. Turn around and walk away on the same path on which you came.
- Wear sturdy hiking boots.
- If you have pets that go outdoors, spray them with repellent made for that type of pet. Apply the repellent according to the label, and check your pet for ticks often.
- If you will be in a grassy or wooded area for a long time or if you know that an area is highly infested with insects or ticks, consider using a repellent. Follow the label instructions carefully:
  - Repellents containing DEET can be applied on exposed areas of skin and clothing. However, repellents containing permethrin, another common repellent, should be used only on clothing.
  - Keep all repellents out of the reach of children.
  - To apply repellent to the face, first spray it on your hands and then apply it from your hands to your face. Avoid sensitive areas, such as the lips, eyes and near the mouth.
  - Never spray repellents containing permethrin on your skin or a child's skin.
  - Never use repellents on a wound or on irritated skin.
  - Never put repellents on children's hands. Children may put their hands in their eyes or mouth.
  - Use repellents sparingly. Heavier or more frequent applications will not increase effectiveness and may be toxic.
  - Wash treated skin with soap and water and remove clothes that have been treated after you come indoors.
  - If you suspect you are having an allergic reaction to a repellent, wash the treated skin immediately and call your health care provider.

To prevent stings from marine animals:

- Consider wearing a wet suit or dry suit and/or protective footwear in the water—especially at times or in areas where there is a high risk for such occurrences.

To prevent dog bites, the Humane Society of the United States offers several guidelines. Many of the dog bites that are reported in the United States

(*continued*)

SMART MOVES: PREVENTING BITES AND STINGS (*continued*)

each year could have been prevented by taking these precautions:

- Do not run past a dog. The dog's natural instinct is to chase and catch prey.
- If a dog threatens you, do not scream. Avoid eye contact; try to remain motionless until the dog leaves, then back away slowly until the dog is out of sight.
- Do not approach a strange dog, especially one that is tied or confined.
- Always let a dog see and sniff you before you pet the animal.

SUMMARY

Bites and stings are among the most common types of injected poisonings. The good news is that while there are many thousands of species of insects, spiders, scorpions and snakes, only a few are venomous and pose any danger to humans. Taking steps to prevent bites and stings from occurring in the first place is one of the most important actions you can take (see Smart Moves: Preventing Bites and Stings). In addition, recognizing the signals of a bite or sting, as well as when a serious allergic reaction may be occurring—and quickly taking steps to give care and summon additional help when needed—will help reduce the effects.

READY TO RESPOND?

Think back to Sara in the opening scenario, and use what you have learned to respond to these questions:

1. Given the details of the scenario, what do you think is causing Sara's rash?
2. What can you do to help Sara?

STUDY QUESTIONS

1. Match each term with the correct definition.

    a. Lyme disease

    b. Antivenin

    c. Rabies

    d. Rocky Mountain spotted fever

_____ A disease transmitted by the deer tick and black-legged tick

_____ A substance used to counteract the poisonous effects of venom

_____ A disease caused by the transmission of microscopic bacteria from the wood tick or dog tick host

_____ An infectious viral disease that affects the nervous system of humans and other mammals

2. List the steps of care for a tick bite.

3. List three general signals of insect stings.

4. List the steps of care for a snakebite.

In questions 5 through 10, circle the letter of the correct answer.

5. In caring for a bee sting, what should you do?

    a. Remove the remaining stinger by scraping it from the skin.
    b. Leave the stinger in place until more advanced personnel arrive.
    c. Pull the stinger out with your bare hands.
    d. Rub over the stinger with an alcohol swab.

6. When spending time outdoors in woods or tall grass, what should you do to prevent bites and stings?

    a. Wear light-colored clothing.
    b. Use insect or tick repellent.
    c. Tuck pant legs into boots or socks.
    d. All of the above

7. Which of the following are signals of Lyme disease?

    a. Trouble breathing
    b. Headache, fever, weakness, joint and muscle pain
    c. Excessive saliva
    d. Sneezing

8. Which of the following should you do to care for a scorpion sting?

    a. Apply suction to the wound.
    b. Call 9-1-1 or the local emergency number.
    c. Wash the wound and apply a cold pack.
    d. b and c

9. Which of the following should you apply to bluebottle jellyfish/Portuguese man-of-war sting?

    a. Vinegar
    b. Meat tenderizer
    c. Baking soda paste
    d. Ocean water

10. Which of the following should you do to care for a severe human bite?

    a. Wash the wound with an antiseptic.
    b. Control bleeding.
    c. Call 9-1-1 or the local emergency number immediately.
    d. b and c

Answers are listed in Appendix B.

Substance Abuse and Misuse

18

You are at an off-campus bar, getting the weekend off to a great start with your friends. You and your friend Julia exchange a glance. Michelle, who had been animated and talking loudly, now has an agitated look on her face. “I’ve got to get some air,” Michelle mutters to the group as she puts down her beer and wanders toward the door. You and Julia decide to follow, and you find her slumped against the wall outside, limp and seemingly losing consciousness.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Identify the main categories of commonly abused or misused substances.
- Identify the signals that may indicate substance abuse and misuse.
- Describe how to care for someone who you suspect or know is abusing or misusing a substance.
- Explain how you can help prevent substance abuse and misuse.

KEY TERMS

Addiction: The compulsive need to use a substance; stopping use would cause the user to suffer mental, physical and emotional distress.

Cannabis products: Substances such as marijuana and hashish that are derived from the *Cannabis sativa* plant; can produce feelings of elation, distorted perceptions of time and space, and impaired motor coordination and judgment.

Dependency: The desire or need to continually use a substance.

Depressant: A substance that affects the central nervous system and slows down physical and mental activity; can be used to treat anxiety, tension and high blood pressure.

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

Hallucinogen: A substance that affects mood, sensation, thinking, emotion and self-awareness; alters perception of time and space; and produces hallucinations or delusions.

Inhalant: A substance, such as a medication, that a person inhales to counteract or prevent a specific condition; also a substance inhaled to produce mood-altering effects.

Medication: A drug given therapeutically to prevent or treat the effects of a disease or condition, or otherwise enhance mental or physical well-being.

Narcotic: A drug derived from opium or opium-like compounds; used to reduce pain and can alter mood and behavior.

Overdose: The use of an excessive amount of a substance, resulting in adverse reactions ranging from mania (mental and physical hyperactivity) and hysteria to coma and death.

Stimulant: A substance that affects the central nervous system and speeds up physical and mental activity.

Substance abuse: The deliberate, persistent, excessive use of a substance without regard to health concerns or accepted medical practices.

Substance misuse: The use of a substance for unintended purposes or for intended purposes but in improper amounts or doses.

Synergistic effect: The outcome created when two or more drugs are combined; the effects of each may enhance those of the other.

Tolerance: The condition in which the effects of a substance on the body decrease as the result of continued use.

Withdrawal: The condition of mental and physical discomfort produced when a person stops using or abusing a substance to which he or she is addicted.

INTRODUCTION

A ***drug*** is any substance, other than food, intended to affect body functions. A drug given therapeutically to prevent or treat a disease or otherwise enhance mental or physical well-being is a ***medication. Substance abuse*** is the deliberate, persistent and excessive use of a substance without regard to health concerns or accepted medical practices. ***Substance misuse*** refers to the use of a substance for unintended purposes or for appropriate purposes but in improper amounts or doses.

Because of the publicity they receive, we tend to think of illegal (also known as illicit or controlled) drugs when we hear of substance abuse. However, legal substances (also called licit or noncontrolled substances) are among those most often abused or misused. These include nicotine (found in tobacco products), alcohol and over-the-counter (OTC) medications such as sleeping pills and diet pills.

In the United States, substance abuse costs tens of billions of dollars each year in medical care, insurance and lost productivity. Even more important, however, are the lives lost or permanently impaired each year from injuries or medical emergencies related to substance abuse or misuse. For example, experts estimate that as many as two-thirds of all homicides and serious assaults occurring annually involve alcohol. Other problems directly or indirectly related to substance abuse include dropping out of school, adolescent pregnancy, suicide, involvement in violent crime and transmission of the human immunodeficiency virus (HIV).

This chapter will address how to recognize common forms of substance abuse and misuse, how to care for people who abuse or misuse substances and how to prevent substance abuse and misuse from occurring.

FORMS OF SUBSTANCE ABUSE AND MISUSE

Many substances that are abused or misused are legal. Other substances are legal only when prescribed by a health care provider. Some are illegal only for those under a certain age, such as alcohol.

Any drug can cause ***dependency***, or the desire to continually use the substance. Those with drug dependency issues feel that they need the drug to function normally. Persons with a compulsive need for a substance and those who would suffer mental, physical and emotional distress if they stopped taking it are said to have an ***addiction*** to that substance.

The term ***withdrawal*** describes the condition produced when people stop using or abusing a substance to which they are addicted. Stopping the use of a substance may occur as a deliberate decision or because the person is unable to obtain the specific drug. Withdrawal from certain substances, such as alcohol, can cause severe mental and physical distress. Because withdrawal may become a serious medical condition, medical professionals often oversee the process.

When someone continually uses a substance, its effects on the body often decrease—a condition called ***tolerance***. The person then has to increase the amount and frequency of use to obtain the desired effect.

An ***overdose*** occurs when someone uses an excessive amount of a substance. Signals can vary but may range from mania and hysteria to coma and death. Specific reactions include changes in blood pressure and heart rate, sweating, vomiting and liver failure. An overdose

What if...

A person has ingested a large amount medication in an attempt to harm himself? Should I try to induce vomiting?

Whether a person ingests a large amount medication by accident or on purpose, it is treated as an ingested poison emergency. In such a case, your first step would be to assess for scene safety, then assess for life-threatening conditions. If any are found, you would call 9-1-1 or the local emergency number and give care as needed for the conditions found. If no life-threatening conditions are found, you would call the poison control center and follow any directions given. As you may recall from Chapter 16, you should *not* induce vomiting unless specifically instructed to do so.

may occur unintentionally if a person takes too much medication at one time. For example, an elderly person might forget about taking one dose of a medication and thus takes an additional dose. An overdose may also be intentional, as in a suicide attempt. Sometimes the person takes a sufficiently high dose of a substance to be certain to cause death. In other cases, the person may take enough of a substance to need medical attention but not enough to cause death.

ABUSED AND MISUSED SUBSTANCES

Substances are categorized according to their effects on the body **(Table 18-1)**. The six major categories are stimulants, hallucinogens, depressants, narcotics, inhalants and cannabis products. The category to which a substance belongs depends mostly on the effects it has on the central nervous system or the way the substance is taken. Some substances depress the nervous system, whereas others speed up its activity. Some are not easily categorized because they have various effects or may be taken in a variety of ways. A heightened or exaggerated effect may be produced when two or more substances are used at the same time. This is called a ***synergistic effect***, which can be deadly.

Stimulants

Stimulants are drugs that affect the central nervous system by speeding up physical and mental activity. They produce temporary feelings of alertness and prevent fatigue. They are sometimes used for weight reduction because they also suppress appetite, or to enhance exercise routines because they provide bursts of energy.

Many stimulants are ingested as pills, but some can be absorbed or inhaled. Amphetamine, dextroamphetamine and methamphetamine are stimulants. On the street, an extremely addictive, dangerous and smokable form of methamphetamine is often called “crystal meth” or “ice.” The street term “speed” usually refers to amphetamine or methamphetamine. Other street terms for amphetamines are “uppers,” “bennies,” “black beauties,” “crystal,” “meth” and “crank.”

Cocaine is one of the most publicized and powerful stimulants. It can be taken into the body in different ways. The most common way is sniffing it in powder form, known as “snorting.” In this method, the drug is absorbed into the blood through capillaries in the nose. Street names for cocaine include “coke,” “snow,” “blow,” “flake,” “foot” and “nose candy.” A purer and more potent form of cocaine is crack, which is smoked. The vapors are inhaled into the lungs, reach the brain and cause almost immediate effects. Crack is highly addictive. Street names for crack include “rock” and “freebase rocks.”

Ephedra, also known as “ma huang,” is a stimulant plant that has been used in China and India for over 5000 years. Until it was banned by the Food and Drug Administration (FDA) in 2004, it was a common ingredient in dietary supplements sold in the United States. The dried stems and leaves are put into capsules, tablets, extracts, tinctures or teas, and then ingested. It is used for weight loss, increased energy and to enhance athletic performance.

Table 18-1 Commonly Abused and Misused Substances

CATEGORY	SUBSTANCES	COMMON NAMES	POSSIBLE EFFECTS
Stimulants	Caffeine Cocaine, crack cocaine Amphetamines Methamphetamine Dextroamphetamine Nicotine Ephedra OTC diet aids Asthma treatments Decongestants	Coke, snow, nose candy, blow, flake, Big C, lady, white, snowbirds, powder, foot, crack, rock, cookies, freebase rocks, speed, uppers, ups, bennies, black beauties, crystal, meth, crank, crystal meth, ice, ma huang	Increase mental and physical activity. Produce temporary feelings of alertness. Prevent fatigue. Suppress appetite.
Hallucinogens	Diethyltryptamine (DET) Dimethyltryptamine (DMT) LSD PCP Mescaline Peyote Psilocybin 4-Methyl-2,5-dimethoxyamphetamine (DOM)	Psychedelics, acid, white lightning, sugar cubes, angel dust, hog, loveboat, peyote, buttons, cactus, mesc, mushrooms, magic mushrooms, 'shrooms, STP (serenity, tranquility and peace)	Cause changes in mood, sensation, thought, emotion and self-awareness. Alter perceptions of time and space. Can produce profound depression, tension and anxiety, as well as visual, auditory or tactile hallucinations.
Depressants	Barbiturates Benzodiazepines Narcotics Alcohol Antihistamines Sedatives Tranquilizers OTC sleep aids Ketamine Rohypnol® GHB	Valium®, Xanax®, downers, barbs, goofballs, yellow jackets, reds, Quaaludes, ludes, club drugs, date rape drugs, special K, vitamin K, roofies, roach, rope, liquid ecstasy, soap, vita-G	Decrease mental and physical activity. Alter consciousness. Relieve anxiety and pain. Promote sleep. Depress respiration. Relax muscles. Impair coordination and judgment.
Narcotics	Morphine Codeine Heroin Oxycodone Methadone Opium	Pectoral syrup, Oxycontin®, Percodan®, smack, horse, mud, brown sugar, junk, black tar, big H	Relieve pain. Produce stupor or euphoria. Can cause coma or death. Highly addictive.
Inhalants	Medical anesthetics Lacquer and varnish thinners Propane Toluene Butane Acetone Fuel Propellants	Laughing gas, whippets, glue, lighter fluid, nail polish remover, gasoline, kerosene, aerosol sprays	Alter mood. Produce a partial or complete loss of feeling. Produce effects similar to drunkenness, such as slurred speech, lack of inhibitions and impaired motor coordination. Can cause damage to the heart, lungs, brain and liver.

(*continued*)

Table 18-1 ***Continued***

CATEGORY	SUBSTANCES	COMMON NAMES	POSSIBLE EFFECTS
Cannabis Products	Hashish Marijuana THC	Hash, pot, grass, weed, reefer, ganja, mary jane, dope	Produce feelings of elation. Increase appetite. Distort perceptions of time and space. Impair motor coordination and judgment. Irritate throat. Redden eyes. Increase pulse. Cause dizziness.
Other	MDMA	Ecstasy, E, XTC, Adam, essence	Elevate blood pressure. Produce euphoria or erratic mood swings, rapid heartbeat, profuse sweating, agitation and sensory distortions.
	Anabolic steroids	Androgens, hormones, juice, roids, vitamins	Enhance physical performance. Increase muscle mass. Stimulate appetite and weight gain. Chronic use can cause sterility, disruption of normal growth, liver cancer, personality changes and aggressive behavior.
	Aspirin		Relieves minor pain. Reduces fever. Impairs normal blood clotting. Can cause inflammation of the stomach and small intestine.
	Laxatives and emetics	Ipecac syrup	Relieve constipation or induce vomiting. Can cause dehydration, uncontrolled diarrhea and other serious health problems.
	Decongestant nasal sprays		Relieve congestion and swelling of nasal passages. Chronic use can cause nosebleeds and changes in the lining of the nose, making it difficult to breathe without sprays.

The FDA banned ephedra because it appears to have little effectiveness, along with some substantial health risks. Taking ephedra can cause nausea, anxiety, headache, psychosis, kidney stones, tremors, dry mouth, irregular heart rhythms, high blood pressure, restlessness and sleep problems. It has been found to increase the risk of heart problems, stroke and even death.

Interestingly, the most common stimulants in America are legal. Leading the list is caffeine, present in coffee, tea, high energy drinks, many kinds of sodas, chocolate, diet pills and pills used to combat fatigue. The next most common stimulant is nicotine, found in tobacco products. Other stimulants used for medical purposes are asthma medications or decongestants that can be taken by mouth or inhaled.

Hallucinogens

Hallucinogens, also known as psychedelics, are substances that cause changes in mood, sensation, thought, emotion and self-awareness. They alter one's perception of time and space and produce visual, auditory and tactile (relating to the sense of touch) delusions.

Among the most widely abused hallucinogens are lysergic acid diethylamide (LSD), called "acid"; psilocybin, called "mushrooms"; phencyclidine (PCP), called "angel dust"; and mescaline, called "peyote," "buttons" or "mesc." These substances are usually ingested, but PCP is also often inhaled.

Hallucinogens often have physical effects similar to stimulants but are classified differently because of the other effects they produce. Hallucinogens sometimes cause what is called a "bad trip." A bad trip can involve intense fear, panic, paranoid delusions, vivid hallucinations, profound depression, tension and anxiety. The person may be irrational and feel threatened by any attempt others make to help.

Depressants

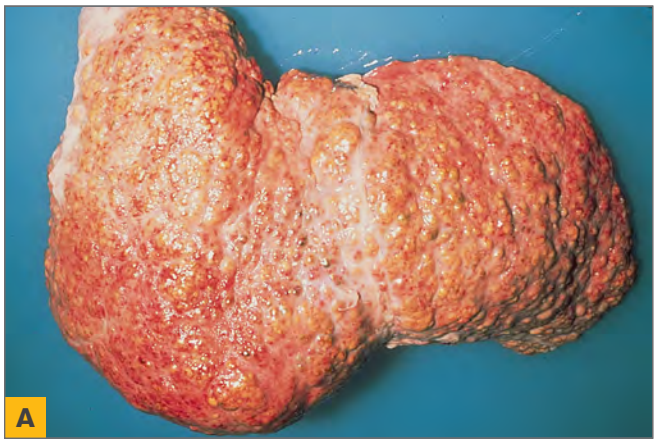
Depressants are substances that affect the central nervous system by slowing down physical and mental activity. Depressants are commonly used for medical purposes. All depressants alter consciousness to some degree. They relieve anxiety, promote sleep, depress respiration, relieve pain, relax muscles and impair coordination and judgment. Like other substances, the larger the dose or the stronger the substance, the greater its effects.

Common depressants are barbiturates, benzodiazepines (e.g., Valium®, Xanax®), narcotics and alcohol. Most depressants are ingested or injected. Their street names include "downers," "barbs," "goofballs," "yellow jackets," "reds" or "ludes."

Three depressants that have gained popularity as club drugs (so-called because they are used at all-night dance parties) include ketamine (also referred to as "special K" or "vitamin K"), an anesthetic approved for use in animals and humans; Rohypnol® (also referred to as "roofies," "roach," or "rope"), a benzodiazepine that is illegal in the United States; and gamma-hydroxybutyrate (GHB) (also referred to as "liquid ecstasy," "soap," or "vita-G"), an illicit drug that has depressant, euphoric and body-building effects. These drugs are particularly dangerous because they are often used in combination or with other depressants (including alcohol), which can have deadly effects, and because they are the "date rape drugs" of choice. As such, they are sometimes slipped to others unnoticed.

Alcohol is the most widely used and abused substance in the United States. In small amounts, its effects may be fairly mild. In higher doses, its effects can be toxic. Alcohol is like other depressants in its effects and risks for overdose. Frequent drinkers may become dependent on the effects of alcohol and increasingly tolerant of those effects. Alcohol poisoning occurs when a large amount of alcohol is consumed in a short period of time and can result in unconsciousness and, if untreated, death.

Drinking alcohol in large or frequent amounts can have many unhealthy consequences. Alcohol can irritate the digestive system and even cause the esophagus to rupture, or it can



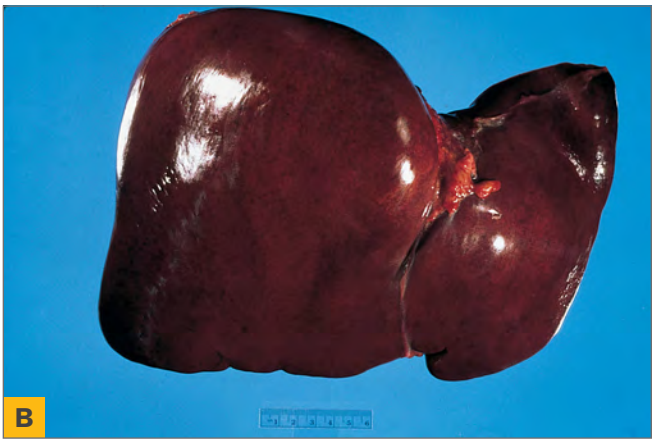


FIGURE 18-1, A–B **A,** *Chronic drinking can result in cirrhosis, a disease of the liver.* **B,** *A healthy liver.*

What if...

I know a person is suffering from alcohol poisoning? Should I use activated charcoal as I have seen them do on TV?

Alcohol poisoning is a serious and possibly deadly condition occurring as consequence of drinking large amounts of alcohol in a short period of time. Excessive drinking can affect breathing, heart rate and gag reflex and potentially lead to coma and death. While treating a person right away might seem like the best thing to do, as with any ingested poison, initial treatment would be to call 9-1-1 or the local poison control center depending on the condition of the person. Activated charcoal should never be administered to a person who has ingested a poisonous substance unless you are advised to do so by the poison control center or emergency medical personnel.

injure the stomach lining. Chronic drinking can also affect the brain and cause memory loss, apathy and a lack of coordination. Other problems include liver disease, such as cirrhosis **(Figure 18-1, A–B)**. In addition, many psychological, family, social and work problems are related to chronic drinking. See The Incalculable Cost of Alcohol Use.

Narcotics

While they have a depressant effect, ***narcotics*** (which are derived from opium) are used mainly to relieve pain. Narcotics are so powerful and highly addictive that all are illegal without a prescription, and some are not prescribed at all. When taken in large doses, narcotics can produce euphoria, stupor, coma or death. The most common natural narcotics are morphine and codeine. Most other narcotics, including heroin, are synthetic or semi-synthetic. Oxycodone, also known by the trade names Oxycontin® or Percodan®, is a powerful semi-synthetic narcotic that has recently gained popularity as a street drug.

Inhalants

Substances inhaled to produce mood-altering effects are called ***inhalants***. Inhalants also depress the central nervous system. In addition, inhalant use can damage the heart, lungs, brain and liver. Inhalants include medical anesthetics, such as amyl nitrite and nitrous oxide (also known as “laughing gas”), as well as hydrocarbons, known as solvents. The effects of solvents are similar to those of alcohol. People who use solvents may appear to be drunk. Other effects of inhalant use include swollen mucous membranes in the nose and mouth, hallucinations, erratic blood pressure and seizures. Solvents include toluene, found in glues; butane, found in lighter fluids; acetone, found in nail polish removers; fuels, such as gasoline and kerosene; and propellants, found in aerosol sprays.

THE INCALCULABLE COST OF ALCOHOL USE

According to the CDC, some 79,000 people die each year as a result of excessive alcohol use (defined as heavy drinking or binge drinking). Deaths from excessive alcohol use add up to 2.3 million years of potential life lost annually—or an average of about 30 years of potential life lost for every death.

What defines heavy drinking and binge drinking? For women, it is drinking more than 1 drink per day on average, or 4 or more drinks on a single occasion; for men, it is more than 2 drinks per day on average or 5 or more drinks on a single occasion. Most people who binge drink, incidentally, are not alcoholics or alcohol-dependent.

Among some of the other striking statistics: according to the National Council on Alcoholism and Drug Dependence (NCADD), an estimated 32% of fatal car crashes involve an intoxicated driver or pedestrian. And while there are over 1.4 million arrests for drunk driving annually, that is less than 1% of the 159 million self-reported incidences of alcohol-impaired driving. In addition, some 40% of all violent crimes and two-thirds of intimate partner violence involve alcohol. The CDC reports that alcohol use is involved in up to half of adolescent and adult deaths associated with water activities.

Motor vehicle accidents, violence and water accidents are just some of the immediate risks of excessive alcohol use. Alcohol use also puts you at increased risk for unintentional injury due to falls, burns and firearm injuries; as well as risky sexual behaviors that can lead to sexually transmitted infections and unintended pregnancy; alcohol poisoning; and in the case of pregnant women, stillbirth, miscarriage and birth defects.

Over the long-term, excessive alcohol use can cause a whole host of chronic diseases, neurological impairments and social problems, including dementia, stroke, cardiovascular problems, liver disease, depression, anxiety and suicide, along with loss of employment, lost productivity and family problems. Again, according to the CDC, up to 40% of all hospital beds (not including maternity and ICU beds) are occupied by someone with a health condition related to alcohol use.

SOURCES: Centers for Disease Control and Prevention. Alcohol Use and Health. *www.cdc.gov/alchohol/fact-sheets/alcohol-use.htm*, Accessed 11/11/11.

Centers for Disease Control and Prevention. Unintentional Drowning: Fact Sheet, *www.cdc.gov/HomeandRecreationalSafety/Water-Safety/waterinjuries-factsheet.html*, Accessed 11/11/11.

National Council on Alcoholism and Drug Dependence. *www.ncadd.org*, Accessed 11/11/11.

Cannabis Products

Cannabis products, including hash oil, tetrahydrocannabinol (THC) and hashish, are all derived from the plant *Cannabis sativa*. Marijuana is the most widely used illicit drug in the United States. Street names include "pot," "grass," "weed," "reefer," "ganja" and "dope." It is typically smoked in cigarette form or in a pipe, but it can also be ingested. The effects include feelings of elation, distorted perceptions of time and space and impaired judgment and motor coordination. Marijuana irritates the throat, reddens the eyes and causes dizziness and often an increased appetite. Depending on the dose, the person and many other factors, cannabis products can produce effects similar to those of substances in any of the other major substance categories.

Marijuana, although illegal, has been legalized in some states for limited medical use to help alleviate symptoms of certain conditions, such as multiple sclerosis. Marijuana and its legal synthetic versions are used as an anti-nausea medication for people undergoing chemotherapy for cancer, for treating glaucoma, for treating muscular weakness caused

by multiple sclerosis and to combat the weight loss caused by cancer and acquired immunodeficiency syndrome (AIDS).

Other Substances

Some other substances do not fit neatly into these categories. These substances include **designer drugs**, steroids and OTC substances, which can be purchased without a prescription.

Designer Drugs

Designer drugs are variations of other substances, such as narcotics and amphetamines. Through simple and inexpensive methods, the molecular structure of substances produced for medicinal purposes can be modified into extremely potent and dangerous street drugs; hence the term "designer drug." When the chemical makeup of a drug is altered, the user can experience a variety of unpredictable and dangerous effects. The people who modify these drugs may have no knowledge of the effects a new designer drug might produce.

One of the more commonly used designer drugs is methylenedioxymethamphetamine (MDMA). Another popular club drug, it is often called "ecstasy" or "E." Although ecstasy is structurally related to stimulants and hallucinogens, its effects are somewhat different from either category. Ecstasy can evoke a euphoric high that makes it popular. Other signals of ecstasy use range from the stimulant-like effects of high blood pressure, rapid heartbeat, profuse sweating and agitation to the hallucinogenic-like effects of paranoia, sensory distortion and erratic mood swings.

Anabolic Steroids

Anabolic steroids are drugs sometimes used by athletes to enhance performance and increase muscle mass. Their medical uses include stimulating weight gain for persons unable to gain weight naturally. They should not be confused with corticosteroids, which are used to counteract toxic effects and allergic reactions. Chronic use of anabolic steroids can lead to sterility, liver cancer and personality changes, such as aggressive behavior. Steroid use by younger people may also disrupt normal growth. Street names for anabolic steroids include "androgens," "hormones," "juice," "roids" and "vitamins." See Steroids: Body Meltdown for more information.

STEROIDS: BODY MELTDOWN

If you think using steroids is the way to get those sculpted, muscular bodies that are typical of bodybuilders and many professional athletes, think again. These drugs may build up bodies on the outside, but they can cause a body meltdown on the inside. Physicians and other public health officials warn of the dangers of steroid abuse and are particularly concerned about the long-term effects of high doses.

Anabolic steroids are synthetic chemicals that mimic the naturally occurring hormone testosterone. They are designed to promote the growth of skeletal muscles as well as the development of male sexual characteristics. While there are several legitimate, legal uses of prescribed steroids, when anabolic steroids are used illegally, most often by people looking to improve their athletic performance or enhance their physical appearance, they can have devastating effects on the body. These effects, some of which are permanent even if steroid use is stopped, include:

- Hormonal changes causing breast development, shrinking of the testicles, male-pattern baldness and infertility in men; and excessive growth of

Over-the-Counter Substances

Aspirin, nasal sprays, laxatives and emetics (agents to induce vomiting) are among the most commonly abused or misused OTC substances **(Figure 18-2)**. Aspirin is an effective minor pain reliever and fever reducer that is found in a variety of medicines. People use aspirin for many reasons and conditions. In recent years, cardiologists have praised the benefits of low-dose aspirin for the treatment of heart disease and prevention of stroke. As useful as aspirin is, misuse can have toxic effects on the body. Typically, aspirin can cause inflammation of the stomach and small intestine that can result in bleeding ulcers. Aspirin can also impair normal blood clotting.

FIGURE 18-2 *Many OTC substances, such as pain relievers, decongestants, laxatives and emetics, can be abused or misused.*

Decongestant nasal sprays can help relieve the congestion of colds or hay fever. If misused, they can cause a physical dependency. Using the spray over a long period can cause nosebleeds and changes in the lining of the nose that make it difficult to breathe without the spray.

Laxatives are used to relieve constipation. They come in a variety of forms and strengths. If used improperly, laxatives can cause uncontrolled diarrhea that may result in dehydration, which is the excessive loss of water from the body tissues. The very young and the elderly are particularly susceptible to dehydration.

Emetics are drugs that induce vomiting. A popular OTC emetic is ipecac syrup. It has been used in the past to induce vomiting following the ingestion of some toxic substances. The routine administration of ipecac syrup for ingested poisons is *not* recommended. Improper use can be quite dangerous and may cause recurrent vomiting, diarrhea, dehydration, pain and weakness in the muscles, abdominal pain and heart problems. Over time, the recurrent vomiting can erode tooth enamel, causing dental problems. The American Academy of Pediatrics and the American Association of Poison Control Centers do *not* recommend that ipecac syrup be stocked at home.

The abuse of laxatives and emetics is frequently associated with attempted weight loss and eating disorders, such as anorexia nervosa or bulimia. **Anorexia nervosa** is a disorder that most often affects young women and is characterized by a long-term refusal to eat

body hair, male-pattern baldness, deepening of the voice, a decrease in breast size, and enlargement of the clitoris in women.

- Permanent stunting of growth when taken by adolescents.
- Development of cardiovascular disease (including heart attack and strokes) as well as liver disease (including tumors and cysts) and some cancers.
- Skin changes including severe acne, oily scalp, jaundice and fluid retention.
- Psychiatric effects including rage, aggression, mania and delusions.
- Increased risk for viruses such as HIV and hepatitis from sharing needles to inject steroids.

SOURCE: National Institutes of Health, National Institute on Drug Abuse. NIDA InfoFacts: Steroids (Anabolic-Androgenic). *www.drugabuse.gov/infofacts/steroids.html*, Accessed 11/11/11.

food with sufficient nutrients and calories. People with anorexia typically use laxatives and emetics to keep from gaining weight. **Bulimia** is a condition in which people gorge themselves with food, then purge by vomiting (sometimes with the aid of emetics) or using laxatives. For this reason, the behavior associated with bulimia is often referred to as "binging and purging." Anorexia nervosa and bulimia have underlying psychological factors that contribute to their onset. The effect of both of these eating disorders can be severe malnutrition, which can result in death.

SIGNALS OF SUBSTANCE ABUSE AND MISUSE

Many of the signals of substance abuse and misuse are similar to those of other medical emergencies. For example, you should not necessarily assume that someone who is stumbling, is disoriented or has a fruity, alcohol-like odor on the breath is intoxicated by alcohol or other drugs as this may also be a signal of a diabetic emergency (see Chapter 15).

In general, signals of possible substance abuse and misuse include:

- Behavioral changes not otherwise explained.
- Sudden mood changes.
- Restlessness, talkativeness or irritability.
- Changes in consciousness, including loss of consciousness.
- Slurred speech or poor coordination.
- Moist or flushed skin.
- Chills, nausea or vomiting.
- Dizziness or confusion.
- Abnormal breathing.

The misuse or abuse of stimulants can have many unhealthy effects on the body that mimic other conditions. For example, a stimulant overdose can cause moist or flushed skin, sweating, chills, nausea, vomiting, fever, headache, dizziness, rapid pulse, rapid breathing, high blood pressure and chest pain. In some instances, a stimulant overdose can cause respiratory distress, disrupt normal heart rhythms or cause death. The person may appear very excited, restless, talkative or irritable or the person may suddenly lose consciousness. Stimulant abuse can lead to addiction and can cause a heart attack or stroke.

Specific signals of hallucinogen abuse, as well as abuse of some designer drugs, may include sudden mood changes and a flushed face. The person may claim to see or hear something not present. He or she may be anxious and frightened.

Specific signals of depressant abuse may include drowsiness, confusion, slurred speech, slowed heart and breathing rates and poor coordination. A person who abuses alcohol may smell of alcohol. A person who has consumed a great deal of alcohol in a short time may be unconscious or hard to arouse. The person may vomit violently.

Specific signals of alcohol withdrawal, a potentially dangerous condition, include confusion and restlessness, trembling, hallucinations and seizures.

A telltale sign of cannabis use is red, bloodshot eyes, while those abusing inhalants may appear drunk or disoriented in a similar manner to a person abusing hallucinogens.

SOURCES OF HELP FOR SUBSTANCE ABUSE

After a substance abuse emergency, a person may need additional support to overcome addiction. If you know the person, you may be able to help him or her contact one of the many agencies and organizations that offer ongoing assistance to persons trying to overcome substance abuse. Community-based programs through schools and religious institutions provide access to hotlines and local support groups. Some of the resources listed below may have facilities or contacts in your area. Look on the Internet or in the advertising pages of the telephone book under Counseling, Drug Abuse and Addiction Information, Social Service Organizations, or Clinics and Health Services for additional resources.

Al-Anon Family Group Headquarters, Inc.
www.al-anon.org

Alcoholics Anonymous
www.aa.org

Cocaine Anonymous
www.ca.org

Mothers Against Drunk Driving (MADD)
www.madd.org

Narcotics Anonymous
www.na.org

National Council on Alcoholism and Drug Dependence
www.ncadd.org

Students Against Destructive Decisions (SADD)
www.sadd.org

U.S. Department of Health and Human Services
www.hhs.gov

Substance Abuse and Mental Health Services Administration
www.samhsa.gov

CARE FOR SUBSTANCE ABUSE AND MISUSE

Your initial care for substance abuse or misuse does not require that you know the specific substance taken. Follow these general principles as you would for any poisoning, normally an ingested poison:

- Check the scene to be sure it is safe to help the person. Do not approach the person if he or she is behaving in a threatening manner.
- Call 9-1-1 or the local emergency number immediately if the person:
  - Is unconscious, confused or seems to be losing consciousness.
  - Has trouble breathing or is breathing irregularly.
  - Has persistent chest pain or pressure.
  - Has pain or pressure in the abdomen that does not go away.
  - Is vomiting blood or passing blood.
  - Has a seizure, a severe headache or slurred speech.
  - Acts violently.
- If none of the above conditions are present, and you have good reason to suspect a substance was taken, call the National Poison Control Center Hotline at 800-222-1222 and follow the call taker's directions.
- Try to learn from the person or others what substances may have been taken.
- Calm and reassure the person.
- Keep the person from getting chilled or overheated.

Because many of the physical signals of substance abuse and misuse mimic other conditions, you should not assume that a person has overdosed on a substance. Always check for life-threatening conditions and give care as you would for any person with a sudden illness or injury.

If possible, interview the person or bystanders to try to find out what substance was taken, how much was taken and when it was taken. You may also be able to find clues at the scene that suggest the nature of the problem. Such clues may help you provide more complete information to emergency medical services (EMS) personnel. Look for containers, pill bottles, drug paraphernalia and signals of other medical problems. If you suspect that someone has used a designer drug, tell EMS personnel. Telling EMS personnel your suspicions is important because a person who has overdosed on a designer drug frequently may not respond to usual medical treatment.

See Smart Moves: Preventing Substance Abuse and Smart Moves: Preventing Substance Misuse for more information.

SMART MOVES: PREVENTING SUBSTANCE ABUSE

Experts in the field of substance abuse generally agree that prevention efforts are far more cost-effective than treatment. Yet preventing substance abuse is a complex process that involves many underlying factors. These include:

- A lack of parental supervision.
- The breakdown of traditional family structures.
- A wish to escape unpleasant surroundings and stressful situations.
- The widespread availability of substances.
- Peer pressure and the basic need to belong.
- Low self-esteem, including feelings of guilt or shame.
- Media glamorization, especially of alcohol and tobacco, promoting the idea that using substances enhances fun and popularity.
- A history of substance abuse in the home or community environment.

Various approaches, including educating people about substances and their effects on health and attempting to instill fear of penalties, have not by themselves proved particularly effective. To be effective, prevention efforts must address the various underlying factors of and approaches to substance abuse.

SMART MOVES: PREVENTING SUBSTANCE MISUSE

Many poisonings from medicinal substances are not intentional. The following guidelines can help prevent unintentional misuse or overdose:

- Read the product information and use products only as directed.
- Ask your physician or pharmacist about the intended use and side effects of prescription and OTC medications. If you are taking more than one medication, check for possible interaction effects.
- Never use another person's prescribed medications; what is right for one person is seldom right for another.
- Always keep medications in their appropriate, marked containers.
- Destroy all out-of-date medications. Time can alter the chemical composition of medications, causing them to be less effective and possibly even toxic.
- Always keep medications out of the reach of children.

SUMMARY

There are six major categories of substances that, when abused or misused, can produce a variety of signals, some of which are indistinguishable from those of other medical emergencies. Remember, you do not have to diagnose the condition to give care. If you suspect that the person's condition is caused by substance abuse or misuse, give care for a poisoning emergency. Call 9-1-1 or the local emergency number or poison control center and follow their directions. If the person becomes violent or threatening, go to a safe place and call 9-1-1 or the local emergency number. Do not return to the scene until EMS personnel and the police arrive.

READY TO RESPOND?

Think back to Michelle in the opening scenario, and use what you have learned to respond to these questions:

1. What are the signals of Michelle's condition?
2. What do you think is the cause of Michelle's condition? Can you be sure?
3. Should you call 9-1-1 or the local emergency number for Michelle? Why or why not?

STUDY QUESTIONS

1. Match each term with the correct definition.

a. Addiction	e. Overdose
b. Dependency	f. Substance abuse
c. Medication	g. Tolerance
d. Drug	h. Withdrawal

_____ Deliberate, persistent, excessive use of a substance

_____ A drug given therapeutically to prevent or treat the effects of a disease or condition, or otherwise enhance mental or physical well-being

_____ Any substance other than food intended to affect the functions of the body

_____ The use of an excessive amount of a substance, resulting in adverse reactions ranging from mania (mental and physical hyperactivity) and hysteria to coma and death

_____ The compulsive need to use a substance

_____ The condition of mental and physical discomfort produced when a person stops using or abusing a substance to which he or she is addicted

_____ The desire or need to continually use a substance

_____ The condition in which the effects of a substance on the body decrease as the result of continued use

2. List four general signals that might indicate substance abuse or misuse.

3. List the six major categories of abused or misused legal substances.

4. List four things you can do to prevent unintentional substance misuse.

5. Describe the care for a person suspected of substance abuse or misuse.

6. Match each type of substance with the effects it has on the body.

a. Depressants	d. Stimulants
b. Hallucinogens	e. Narcotics
c. Inhalants	f. Cannabis products

_____ Affect mood, sensation, thought, emotion and self-awareness; alter perception of time and space; and produce hallucinations and delusions

_____ Produce mood-altering effects similar to those of alcohol; found in glues and solvents

_____ Slow down the physical activities of the brain, producing temporary feelings of relaxation

_____ Speed up the physical and mental activity of the brain, producing temporary feelings of alertness and improved task performance

_____ Relieve pain

_____ Produce feelings of elation, disoriented perceptions of time and space and impaired judgment

In questions 7 and 8, circle the letter of the correct answer.

7. Which of the following is true of substance abuse?

   a. It occurs only among the elderly who are forgetful and may have poor eyesight.
   b. It is the use of a substance for intended purposes but in improper amounts or doses.
   c. It is the use of a substance without regard to health concerns or accepted medical practices.
   d. Its effects are minor and rarely result in medical complications.

8. The effects of designer drugs are—

   a. Well known.
   b. Unpredictable.
   c. Harmless.
   d. Easily controlled.

Answers are listed in Appendix B.

Heat-Related Illnesses and Cold-Related Emergencies

19

You are hiking in the woods on a fall day that starts out warm, but is quickly getting cooler as gray clouds move in overhead. Although the exertion is still making you sweat, you feel cold as the wind picks up and a steady rain begins to fall. Your hiking partner, Kelly, is shivering and complaining that she cannot get warm, despite having put on all the layers of clothing she brought along. She states that everything she is wearing is soaked-through anyway, and asks if you can just stop walking for a while as she doesn't feel like fighting the wind and rain anymore.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Describe how body temperature is controlled.
- Identify the factors that influence how well the body maintains its temperature.
- Identify the risk factors that increase a person's susceptibility to heat-related illnesses and cold-related emergencies.
- List the signals of dehydration, heat cramps, heat exhaustion and heat stroke.
- Describe the care for dehydration, heat cramps, heat exhaustion and heat stroke.
- List the signals of frostbite and hypothermia.
- Describe the care for frostbite and hypothermia.
- Describe the ways to help prevent heat-related illnesses and cold-related emergencies.

KEY TERMS

Frostbite: A condition in which body tissues freeze; most commonly occurs in the fingers, toes, ears and nose.

Heat cramps: A form of heat-related illness; painful involuntary muscle spasms that occur during or after physical exertion in high heat, caused by loss of electrolytes and water from perspiration; may be a sign that a more serious heat-related illness is developing; usually affects the legs and abdomen.

Heat exhaustion: A more severe form of heat-related illness; results when fluid and electrolytes are lost through perspiration and are not replaced by other fluids; often results from strenuous work or wearing too much clothing in a hot, humid environment.

Heat stroke: The most serious form of heat-related illness; life threatening and develops when the body's cooling mechanisms are overwhelmed and body systems begin to fail.

Hypothalamus: Control center of the body's temperature; located in the brain.

Hypothermia: The state of the body being colder than the usual core temperature, caused by either excessive loss of body heat and/or the body's inability to produce heat.

INTRODUCTION

The human body is equipped to withstand extremes in temperature. Under normal circumstances, its mechanisms for regulating body temperature work very well. However, when the body is overwhelmed, heat-related illnesses and cold-related emergencies can occur.

Heat-related illnesses and cold-related emergencies can happen anywhere—indoors or outdoors and under a variety of conditions. The signals of heat-related illnesses and cold-related emergencies are progressive and can quickly become life threatening. A person can develop heat-related illnesses and cold-related emergencies even when temperatures are not extreme. The effects of humidity, wind, clothing, living and working environments, physical activity, age, and health all play a role in determining an individual's susceptibility.

In this chapter, you will learn how to recognize and give care for heat-related illnesses and cold-related emergencies.

HOW BODY TEMPERATURE IS CONTROLLED

In order to work efficiently, the human body must maintain a constant core temperature. Normal body temperature is 98.6° F (37° C). The control center of body temperature is in the brain and is called the ***hypothalamus***. The hypothalamus receives information and adjusts the body temperature accordingly. The body needs to be kept within a specific range of temperatures for the cells to stay alive and healthy (97.8° F to 99° F, or 36.5° C to 37.2° C). It is vital that the body responds properly to temperature signals.

How the Body Stays Warm

Heat is a byproduct of metabolism, the conversion of food and drink into energy. The body also gains heat with any kind of physical activity. If the body starts to become too cold, it responds by constricting (closing up) the blood vessels close to the skin so it can keep the warmer blood near the center of the body **(Figure 19-1)**. This helps keep the organs warm. If this does not work, the body then begins to shiver. The shivering motion increases body heat because it is a form of movement.

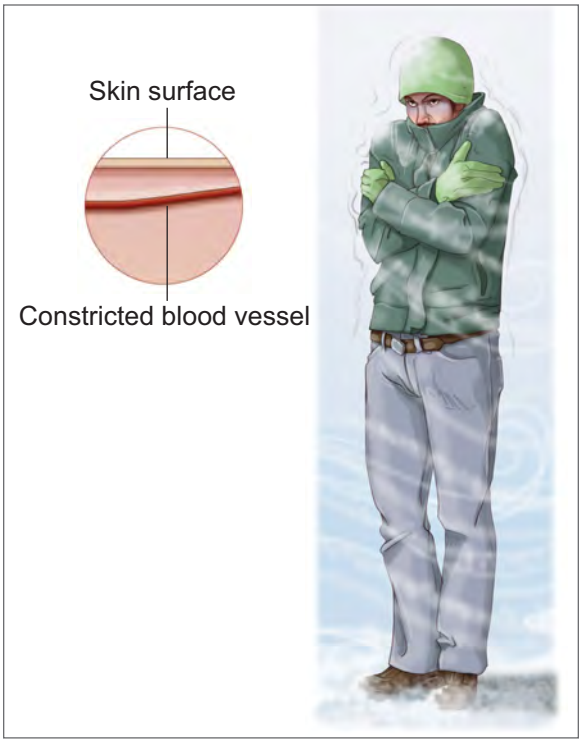


FIGURE 19-1 *The body stays warm by constricting blood vessels close to the skin. If this does not work, it begins to shiver.*

How the Body Stays Cool

In a warm or hot environment, the hypothalamus detects an increase in blood temperature. Blood vessels near the skin dilate (widen) to bring more blood to the surface, which allows heat to escape **(Figure 19-2)**.

There are five general ways in which the body can be cooled:

- Radiation: This process involves the transfer of heat from one object to another without physical contact. The body loses the majority of heat through radiation, mostly from the head, hands and feet.
- Convection: This process occurs when air moves over the skin and carries the skin's heat away. The faster the air is moving, the faster the body will be cooled. Convection is what makes warm skin feel cooler in a breeze. Convection also assists in the evaporation process.
- Conduction: This occurs when the body is in direct contact with a substance that is cooler than the body's temperature. Through conduction, the body's heat is transferred to the cooler substance (e.g., if you are swimming in cold water or sitting on a cool rock in the shade, body heat is transferred to the water or to the rock).

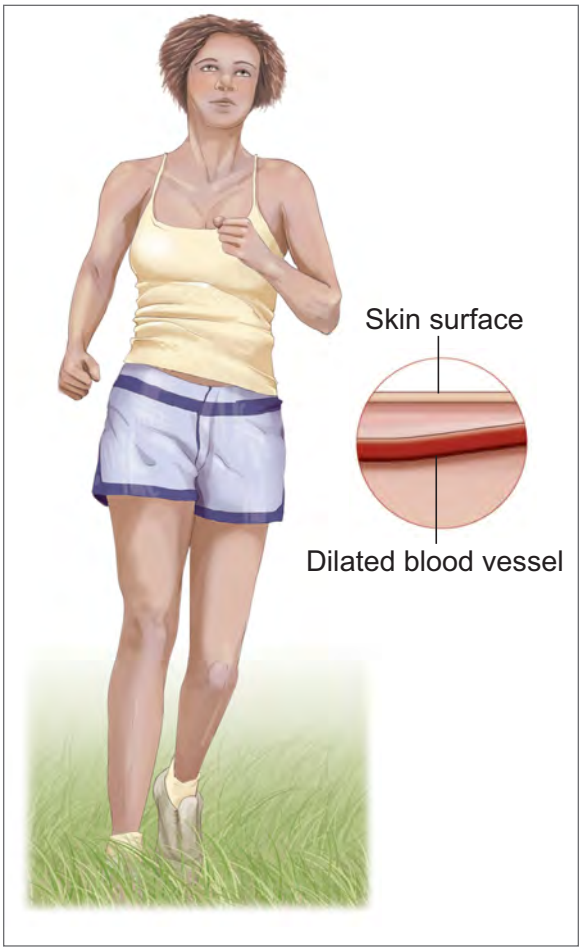


FIGURE 19-2 *The body stays cool by dilating blood vessels near the skin so heat can escape.*

- Evaporation: This is the process by which a liquid or solid becomes a vapor. When body heat causes one to perspire and the perspiration evaporates, the heat that was absorbed into sweat dissipates into the air, which cools off the skin through the process of convection.
- Respiration: Heat is also lost through respiration, another term for breathing. Before air is exhaled, it is warmed by the lungs and airway. Respiration normally accounts for approximately 10 to 20 percent of heat loss.

Factors Affecting Body Temperature Regulation

Three main factors affect how well the body maintains its temperature: the air temperature, the humidity level and wind (e.g., wind-chill factor). Extreme heat or cold accompanied by high humidity or high wind speed reduces the body's ability to maintain temperature effectively **(Figure 19-3)**.

Other factors, such as the clothing you wear, how often you take breaks from exposure to extreme temperature, how much and how often you drink water and how intense your activity is, also affect how well the body manages temperature extremes. These are all factors you can control to prevent heat-related illnesses and cold-related emergencies.

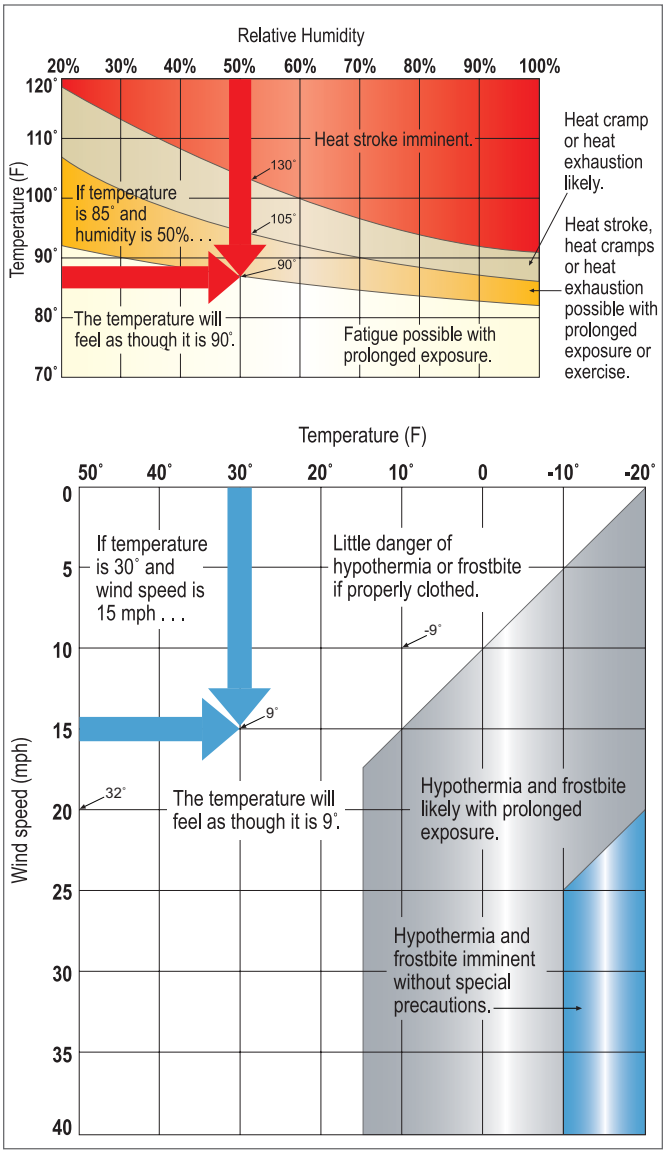


FIGURE 19-3 *Temperature, humidity and wind are the three main factors affecting body temperature.*

People at Increased Risk

Although anyone can be at risk for heat-related illnesses and cold-related emergencies, some people are at greater risk than others. People more susceptible to heat-related illnesses and cold-related emergencies include those who:

- Work (e.g., roofers, construction workers) or exercise (e.g., athletes) strenuously in a warm or hot and humid environment or a cold environment.
- Have a pre-existing health problem, such as diabetes or heart disease. Pre-existing health problems can increase a patient's susceptibility to heat-related illness. Medications taken for these conditions can also cause dehydration.
- Take medications to eliminate water from the body (diuretics). Diuretics increase the risk of dehydration, which causes an increase in core body temperature by preventing adequate blood flow to remove excess heat.
- Consume other substances that have a diuretic effect, such as fluids containing caffeine, alcohol or carbonation.
- Do not maintain adequate hydration by drinking enough water to counteract the loss of fluids through perspiration, exertion or exposure to heat and humidity.
- Have had a previous heat-related illness or cold-related emergency.
- Live in a situation or environment that does not provide them with enough heating or cooling, depending on the season.
- Wear clothing inappropriate for the weather.

People usually seek relief from an extreme temperature before they begin to feel ill. However, some people do not or cannot easily escape these extremes. Athletes and those who work outdoors often keep working even after they develop the first indications of illness. Many times, they may not even recognize the signals.

Heat-related illnesses and cold-related emergencies occur more frequently among the elderly, especially those living in poorly ventilated or poorly insulated buildings or buildings with poor heating or cooling systems. Young children and people with health problems are also at risk because their bodies do not respond as effectively to temperature extremes.

TYPES OF HEAT-RELATED ILLNESSES

Heat cramps, ***heat exhaustion*** and ***heat stroke*** are conditions caused by overexposure to heat, and loss of fluids and electrolytes. Dehydration is another condition often related to heat-related illnesses. Heat-related illness, if not cared for promptly, can get progressively worse in a very short period of time. By recognizing the signals of the early stages of heat-related illness and responding appropriately, you may be able to prevent the condition from becoming life threatening.

Dehydration

Deydration refers to inadequate fluids in the body's tissues and is often caused by inadequate fluid intake, vomiting, diarrhea, certain medications, and alcohol or caffeine use. Dehydration can be a serious and even life-threatening situation. The people at highest risk for dying from dehydration are the very young and the very old. Lay responders can measure dehydration levels by monitoring urine color before, during, and after a period of heavy work or exercise. Dark, amber urine or complete lack of urine output suggests a dehydrated state. Fluid loss that is not regained increases the risk for a heat-related illness.

Signals of Dehydration

The signals of dehydration worsen as the body becomes dryer. Initial signals include:

- Fatigue.
- Weakness.
- Headache.
- Irritability.
- Nausea.
- Dizziness.
- Excessive thirst.
- Dry lips and mouth.

As dehydration worsens, signals can include:

- Disorientation or delirium.
- Loss of appetite.
- Severe thirst.
- Dry mucous membranes.
- Sunken eyes.
- Dry skin that does not spring back if pinched, creating a "tenting" effect.
- Lack of tears (particularly important among young children).
- Decrease in perspiration.
- Dark, amber urine or complete lack of urine output.
- Unconsciousness.

Care for Dehydration

To care for a person who is dehydrated, you need to help him or her replace the lost fluid. If the person is still conscious and able to swallow, encourage him or her to drink small amounts of cool water or a commercial sports drink. Do not let the person gulp the fluid down; instead, have the person sip it at a slow pace. If the person drinks too quickly, vomiting may occur. If dehydration is severe, the person will likely need more advanced medical care to receive fluids intravenously.

Heat Cramps

Heat cramps are the least severe heat-related illness but, if not cared for, may be followed by heat exhaustion and heat stroke. The exact cause of heat cramps is not known, although it is believed to be a combination of loss of fluid and salt from heavy sweating. Heat cramps develop fairly rapidly and usually occur after heavy exercise or work in warm or even moderate temperatures.

Signals of Heat Cramps

Heat cramps are painful spasms of skeletal muscles. While they usually affect the legs and the abdomen, they can occur in any voluntary muscle. The person's body temperature is usually normal and the skin moist. However, heat cramps may indicate that a person is in the early stages of a more severe heat-related emergency.

Care for Heat Cramps

To care for heat cramps:

- Help the person move to a cool place to rest.
- Give an electrolyte- and carbohydrate-containing fluid such as a commercial sports drink, fruit juice or milk. Water also may be given.
- Lightly stretch the muscle and gently massage the area **(Figure 19-4)**.
- Do *not* give the person salt tablets. They can worsen the situation.

When cramps stop, the person usually can start activity again if there are no other signals of illness. He or she should keep drinking plenty of fluids. Watch the person carefully for further signals of heat-related illness.

What if...

A person has heat cramps? I've heard that eating salty food such as cured meat helps to prevent heat cramps from recurring.

Rest, cooling off and drinking an electrolyte-carbohydrate fluid, such as a commercial sports drink, fruit juice or milk is typically the only care needed for heat cramps. When exercising heavily in hot and humid conditions in which a person is losing a lot of salt through sweat, however, extra sodium from food intake or rehydration beverages (or both) may be required. Cured meat is not the best option though. Consider consulting with a dietician or medical professional to identify a safe and healthy strategy to increase sodium in the event of excessive exercise-induced muscle cramping.

FIGURE 19-4 *Resting, lightly stretching and massaging the affected muscle and replenishing fluids are usually enough for the body to recover from heat cramps.*

Heat Exhaustion

Heat exhaustion is a more severe form of heat-related illness. Heat exhaustion results when fluid lost through perspiration is not replaced by other fluids. This results in the body pulling the blood away from the surface areas of the body to protect the vital organs, such as the heart and brain.

Anyone can be at risk for developing heat exhaustion from exposure to a hot or humid environment. However, it happens most often to those engaged in intense physical activity—such as firefighters, construction or factory workers and athletes. Simply being in a hot and humid environment while overdressed with heavy clothes can also cause heat exhaustion.

Signals of Heat Exhaustion

The signals of heat exhaustion include:

- Cool, moist, pale, ashen or flushed skin.
- Weakness.
- Dizziness.
- Shallow breathing.
- Exhaustion.
- Decreasing level of consciousness.
- Heavy sweating.
- Headache.
- Nausea.
- Muscle cramps.

Care for Heat Exhaustion

When a heat-related illness is recognized in its early stages, it usually can be reversed. To give care:

- Move the person from the hot environment to a cooler environment with circulating air.
- Loosen or remove as much clothing as possible.
- Apply cool, wet cloths, such as towels or sheets, taking care to remoisten the cloths periodically. Spraying the person with water and fanning also can help increase the evaporative cooling **(Figure 19-5)**.
- If the person is conscious and able to swallow, give him or her small amounts of a cool fluid such as a commercial sports drink or fruit juice to restore fluids and electrolytes. Milk or water also may be given. Do not let the conscious person drink too quickly.
- Let the person rest in a comfortable position and watch carefully for changes in his or her condition. The person should not resume normal activities the same day.
- If the person's condition does not improve or he or she refuses fluids, has a change in consciousness or vomits, call 9-1-1 or the local emergency number, as these are indications that the person's condition is getting worse. Stop giving fluids and place the person on his or her side in the high arm in endangered spine (H.A.IN.E.S.) recovery position if needed. Watch for signals of breathing problems. Keep the person lying down and continue to cool the body any way you can (see Care for Heat Stroke for methods).

FIGURE 19-5 *Spraying a person with water and fanning a person can be effective at cooling him or her down.*

Heat Stroke

The most serious of heat-related illnesses is heat stroke. Heat stroke is a life-threatening condition that most often occurs when people ignore the signals of heat

exhaustion or do not act quickly enough to give care. Heat stroke develops when the body systems are overwhelmed by heat and begin to stop functioning. Sweating often stops because body fluid levels are low (i.e., dehydration). When sweating stops, the body cannot cool itself effectively through evaporation. Body temperature rises quickly, soon reaching a level at which the brain and other vital organs, such as the heart and kidneys, begin to fail. If the body is not cooled, convulsions, coma and death will result.

Two types of heat stroke are typically reported—classic heat stroke and exertional heat stroke.

Classic heat stroke is normally caused by environmental changes and often occurs during the summer months. Classic heat stroke most often occurs in infants, children, the elderly, those with chronic medical illnesses and those who suffer from inefficient body heat-regulation mechanisms—such as those in poor socioeconomic settings with limited access to air conditioning and those on certain medications (e.g., antihistamines, amphetamines, diuretics, and blood pressure and heart medicines). Typically, classic heat stroke develops slowly, over a period of several days, with persons presenting with minimally elevated core temperatures.

Exertional heat stroke is the opposite of classic heat stroke. Exertional heat stroke—which primarily affects younger, active individuals, such as athletes (recreational and competitive), military recruits and heavy laborers—occurs when excess heat is generated through exercise and exceeds the body's ability to cool off. Exposure to factors such as high air temperature, high relative humidity and dehydration increases the risk for developing exertional heat stroke.

Signals of Heat Stroke

Heat stroke is a serious medical emergency. You must recognize the signals of heat stroke and give care immediately. The signals include:

- Extremely high body temperature (above 104° F, or 40° C).
- Flushed or red skin that can be either dry or moist.
- Rapid, shallow breathing.
- Throbbing headache.
- Dizziness, nausea or vomiting.
- Confusion.
- Changes in level of consciousness, unresponsiveness.
- Seizures.

What if...

A person has signals of heat stroke, but still seems to be sweating? Should I give care for heat exhaustion instead?

Not necessarily. While one signal of heat stroke is red, hot and dry skin; due to the body's lack of fluid (and therefore sweat), it is possible for a person with heat stroke to still be sweating in earlier stages, or to appear to be sweating, with wet skin and sweat-soaked clothing. Therefore, if a person has other signals of heat stroke, such as a high body temperature, change in level of consciousness, rapid shallow breathing, confusion, vomiting or seizures, assume heat stroke and call 9-1-1 or the local emergency number immediately. Then, cool the person as rapidly as possible.

Care for Heat Stroke

Call 9-1-1 or the local emergency number immediately for heat stroke as it is a life-threatening emergency. While waiting for help to arrive, you will need to cool the person by following these steps:

- Preferred method: Rapidly cool the body by immersing the person up to the neck in cold water, if possible.

  OR

  Douse the person with ice water-soaked towels over the entire body, frequently rotating the cold, wet towels, spraying with cold water, fanning the person or covering the person with ice towels or bags of ice placed over the body.

- If you are not able to measure and monitor the person's temperature, apply rapid cooling methods for 20 minutes or until the person's level of consciousness improves.
- Give care according to other conditions found.

A person having a heat stroke may experience respiratory or cardiac arrest. Be prepared to perform CPR, if needed.

COLD-RELATED EMERGENCIES

Frostbite and ***hypothermia*** are two types of cold-related emergencies. Frostbite occurs in body parts exposed to the cold. Hypothermia develops when the body can no longer generate sufficient heat to maintain normal temperature.

Frostbite

Frostbite is the freezing of body tissues, usually the nose, ears, fingers or toes. It usually occurs in exposed areas of the body, depending on the air temperature, length of exposure and the wind. Frostbite can be superficial or deep. In superficial frostbite, the skin is frozen but the tissues below are not. In deep frostbite, both the skin and underlying tissues are frozen. Both types of frostbite are serious. The water in and between the body's cells freezes and swells. The ice crystals and swelling damage or destroy the cells. Frostbite can cause the eventual loss of the affected body part.

Signals of Frostbite

The signals of frostbite include:

- Lack of feeling in the affected area.
- Swelling.
- Skin that appears waxy, is cold to the touch and is discolored (flushed, white, yellow or blue) **(Figure 19-6)**.
- In more serious cases, blisters may form and the affected part may turn black and show signals of deep tissue damage.

FIGURE 19-6 *Frostbitten skin my appear waxy, is cold to the touch and is discolored (flushed, white, yellow or blue).* Courtesy of Nigel Vardy and Nottingham University Hospitals NHS Trust.

Care for Frostbite

When giving care for frostbite, the priority is to get the person out of the cold. Once the person is removed from the cold, follow these steps:

- Handle the area gently. Rough handling can damage the body part. *Never* rub the affected area, as this can cause skin damage.
- If there is a chance that the body part may refreeze or if you are close to a medical facility, do *not* attempt to re-warm the frostbitten area.
- For minor frostbite, rapidly re-warm the affected part using skin-to-skin contact such as with a warm hand.
- For more serious frostbite, re-warm the affected area by gently soaking it in water not warmer than 105° F **(Figure 19-7, A)**. If you do not have a thermometer, test the water temperature yourself. If the temperature is uncomfortable to your touch, it is too warm. Keep the frostbitten part in the water until normal color returns and it feels warm (about 20 to 30 minutes).

FIGURE 19-7, A-B **A,** *Re-warm the frostbitten area by gently soaking it in water between 100 and 105° F.* **B,** *If the fingers or toes are frostbitten, place dry, sterile gauze between them to keep them separated before bandaging.*

- Loosely bandage the area with dry, sterile dressings.
- If the fingers or toes are frostbitten, place dry, sterile gauze between them to keep them separated **(Figure 19-7, B)**. If the damage is to the feet, do *not* allow the person to walk.
- *Avoid* breaking any blisters.
- Take precautions to prevent hypothermia.
- Monitor the person and care for shock.
- Do not give any ibuprofen or other nonsteroidal anti-inflammatory drugs.
- Call 9-1-1 or the local emergency number or seek emergency medical care as soon as possible.

Hypothermia

Hypothermia is the state of the body being colder than the usual core temperature. It is caused by either excessive loss of body heat and/or the body's inability to produce heat. Hypothermia can come on gradually or it can develop very quickly. In hypothermia, body temperature drops below 95° F (35° C). As the body cools, an abnormal heart rhythm (ventricular fibrillation) may develop. If this happens, the heart will eventually stop and the person will die if not given care.

The air temperature does not have to be below freezing for people to develop hypothermia. This is especially true if the person is wet or if it is windy.

Contributing Factors

As with heat-related emergencies, anyone can develop hypothermia, but predisposing factors place some people at a higher risk. These factors include:

- A cold environment. Even if the ambient temperature is not extremely low, hypothermia can occur if a person is not adequately protected from the cold.
- A wet environment. The presence of moisture (e.g., perspiration, rain, snow or water) will increase the speed at which body heat is lost.
- Wind. Wind makes the environment a lot colder than the ambient temperature indicates. The higher the wind chill effect, the lower the temperature actually is.
- Age. The very young and the very old may have difficulty keeping warm in cool or cold conditions. Infants may not yet be able to shiver effectively. The elderly may not have

enough body mass to retain body heat. Both age groups may be unable to help themselves stay warm by removing themselves from the cold environment or by protecting themselves with warmer clothing. In addition, many elderly people have impaired circulation.

- Medical conditions. People with certain medical conditions, such as generalized infection, hypoglycemia, shock and head injury, may be at higher risk for developing hypothermia.
- Alcohol, drugs and poisoning. Alcohol and certain types of drugs or poisons can reduce a person's ability to feel the cold, or can cloud judgment and impede rational thought, preventing the patient from taking proper precautions to stay warm.

Signals of Hypothermia

The signals of hypothermia include:

- Shivering (may be absent in later stages of hypothermia).
- Numbness.
- Glassy stare.
- Apathy or decreasing level of consciousness.
- Weakness.
- Impaired judgment.
- Changes in level of consciousness, unresponsiveness.

Shivering that stops without re-warming is a sign that the person's condition is worsening. He or she needs immediate medical care.

LAYER YOUR WAY TO WARMTH

When the weather is cold, but you need or want to be outdoors, the best way to ensure your comfort and warmth is to layer your clothing.

The first layer, called the base layer, is next to your skin. The base layer helps to regulate your body temperature by moving perspiration away from your skin. This is important because if perspiration gets trapped inside your clothes, you can become chilled rapidly, which can lead to hypothermia. Thermal underwear makes a good base layer for cold weather. The fabrics that are best at moving sweat away from the skin (also called wicking) are silk, merino wool and certain synthetics. Cotton is not a good choice because it traps moisture rather than wicking it away.

The job of the middle layer is insulation. This layer keeps you warm; it helps you retain heat by trapping air close to your body. Natural fibers, such as wool and goose down, are excellent insulators. So is synthetic fleece. Vests, jackets and tights are examples of clothing that can be worn for insulation.

The shell or outer layer protects you from wind, rain or snow. For cold weather, the shell layer should be both waterproof and "breathable." This will keep wind and water from getting inside of the other two layers while allowing perspiration to evaporate. The shell also should be roomy enough to fit easily over the other layers without restricting your movement.

One of the other advantages of layering is that you can make quick adjustments if the weather changes or you change your activity level. You can take clothes off when you become too warm and put them back on if you get cold.

In addition to layering your clothes, to stay warm in cold weather you also should wear:

- A hat.
- A scarf or knit mask that covers your face and mouth.
- Sleeves that are snug at the wrist.
- Mittens (they are warmer than gloves).
- Water-resistant boots.

Care for Hypothermia

Call 9-1-1 or the local emergency number immediately for any suspected case of hypothermia. Your priority is to move the person into a warmer environment if possible. Be careful to move the person gently, as any sudden movement can cause a heart arrhythmia and possibly cardiac arrest.

Then, give care as follows:

- In cases of severe hypothermia, the person may appear to be unconscious. Breathing may have slowed or stopped. The body may feel stiff because the muscles became rigid. If the person is unconscious, check for breathing for no more than 10 seconds and perform CPR if needed. Continue to take steps to warm the person until emergency medical services (EMS) personnel take over.
- Make the person comfortable. Remove any wet clothing and dry the person off. Put on dry clothing if available.
- Warm the body gradually by wrapping the person in blankets and plastic sheeting to hold in body heat **(Figure 19-8)**. Also, keep the head covered to further retain body heat.
- If you are far from medical care, position the person near a heat source or apply heat pads or other heat sources to the body, such as containers filled with warm water. Carefully monitor any heat source to avoid burning the person. Keep a barrier, such as a blanket, towel or clothing, between the heat source and the person.
- If the person is alert and can swallow, give warm, not hot, liquids that do not contain alcohol or caffeine. Alcohol can cause heat loss and caffeine can cause dehydration.

FIGURE 19-8 *For hypothermia, re-warm the body gradually by wrapping the person in blankets and keeping the head covered.*

What if...

I am sure a person I am helping has signals of hypothermia, but he or she is insisting on undressing? Could I be wrong that the person is cold?

In some cases, people who have died from the cold have been discovered in an undressed state known as *paradoxical undressing*. As unusual as this may sound, individuals in a hypothermic state do often exhibit signals of an altered mental status, including judgment, which helps to explain why a person might remove warm clothing even though he or she is essentially freezing to death. Paradoxical undressing varies from complete stripping of clothes to unzipping of trousers. If you encounter a situation such as this, remember your basic care steps, begin re-warming the person immediately by moving him or her to a warm environment, and wrap all exposed body surfaces with anything at hand, such as blankets, clothing, and newspapers, to increase the body's core temperature. Of course, you should also call 9-1-1 or the local emergency number immediately for any case of hypothermia.

SMART MOVES: PREVENTING HEAT-RELATED ILLNESSES AND COLD-RELATED EMERGENCIES

Generally, illnesses and emergencies caused by overexposure to extreme temperatures are preventable. Follow these guidelines:

- Avoid being outdoors in the hottest or coldest part of the day. If you plan to work outdoors in hot weather, plan your activity for the early morning and evening hours when the sun is not as strong. Likewise, if you must be outdoors on cold days, plan your activities for the warmest part of the day.
- Dress appropriately for the environment and your activity level. When possible, wear light-colored clothing in the heat as it reflects the sun's rays. When you are in the cold, wear layers to stay warm (see Layer Your Way to Warmth for more information). Wear a head covering in both heat and cold. A hat protects the head from the sun's rays in the summer and prevents heat from escaping in the winter.
- Change your activity level according to the temperature and take frequent breaks. In very hot conditions, exercise only for brief periods, then rest in a cool, shaded area. Frequent breaks allow your body to readjust to normal body temperature, enabling it to better withstand brief periods of exposure to temperature extremes. Avoid heavy exercise during the hottest or coldest part of the day. Extremes of temperature promote fatigue, which hampers the body's ability to adjust to changes in the environment.
- Whether it is hot or cold, drink large amounts of nonalcoholic, decaffeinated fluids before, during and after activity. Drinking at least six 8-ounce glasses of fluids is the most important way to prevent heat-related illnesses or cold-related emergencies. *Never* restrict fluid intake as a form of punishment.
- Plan to drink fluids when you take a break. Just as you would drink cool fluids in the summer, drink warm fluids in the winter. Cool and warm fluids help the body maintain a normal temperature. If cold or hot drinks are not available, drink plenty of plain water.
- Do not drink beverages containing caffeine or alcohol. Caffeine and alcohol hinder the body's temperature-regulating mechanism.

- Do *not* warm the person too quickly, such as by immersing the person in warm water.
- Do *not* rub or massage the extremities.
- Check breathing and monitor for any changes in the person's condition, and care for shock.
- Be prepared to perform CPR or use an automated external defibrillator.

SUMMARY

Overexposure to extreme heat or cold may cause a person to develop a heat-related illness or cold-related emergency. The likelihood of this also depends on factors such as physical activity, clothing, wind, humidity, working and living conditions, and a person's age and physical condition (see Smart Moves: Preventing Heat-Related Illnesses and Cold-Related Emergencies).

In warm conditions, dehydration is a danger that can be related to heat-related illnesses. Heat cramps are an early indication that the body's normal temperature-regulating mechanism is not working efficiently. They may signal that the person is in the early stage of a heat-related illness. For heat-related illness, it is important for the person to stop physical activity. Cool the person and call 9-1-1 or the local emergency number if life-threatening conditions are found. Heat stroke can rapidly lead to death if it is left untreated.

Both hypothermia and frostbite are serious cold-related emergencies that require professional medical care. Hypothermia can be life threatening. For both hypothermia and frostbite, the immediate goal is to move the person to a warmer place as quickly as possible, then provide care based on the conditions found. Always handle a person with a cold-related emergency with care to avoid causing further damage or a dangerous heart arrhythmia. Call 9-1-1 or the local emergency number for any case of hypothermia.

READY TO RESPOND?

Think back to Kelly in the opening scenario, and use what you have learned to respond to these questions:

1. What cold-related emergency is Kelly showing signals of?
2. What risk factors are present that increase the likelihood of hypothermia?
3. What should be your priority in caring for Kelly?

STUDY QUESTIONS

1. Match each term with the correct definition.

    a. Frostbite
    b. Heat cramps
    c. Heat exhaustion
    d. Heat stroke
    e. Hypothermia

_____ The early stage and most common form of heat-related illness

_____ A life-threatening condition that develops when the body's warming mechanisms fail to maintain normal body temperature

_____ A life-threatening condition that develops when the body's cooling mechanism fails

_____ The freezing of body tissues caused by overexposure to the cold

_____ Painful spasms of skeletal muscles that develop after heavy exercise or work outdoors in warm or moderate temperatures

2. List the three main factors that affect body temperature.
3. List three conditions that can result from overexposure to heat.
4. List the signals of heat exhaustion.
5. List two reasons why EMS personnel should be called for heat exhaustion.
6. List two ways to cool a person with heat stroke.
7. List two conditions that result from overexposure to the cold.
8. List four ways to prevent heat-related illnesses and cold-related emergencies.

In questions 9 and 10, circle the letter of the correct answer.

9. To care for heat cramps—
    a. Have the person rest comfortably in a cool place.
    b. Call 9-1-1 or the local emergency number.
    c. Give salt tablets.
    d. All of the above
10. To care for dehydration—
    a. Cool the body using wet sheets and towels or cold packs.
    b. Cool the body by applying rubbing alcohol.
    c. Call 9-1-1 or the local emergency number.
    d. Replace lost fluids.

Use the following scenario to answer questions 11 and 12.

You and a friend have been cross-country skiing all morning. The snow is great, but it is really cold. Your buddy has complained for the past half hour or so that his hands are freezing. Now he says he can't feel his fingers at all. You decide to return to the ski chalet you are renting. Once inside where it is warm, your friend has trouble removing his mittens. You help him take them off and notice that his fingers look waxy and white and feel cold. You recognize the signals of minor frostbite.

11. Circle the signals of frostbite you find in the scenario above.

12. How would you care for your friend's hands?

Use the following scenario to answer questions 13 and 14.

You are working on a community service project delivering meals to elderly, homebound individuals. It is a blustery winter day that has you running from the van to each front door. As you enter the last home, you notice that it is not much warmer inside the house than it is outside. An elderly woman, bundled in blankets, is sitting as close as possible to a small space heater. You speak to her, introducing yourself and asking how things are, but you get no response. The woman's eyes are glassy as she makes an effort to look at you. She seems weak and exhausted, barely able to keep her head up. You touch her arm, but she does not seem to feel it.

13. Circle the signals in the scenario above that would lead you to suspect a cold-related emergency.

14. Describe the actions you would take to care for the woman in the scenario.

Answers are listed in Appendix B.

Part Six

Special Situations

Water-Related Emergencies

20

You are at a backyard pool party at your uncle's house. Once food is put out, everyone climbs out of the pool, ready to dig in. As the family sits around complimenting your uncle on his barbecue skills, one of the younger kids quietly wanders off to play by the pool's edge. There is barely a sound when he falls into the pool while going after a toy that is floating by. Luckily, you happen to look up just in time to see him struggling to stay at the water's surface.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Describe how to recognize a water emergency involving a distressed swimmer or a drowning victim.
- Understand what actions you can safely take to assist a person who is in distress or is drowning.
- Describe three nonswimming rescues and assists that you can use to help someone who is in trouble in the water.
- Describe how to use the head splint technique for a person who is unresponsive in the water or has a suspected head, neck or spinal injury in the water.
- Describe the general care for someone who has been involved in a drowning incident.

KEY TERMS

Distressed swimmer: A swimmer showing anxiety or panic; often identified as a swimmer who has gone beyond his or her swimming abilities.

Drowning: An event in which a person experiences respiratory impairment due to submersion in water. Drowning may or may not result in death.

Reaching assist: A method of rescuing someone in the water by using an object to extend the rescuer's reach or reaching with an arm or leg.

Throwing assist: A method of rescuing someone in the water by throwing the person a floating object, with or without a line attached.

Wading assist: A method of rescuing someone in the water by wading out to the person in distress, but to a depth that is not over the rescuer's head.

INTRODUCTION

One of the most common water-related emergencies is ***drowning***. Drowning occurs when a person experiences respiratory impairment due to submersion in water. Drowning may or may not result in death; however, it is the fifth-most-common cause of death from unintentional injury in the United States among all ages, and it rises to the second leading cause of death among those 1 to 14 years of age. Approximately 4,500 Americans die annually from drowning, and an estimated 16,000 drowning incidents result in hospitalization, with many people suffering permanent disability. Children younger than 5 years of age and young adults between 15 and 24 years of age have the highest rates of drowning.

In this chapter, you will learn how to recognize a water-related emergency including how to recognize a distressed swimmer before he or she becomes a drowning victim. You will also learn several methods to *safely* reach and assist a person in water who is in distress or drowning without become a drowning victim yourself, and how to give initial care to a person involved in a drowning incident, including a person who is unresponsive or who may have also suffered a head, neck or spinal injury. Most importantly, you will learn ways to prevent water-related emergencies from happening.

WATER-RELATED EMERGENCIES

An emergency can happen to anyone in, on or around the water, regardless of how good a swimmer the person is or what he or she is doing at the time. Some people who drown never intended to be in the water. They may have slipped in and then did not know what do. A strong swimmer can get into trouble in the water because of sudden injury or illness. A nonswimmer playing in shallow ocean water can be knocked down by a wave or pulled into deeper water by a rip current. Someone can fall through the ice while skating on a pond. A child can drown at home in the bathtub, even in as little as an inch of water, or in a large bucket, the toilet or an irrigation ditch.

What if...

I live in a home that has a swimming pool? What types of information and skills do you think I need to know?

When you own a pool, you—and everyone in your home—should first know how to swim. Likewise, everyone in the home should be prepared for an emergency, including knowing how to call for emergency help; having first aid, CPR and automated external defibrillator (AED) skills; learning water rescue skills; and knowing where the emergency equipment is located and how to use it. Finally, it is important that everyone in the home take responsibility for securing the pool area and keeping the pool well-maintained.

The key to recognizing an emergency is staying alert and knowing the signals that indicate an emergency. Use all your senses when observing others in and around the water. A swimmer may be acting oddly, or you may hear a scream or sudden splash. Watch for anything that may seem unusual.

Contributing Factors

There are certain factors that increase the likelihood of a drowning incident occurring. These factors include:

- Young children left alone or unsupervised around water (e.g., tubs, pools, lakes).
- Use of alcohol and recreational drugs, which may lead people to make bad decisions and do things they otherwise would not.
- Traumatic injury, such as from diving into a shallow body of water.
- Condition or disability, such as heart disease, seizure disorder or neuromuscular disorder that may cause sudden weakness or loss of consciousness while in the water.
- History of mental illness, such as depression, suicide attempt, anxiety or panic disorder.

Severity

Whether a person survives a drowning incident depends on how long he or she has been submerged and unable to breathe. Brain damage or death can occur in as little as 4 to 6 minutes when the body is deprived of oxygen. The sooner the drowning process is stopped by getting the person's airway out of the water, opening the airway, and giving care, the better the person's chances for survival without permanent brain damage. If the submersion lasts any longer, often the result is death. These times are only estimates; brain damage and/or death can occur more or less quickly depending on a variety of factors.

The temperature of the water is one factor that may affect survival rates. People submerged in icy water have been successfully revived after a considerable period of time under the water. This is due to the fact that in cold water, body temperature begins to drop almost as soon as the person enters the water. Swallowing water accelerates this cooling. As the person's core temperature drops, body functions slow almost to a standstill, and the person requires very little oxygen. Any oxygen in the blood is diverted to the brain and heart to maintain minimal functioning of these vital organs.

FIGURE 20-1 *A distressed swimmer is able to stay afloat and breathe, but may be too tired to get to shore or to the side of the pool.*

FIGURE 20-2 *A drowning victim may be floating face-up or face-down on or near the surface of the water, or may be submerged.*

Recognizing a Water-Related Emergency

Being able to recognize that a person is having trouble in the water may help save that person's life. Most people who are drowning cannot or do not call out for help. They spend their energy trying to keep their mouth and nose above water to breathe. They may slip under water quickly and never resurface. There are three kinds of water emergency situations: a distressed swimmer, a drowning victim—active and a drowning victim—passive. Each kind can be recognized by different behaviors.

A ***distressed swimmer*** may be too tired to get to shore or to the side of the pool, but is able to stay afloat and breathe and may be calling for help **(Figure 20-1)**. The person may be floating, treading water or clinging to an object or a line for support. Someone who is trying to swim but making little or no forward progress may be in distress. If not helped, a person in distress may lose the ability to float and start to drown.

A drowning victim—active could be at the surface of the water or sinking. He or she may be positioned vertically in the water and leaning back slightly. This person may not have a supporting kick or the ability to move forward. The person's arms could be at the side pressing down in an instinctive attempt to keep the head above water to breathe. All energy is going into the struggle to breathe, and the person may not be able to call out for help.

A drowning victim—passive may have a limp body or convulsive-like movements. He or she could be floating face-up or face-down on or near the surface of the water, or may be submerged **(Figure 20-2)**. **Table 20-1** compares the behaviors of distressed swimmers and drowning victims with those of swimmers.

TAKING ACTION IN A WATER-RELATED EMERGENCY

Submersion situations are not always easy to manage. *Consider your own safety above all else when faced with a water-related emergency*. You should not attempt a swimming rescue unless you are trained to do so. In the absence of such training, following these steps will help reduce your risk of drowning:

- Look for a lifeguard to help you before attempting any water rescue.
- If a lifeguard or other professional responder is not present, make sure you have appropriate equipment for your own safety and that of the drowning person.
- Call for help immediately if proper equipment is not available.
- *Never* swim out to a person unless you have the proper training, skills and equipment.

Table 20-1 Behaviors of Distressed Swimmers and Drowning Victims Compared with Swimmers

	SWIMMER	DISTRESSED SWIMMER	DROWNING VICTIM—ACTIVE	DROWNING VICTIM—PASSIVE
Breathing	Rhythmic breathing	Can continue breathing and might call for help	Struggles to breathe; cannot call out for help	Is not breathing
Arm and Leg Action	Relatively coordinated	Floating, sculling or treading water; might wave for help	Holds arms to sides, alternately moving up and pressing down; has no supporting kick	None
Body Position	Horizontal	Horizontal, vertical or diagonal, depending on means of support	Vertical, leaning back slightly	Horizontal or vertical; face-up, face-down or submerged
Locomotion (ability to move from place to place)	Recognizable	Makes little or no forward progress; less and less able to support self	None; has only 20–60 seconds before submerging	None

As in any emergency situation, proceed safely. Make sure the scene is safe. If the person is in the water, decide first whether help is needed in order for the person to get out, and then act based on your training. In addition, you should quickly consider the following factors:

- The condition of the person:
  - Is the person responsive and able to cooperate with the rescue or respond to your commands?
  - Is the person submerged? If the person is submerged, he or she will need immediate care once on dry land. Submersion may also make it difficult to find the person in murky or cloudy water.
  - Does the person seem injured? If so, you may have to remove the person from the water before providing care.
  - Does the person potentially have a head, neck or spinal injury? If so, you may need to stabilize the person's spine while staying with the person in shallow water or attempting to remove him or her from the water.
  - Is the person alone? Do others around the person also seem in distress? Are there multiple people who may need to be rescued? A situation involving multiple people can be much more dangerous for a rescuer.
- The condition of the water:
  - Is the water clear enough for you to see the person and any hazards in the water?
  - How cold is the water? Is there potential for the person to also have hypothermia? What are the risks for the rescuer developing hypothermia?
  - How fast is the water moving? Fast-flowing water is very strong. If it is above your knees, do *not* attempt to wade through it without being harnessed; otherwise, you could be swept away. In addition, a person's location can change very quickly in fast-moving water.

- How deep is the water? Will you be able to securely stand if you need to do a wading assist?
- Are there additional hazards (e.g., debris), such as from a flood, or a situation in which a motor vehicle is submerged? Be aware of the potential for exposure to a hazardous material such as oil or gas.

- The resources available:
  - Are you the only other person on the scene?
  - Are there other qualified rescuers on site to assist with the rescue?
  - Is there anyone available to call for help or to help give care once the person is on dry land?
  - Do you have the proper training, skills and equipment for the rescue that needs to be attempted?
  - Are you wearing a personal flotation device?

Remember, your first goal is to stay safe. Rushing into the water to help someone may put you at risk for drowning, too. A panicking person could grab and submerge a non-trained rescuer thus putting both in danger. Once you ensure your own safety, your goal is to help the person out of the water. If the person is unconscious, send someone to call 9-1-1 or the local emergency number while you start the rescue if possible.

Nonswimming Rescues and Assists

You should make every effort to assist a person without entering the water. Whenever possible, start the rescue by talking to the person. Let the person know that help is coming. If it is too noisy or if the person is too far away, use nonverbal communication such as hand gestures to direct them to land. Direct the person in what to do to help with the rescue, such as grasping a line, ring buoy or other object that floats. Ask the person to move toward you such as by using the back float with slight leg movements or small strokes. Some people reach safety by themselves with the calm and encouraging assistance of someone calling to them.

If talking the person to safety does not help, there are several nonswimming rescues and assists that you can try for a distressed swimmer or drowning person.

Reaching Assists

If the person is close enough, you can use a ***reaching assist*** to help him or her out of the water. Firmly brace yourself on a pool deck, pier or shoreline and reach out to the person with any object that will extend your reach, such as a pole, oar or paddle, tree branch, shirt, belt or towel **(Figure 20-3)**. If equipment is not available, you can still perform a reaching assist by lying down and extending your arm or leg for the person to grab, while making sure that you are stable and cannot be inadvertently pulled into the water.

FIGURE 20-3 *To perform a reaching assist, firmly brace yourself on solid ground and reach out to the person with an object that extends your reach.*

Throwing Assists

You can rescue a swimmer in distress or a drowning victim who is out of reach by using a ***throwing assist***. To do so, throw a floating object with a line attached, aiming so it lands just beyond the person, with the line lying across the person's shoulder if possible **(Figure 20-4)**. The person can grasp the object and then be pulled to safety. Throwing equipment

includes heavy lines, ring buoys, throw bags or any floating object available such as a picnic jug, small cooler, buoyant cushion, kickboard or extra lifejacket.

Wading Assists

If the water is safe and shallow enough (not over your chest), you can use a ***wading assist*** to reach the person. If there is a current or the bottom is soft or the depth unknown, making it dangerous to wade, do *not* enter the water. If possible, wear a life jacket and take something with you to extend your reach such as a ring buoy, buoyant cushion, kickboard, life jacket, tree branch, pole, air mattress, plastic cooler, picnic jug, paddle or water exercise belt.

Assisting a Submerged Drowning Person

If a drowning victim is submerged in deep water, and a responder trained in water rescue is not on the scene, call 9-1-1 or the local emergency number for help immediately. If the person is in shallow water (less than chest deep), you can reach down and grab the person to pull him or her to the surface. Once at the surface, turn the person face-up and remove the person from the water and provide care as described in the following sections.

Care for Drowning

A distressed swimmer or drowning victim should be removed from the water as soon as possible, however, how and when to remove the person depends on his or her overall condition (i.e., is the person conscious or unconscious; is a head, neck or spinal injury suspected), the person's size, how soon help is expected to arrive and whether anyone else can help. The priorities when providing care in a water emergency are ensuring the person's face (mouth and nose) are out of the water, an open airway is maintained, and resuscitation (when required) is begun as soon as possible.

Care for an Unresponsive Person

For a person who is *unresponsive and face-down* in shallow water, use the head splint technique to quickly turn the person face-up (if a head, neck or spinal injury is suspected, take care to minimize movement of the spine):

- Gently approach the person from the side.
- Move the person's arms up alongside the head by grasping the person's arms midway between the shoulder and elbow. Move the person's right arm with your right hand, and the person's left arm with your left hand.

FIGURE 20-4 *To perform a throwing assist, throw a floating object with a line just beyond a person in the water and pull the person to safety once he or she has grasped the object.*

What if...

I am at the beach and I see someone who is caught in a rip current? How can I help?

Currents flowing away from the coast are called rip currents. They are dangerous because strong rip currents can be very fast—much faster than any human can swim—and are capable of taking a person a frightening distance from shore. If you see someone caught in a rip current, first tell the lifeguard or, if no lifeguard is available, call 9-1-1 or the local emergency number. Second, remember the rule: Reach or Throw, Don't Go. Do *not* enter the water to help a person who is in trouble unless you are trained to do so. Many people die when attempting to help someone caught in a rip current or otherwise in trouble in the water. While waiting for trained help, the best actions to take are to throw the person something that floats, if possible, such as a life jacket. You should also talk to the person, directing him or her to try to swim out of the rip current in a direction parallel to shore. When the person is out of the current, he or she can head back to shore and away from the current at an angle.

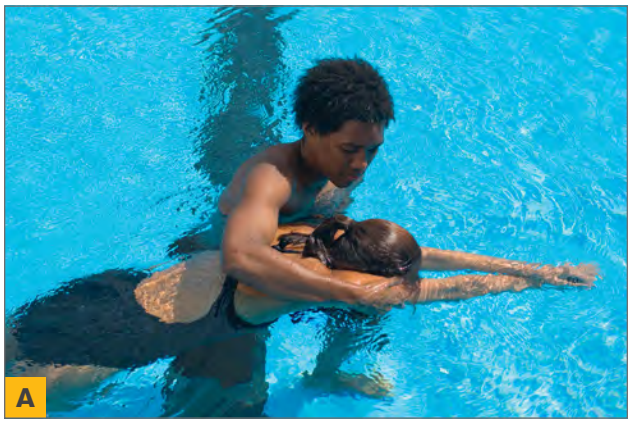
- Squeeze the person's arms against the head. This helps keep the head in line with the body **(Figure 20-5, A)**.
- Glide the person forward.
- Move slowly and rotate the person toward you until he or she is face-up **(Figure 20-5, B)**. To rotate the person, push the person's closer arm under water while pulling the other arm across the surface toward you. In water with currents, hold the person's head upstream to keep the body from twisting.
- Position the person's head close to the crook of your arm, with the head in line with the body **(Figure 20-5, C)**.

If a person is *unresponsive and face-up* in shallow water, or if a spinal injury is suspected (even if the person is conscious), you will use a similar head splint technique as used for a face-down person:

- Gently approach the person's head from behind, or stand behind the person's head. Lower yourself so that the water level is at your neck.
- Grasp the person's arms midway between the shoulder and elbow with your thumbs to the inside of each of the person's arms. Grasp the person's right arm with your right hand, and the person's left arm with your left hand. Gently move the person's arms up alongside the head while you reposition yourself to the person's side while trapping the person's head with his or her arms.
- Squeeze the person's arms against the head. This helps keep the head in line with the body. Do not move the person any more than necessary.
- Position the person's head close to the crook of your arm, with the head in line with the body.

Once an unresponsive person is face-up:

- Open the person's airway and check for breathing for no more than 10 seconds:
  - If there is breathing, and you suspect a head, neck or spinal injury, hold the person steady in the water until additional advanced help arrives. Do not lift the person or attempt to remove him or her from the water if additional help is anticipated.



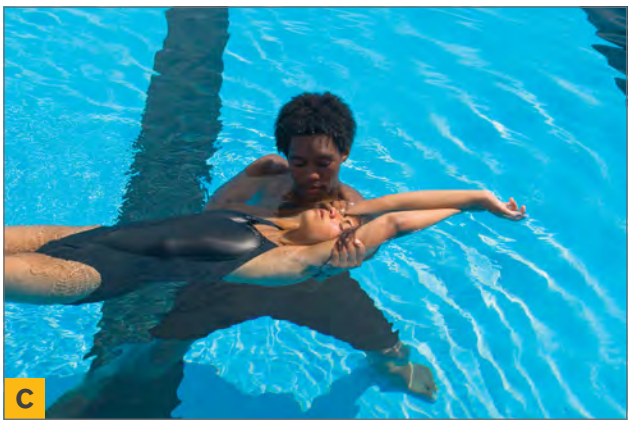


FIGURE 20-5, A–C *To perform the head splint technique on a face-down person,* **A**, *approach from the side, raise the person's arms and squeeze them against the head to keep it in line with the body, and* **B**, *slowly rotate the body.* **C**, *When the person is face-up, keep the head in the crook of your arm and hold it steady until help arrives.*

- If the person is unconscious and there is no breathing, immediately remove the person from the water. Give 2 rescue breaths. If the chest clearly rises, immediately begin performing CPR with chest compressions as described in Chapter 6. If the chest does not clearly rise with the first rescue breath, retilt the airway and give another rescue breath. If the chest still does not rise, perform the modified CPR technique described in Chapter 7.

While rescue breaths may be started in the water by someone trained in water rescue, chest compressions cannot. If the person needs CPR or modified CPR, he or she must be removed from the water first (see *Moving an Unresponsive Person to Dry Land* below). If a head, neck or spinal injury is suspected, care should be taken to minimize movement to the spine, but priority must be given to airway management and performing CPR or modified CPR.

When giving care, remember that many persons who have been submerged vomit because water has filled the stomach or air has been forced into the stomach during rescue breaths. If the person vomits and is on dry land, roll him or her into the modified high arm in endangered spine (H.A.IN.E.S.) recovery position to prevent aspiration (or choking). Use a finger to remove the vomit from the mouth. If possible, use a protective barrier, such as disposable gloves, gauze or even a handkerchief. Then, roll the person on his or her back again and continue giving care as necessary. If the person is still in the water, gently roll the person partially while maintaining stabilization and clear the vomit. Be sure to keep the person's face out of the water.

Moving an Unresponsive Person to Dry Land

If you are on a sloping shore or beach, you can use a beach drag to remove an unresponsive person from the water for the purpose of giving care. To perform the beach drag:

- Stand behind the person, and grasp him or her under the armpits, supporting the person's head, when possible, with your forearms.
- While walking backward slowly, drag the person toward the shore.
- Remove the person completely from the water or at least to a point where the person's head and shoulders are out of the water and on firm ground.

You may also use a two-person beach drag if another person is available to help.

The two-person lift can be used for removing a person from the water if there is no slope for you to easily remove the person (such as in a pool). Do not use the two-person lift if you suspect the person has a head, neck or spinal injury unless you need to give CPR or modified CPR. To perform the two-person lift:

- Place the person's hands, one on top of the other, on the deck or overflow trough (gutter).
- Take the person's hands and pull the person up slightly to keep the head above the water. Be sure the person's head is supported so that it does not fall forward and strike the deck. Note: if in the water, climb out to help the second person.
- Each person grasps one of the person's wrists and upper arms. Lift together until the person's hips or thighs are at deck level.
- Step backward and lower the person to the deck. Be sure to protect the person's head from striking the deck.
- If necessary, pull the person's legs out of the water, taking care not to twist the person's back. Roll the person onto his or her back. Support the person's head and take care not to twist the person's body as it is rolled.

FIGURE 20-6 *Use reaching and throwing assists to rescue a drowning person who has fallen through the ice.*

Care for a Responsive Person

If the person you rescue is responsive and a head, neck or spinal injury is not suspected, help him or her to dry land (use a walking assist as taught in Chapter 3 if needed) and follow the **CHECK—CALL—CARE** steps to determine what care is needed.

Always call 9-1-1 or the local emergency number when a person has been involved in a drowning incident, even if the person is responsive and you think the danger has passed. Complications can develop as long as 72 hours after the incident and may be fatal.

Helping Someone Who Has Fallen Through Ice

If a person falls through the ice, do *not* go onto the ice to attempt a rescue, as the ice may be too thin to support you. It is your responsibility as a lay responder to call 9-1-1 or the local emergency number immediately. In the case of a drowning person, always attempt to rescue the person using reaching and throwing assists **(Figure 20-6)** if you can safely do so. Continue talking to the person until help arrives. If you are able to safely pull the person from the water, provide care for hypothermia as you learned in Chapter 19.

SMART MOVES: PREVENTING WATER-RELATED EMERGENCIES

As frightening as the risk of drowning is, it can usually be prevented by following good common sense around water, including steps to prevent injuries that could lead to drowning. Guidelines include:

- Learn to swim. The American Red Cross has swimming courses for people of any age and swimming ability. To find classes, visit Redcross.org..
- Never leave children unattended or unsupervised around water, including in bathtubs, toilets, wading pools or buckets of water. Proper supervision should be provided by an adult who is able to swim. Full attention must be given to the child/children in and around water. A child should always be within arm's reach of an adult, whether in the bathtub or around some other body of water.
- Always swim with a buddy; never swim alone.
- Read and obey all rules and posted signs, including "no diving" signs.
- Swim in areas supervised by a lifeguard.
- Children or inexperienced swimmers should take extra precautions, such as wearing a U.S. Coast Guard-approved life jacket when around the water.
- Watch out for the "dangerous too's"—too tired, too cold, too far away from safety, too much sun, too much strenuous activity.
- Be knowledgeable of the water environment and the potential hazards (deep and shallow areas, currents, depth changes, obstructions and where the entry and exit points are located). Use feet first entry if you are unsure of any of these things.
- Do not mix alcohol with swimming, diving or boating. Alcohol impairs judgment, balance and coordination; affects swimming and diving skills; and reduces the body's ability to stay warm.
- Learn how to dive safely from a qualified instructor.
- Never dive into an above-ground pool, the shallow end of any in-ground pool or head first into breaking waves at the beach.
- Never dive into cloudy or murky water.
- Do not run on a diving board or attempt to dive a long way through the air. The water might not be deep enough at the point of entry.
- If you are bodysurfing, always keep your arms out in front of you to protect your head and neck.

SUMMARY

Many drownings can be prevented by following simple precautions when in, on or around water (see *Smart Moves: Preventing Water-Related Emergencies*). Use the basic methods of reaching, throwing or wading to rescue or assist a person in the water without endangering yourself. Always remember to stay safe. If there is any chance that you cannot safely and easily help the person in trouble, call 9-1-1 or the local emergency number immediately.

When providing care in a water emergency, your priority is ensuring that the person's face (mouth and nose) is out of the water and then giving appropriate care. If the person is unresponsive and face-up or face-down in shallow water, or when you suspect a head, neck or spinal injury, it is important to use the head splint technique to stabilize the person's head, neck and spine. If the unresponsive person is not breathing, remove the person from the water and give 2 rescue breaths followed immediately by CPR or modified CPR based on what you find. If the person is responsive and no head, neck or spinal injury is suspected, help the person to dry land and use the emergency action steps **CHECK—CALL—CARE** to determine what care to give. *Always* call 9-1-1 or the local emergency number for a person involved in a drowning incident as potentially fatal complications can develop later. Further training in water safety and lifeguarding is available through the American Red Cross.

READY TO RESPOND?

Think back to the water emergency in the opening scenario, and use what you have learned to respond to this question:

1. Knowing that the pool is deep where the child fell in, what is the best way to try to rescue the child?

STUDY QUESTIONS

1. List three nonswimming rescues and assists.
2. List four characteristics of a drowning victim—active.

In questions 3 through 5, circle the letter of the correct answer.

3. In which of the following situations would a wading assist be appropriate?
   a. You can reach the person by extending a branch from the shore.
   b. You suspect or see strong currents.
   c. The bottom is not firm.
   d. The water is shallow, and you can stand firmly with your chest out of the water.
4. You see a man struggling in the rushing waters of a flooded creek. Which is the best way to try to rescue him without endangering yourself?
   a. Dive into the water and grab him.
   b. Wade in and reach out to him with an object.
   c. From the shoreline, extend an object for him to reach.
   d. Yell to him to kick forcefully.
5. After using the head splint technique for someone with a suspected head, neck or spinal injury who is breathing, you should—
   a. Give 2 rescue breaths.
   b. Remove the person from the water.
   c. Hold the person steady in the water until additional help arrives.
   d. Perform CPR.
6. List the general care steps for a drowning victim who is unresponsive in shallow water.

Answers are listed in Appendix B.

Pediatric, Older Adult and Special Situations

21

You go with a friend to visit her Grandma Mary for a nice home-cooked meal. When you arrive, her grandmother does not come to the door when you knock. Figuring she didn't hear you—after all, her hearing is not the best and she does not always wear her hearing aid—your friend uses the spare key she has to go inside. In the living room, you discover the real reason Grandma Mary did not come to the door. She has fallen, and cannot put weight on her leg to get back up. She tells you, "I just don't know how this happened."

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Describe considerations for checking an infant, a toddler, a preschooler, a school-age child and an adolescent.
- Explain how to observe an injured or ill child or infant and how to communicate with the parents or guardian.
- Describe the signals and care for common childhood illnesses and injuries.
- Describe how to check an older adult.
- Describe four problems that can affect older adults and their implications for care.
- Explain how to communicate with and assist a person with a physical disability or mental impairment.
- Explain the options available when trying to communicate with a person when there is a language barrier.
- Explain what you should do if you encounter a crime scene or hostile person.

KEY TERMS

Alzheimer's disease: The most common type of dementia in older people, in which thought, memory and language are impaired.

Child abuse: Action that results in the physical or psychological harm of a child; can be physical, sexual, verbal and/or emotional.

Child neglect: The most frequently reported type of child abuse in which a parent or guardian fails to provide the necessary, age-appropriate care to a child; insufficient medical or emotional attention or respect given to a child.

Disability: The absence or impairment of motor, sensory or mental function.

Hearing loss: Partial or total loss of hearing.

Impairment: Damage or reduction in quality, quantity, value or strength of a function.

Mental (cognitive) function: The brain's capacity to reason and to process information.

Motor function: The ability to move the body or a body part.

Motor impairment: The total or partial inability to move or to use a body part.

Sensory function: The ability to see, hear, touch, taste and smell.

Sudden infant death syndrome (SIDS): The sudden death of an infant younger than 1 year that remains unexplained after the performance of a complete postmortem investigation.

Vision loss: Partial or total loss of sight.

INTRODUCTION

In any emergency, you should be aware of the unique needs and considerations of the person involved. For example, children and infants, older adults, persons with disabilities and persons who speak a different language than your own have special needs and considerations that affect your approach to giving care. It is also important to know what to do if you find yourself in a crime scene or hostile situation.

In any case, there are steps you can take to ensure you respond appropriately. This chapter includes information to help you better understand the nature of an emergency and give appropriate, effective care.

CHILDREN AND INFANTS

Children and infants have unique needs that require special care. As you learned in Chapter 5, assessing a conscious child's or infant's condition can be difficult, especially if he or she does not know you and his or her parents or guardians are not readily available. At certain ages, children and infants do not readily accept strangers and may be very apprehensive. Very young children and infants also cannot tell you what is wrong and have difficulty expressing their feelings.

Communicating with Injured or Ill Children or Infants

We tend to react more strongly and emotionally to a child who is in pain or scared. You will need to try exceptionally hard to control your emotions and your facial expressions. Doing so will be helpful to both the child and any concerned adults. To help an injured or ill child or infant, you also need to try to imagine how the person feels. For example, a child may be afraid of the unknown. This includes being injured or ill, being touched by strangers and being separated from his or her parents or guardian.

How you interact with an injured or ill child or infant is very important. You need to reduce the child's anxiety and panic and gain the child's trust and cooperation if possible. Approach the child slowly. The sudden appearance of a stranger may upset the child. Get as close to the child's or infant's eye level as you can, and keep your voice calm. Smile at the child. Ask the child's name, and use it when you talk with him or her. Talk slowly and distinctly, and use words the child will easily understand. Ask questions the child will be able to answer easily. Depending on the age of the child, it may be necessary to direct questions about the situation to the parents or guardian. Explain to the child and the parents or guardian what you are going to do. Reassure the child that you are there to help and will not leave him or her.

Communicating with Children Who Have Special Health Care Needs

When communicating with children and parents, remember to observe the whole situation and ask questions to determine if the child has special physical or developmental needs. If the child has special needs, ask the parent or caregiver if there is a list summarizing vital emergency information such as any unique or specific care procedures associated with the child's condition or allergies and other medical problems or issues. Generally, the parents and caregivers can give you the best information since they are the most familiar with any medical equipment needed by the child.

When you attempt to communicate with children who have a developmental disability, the child's age and developmental level may not be obvious. Do not assume the child has a mental disability because he or she is unable to express thoughts or words. Ask the parents or guardian what the child is capable of understanding. Speak directly to the child. Do not speak to the parents or guardian as if the child is not in the room.

Communicating with Parents and Caregivers

If the parents or caregivers are excited or agitated during the emergency, the child is likely to be, too. When you can calm the parents or caregivers, the child will often calm down as well. Remember to get consent to give care from any adult responsible for the child when possible. Any concerned adults need your support, so behave as calmly as possible, explaining what you intend to do at each step.

Characteristics of Children and Infants

To be able to effectively check children and infants, it is helpful to be aware of certain characteristics of children and infants in specific age groups.

Children up to 1 year of age are commonly referred to as *infants*. Infants less than 6 months old are relatively easy to approach and are unlikely to be afraid of you. Older infants, however, often show "stranger anxiety." They may turn away from you and cry and cling to their parent or guardian. If a parent or the guardian is calm and cooperative, ask him or her to help you. Try to check the infant in the parent's or guardian's lap or arms if possible and the situation allows this.

Children between 1 and 2 years old are often referred to as *toddlers* **(Figure 21-1, A)**. Toddlers may not cooperate with your attempts to check them. They are usually very concerned about being separated from a parent or guardian. If you reassure the toddler that he or she will not be separated from a parent or guardian, the toddler may be comforted. If possible, give the toddler a few minutes to get used to you before attempting to check him or her and check the toddler in the parent's or guardian's lap. A toddler may also respond to praise or be comforted by holding a special toy or blanket.

Children between the ages of 3 and 5 are commonly referred to as *preschoolers* **(Figure 21-1, B)**. Children in this age group are usually easy to check if you use their natural curiosity. Allow them to inspect items such as bandages. Opportunities to explore can reduce many fears and anxiety about the situation and provide distraction. Reassure the child that you are going to help and will not leave him or her. Sometimes, you can show what you are going to do on a stuffed animal or doll **(Figure 21-2)**. If a child is injured, he or she may be upset by seeing the cut or other injury, so cover it with a dressing as soon as possible.

FIGURE 21-1, A–D **A,** *Toddler;* **B,** *Preschooler;* **C,** *School-age child;* **D,** *Adolescent.*

School-age children are between 6 and 12 years of age **(Figure 21-1, C)**. They are usually cooperative and can be a good source of information about what happened. You can usually talk readily with school-age children. Do not let the child's chronological age influence you to expect an injured or ill child to behave in a way consistent with that age. An injured 11-year-old, for example, may behave more like a 7-year-old during the emergency. Be especially careful not to talk down to these children. Let them know if you are going to do anything that may be painful. Children in this age group are becoming conscious of their bodies and may not like exposure. Respect their modesty.

FIGURE 21-2 *Demonstrating first aid steps on a stuffed animal or doll helps a child understand how you will care for him or her.*

Adolescents are between 13 and 18 years of age and are typically more adult than child **(Figure 21-1, D)**. Direct your questions to the adolescent rather than to a parent or guardian. Allow input from a parent or guardian, however. Occasionally, if a parent or guardian is present, you may *not* be able to get an accurate idea of what happened or what is wrong. Adolescents are modest and often respond better to a first aid responder of the same gender.

Observing Children and Infants

You can obtain a lot of information by observing the child or infant before actually touching him or her. Look for signals that indicate changes in the level of consciousness, any trouble breathing and any apparent injuries and conditions. Realize that the situation may change as soon as you touch the child or infant because he or she may become anxious or upset. Do not separate the child or infant from loved ones. Often, a parent or guardian will be holding a crying child or infant. In this case, you can check the child or infant while the adult continues to comfort him or her. Unlike some injured or ill adults, a child or an infant is unlikely to try to cover up or deny how he or she feels. A child in pain, for example, will generally let you know that he or she hurts and the source of the pain as well as he or she can.

Whenever necessary (e.g., when the child is agitated), begin your check of a conscious child or infant at the toes rather than the head. Checking this way is less threatening to the child or infant and allows him or her to watch what is going on and take part in it. Ask a young child to point to any place that hurts. An older child can often tell you the exact location of painful areas. If you need to hold an infant, always support the head when you pick him or her up.

Common Childhood Injuries and Illnesses

Abdominal Conditions

Abdominal pain in children can be the signal of a large range of conditions. Fortunately, most are not serious and usually go away on their own.

Signals of Abdominal Conditions

Abdominal pain accompanied by any of the following signals could indicate that the child is suffering from a serious condition or illness:

- A sudden onset of severe abdominal pain or pain that becomes worse with time
- Excessive vomiting or diarrhea

- Blood in the vomit or stool
- A bloated or swollen abdomen
- A change in the child's level of consciousness, such as drowsiness or confusion
- Signals of shock

Care for Abdominal Conditions

Call 9-1-1 or the local emergency number if you think the child has a life-threatening condition. While you are waiting for help to arrive, help the child rest in a comfortable position, keep the child from becoming chilled or overheated, comfort and reassure the child, and give care based on any conditions found.

Child Abuse and Neglect

At some point, you may encounter a situation involving an injured child or infant in which you have reason to suspect child abuse or neglect. ***Child abuse*** is the physical, psychological or sexual assault of a child resulting in injury or emotional trauma. Child abuse involves an injury or a pattern of injuries that do not result from an accident. ***Child neglect*** is a type of child abuse in which the parent or guardian fails to provide the necessary age-appropriate care to a child, or provides insufficient medical care or emotional attention to a child.

Signals of Child Abuse and Neglect

The signals of *child abuse* include:

- An injury whose cause does not fit the parent's, guardian's or caregiver's description.
- Obvious or suspected fractures in a child younger than 2 years of age; any unexplained fractures.
- Injuries in various stages of healing, especially bruises and burns.
- Bruises and burns in unusual shapes, such as bruises shaped like belt buckles, burns the size of a cigarette tip, and burn rings around ankles or buttocks (from dipping in hot water).
- Unexplained lacerations or abrasions, especially to the mouth, lips and eyes.
- Injuries to the genitalia; pain when the child sits down.
- A larger number of injuries than is common for a child of the same age.

The signals of *child neglect* include:

- Lack of adult supervision.
- A child who looks malnourished.
- A child with poor hygiene (e.g., old, dirty diaper on).
- An unsafe living environment.
- Untreated chronic illness (e.g., a child with asthma who has no medications).

Care for Child Abuse or Neglect

When caring for a child or an infant whom you suspect may have been abused or neglected, your first priority is to care for the child's or infant's injuries or illnesses. An abused child may be frightened, hysterical or withdrawn. He or she may be unwilling to talk about the incident in an attempt to protect the abuser. Do not confront the suspected parent, caregiver or child care provider. Instead, continue to treat them with the same respect you would give to any other person. If you suspect abuse, explain your

concerns to responding police officers or emergency medical services (EMS) personnel if possible.

If you think you have reasonable cause to believe that abuse has occurred, report your suspicions to a community or state agency, such as the Department of Social Services, the Department of Child and Family Services or Child Protective Services. You may be afraid to report suspected child abuse because you do not wish to get involved or are afraid of getting sued. However, in most states, when you make a report in good faith, you are immune from any civil or criminal liability or penalty, even if you made a mistake. In this instance, "good faith" means that you honestly believe that abuse has occurred or the potential for abuse exists and a prudent and reasonable person in the same position would also honestly believe the abuse has occurred or the potential for abuse exists. You do not need to identify yourself when you report child abuse, although your report will have more credibility if you do.

In some areas, certain professions are legally obligated to report suspicions of child abuse, such as day care workers or school employees. For more information on reporting child abuse at your workplace, contact your supervisor or mandated reporter.

Diarrhea and Vomiting

Diarrhea, or loose stools, often accompanies an infection or other gastrointestinal issues in children. Vomiting can be frightening for a young child, but it is rarely a serious problem. However, diarrhea and vomiting both can lead to dehydration and shock. This is more likely to occur in young children.

Signals of Serious Diarrhea and Vomiting

A health care provider should be contacted if:

- Diarrhea or vomiting persists for more than a few days (in an infant, less than a day).
- The child is not replacing lost liquids or cannot retain liquids.
- The child has not had a wet diaper in 3 or more hours or, if older, has not had any urine output for more than 6 hours.
- The child has a high fever.
- The child has bloody or black stools.
- The child is unusually sleepy, drowsy, unresponsive or irritable.
- The child cries without tears or has a dry mouth.
- The child has a sunken appearance to the abdomen, eyes or cheeks, or, in a very young infant, has a sunken soft spot at the top of the head.
- The child has skin that remains "tented" if pinched and released.

Care for Diarrhea and Vomiting

Remember the following when caring for children and infants with diarrhea:

- If the infant will not tolerate his or her normal feedings or if a child is drinking less fluid than normal, add a commercially available oral rehydration solution specially designed for children and infants.
- Do not give over-the-counter anti-diarrhea medications to children younger than 2 years. Use these with the guidance of the health care provider in older children.
- Try to limit sugar and artificial sweeteners. Focus on a low-fiber diet. For a child in gastrointestinal distress, think "B.R.A.T": bananas, rice, applesauce and toast. Tea and yogurt may also be considered.

Remember the following when caring for children and infants who are vomiting:

- For a very young child or infant, lay the child on his or her side so that the child does not swallow or inhale the vomit.
- Halt solid foods for 24 hours during an illness involving vomiting and replace with clear fluids, such as water, popsicles, gelatin or an oral rehydration solution specially designed for children and infants.
- Introduce liquids slowly. For instance, wait 2 to 3 hours after a vomiting episode to offer the child some cool water. Offer 1 to 2 ounces every half hour, four times. Then, alternate 2 ounces of rehydration solution with 2 ounces of water every 2 hours.
- After 12 to 24 hours with no vomiting, gradually reintroduce the child's normal diet.

Ear Infections

Ear infections are common in young children. Nearly 90 percent of young children have an ear infection at some time before they reach school age.

Signals of Ear Infections

Common signals of an ear infection include:

- Pain. Older children can tell you that their ears hurt, but younger children may only cry or be irritable or rub or tug on the affected ear.
- Fever.
- Ear drainage.
- Trouble hearing.
- Loss of appetite.
- Trouble sleeping.

Care for Ear Infections

A health care provider should be contacted if:

- The child's signals last longer than a day.
- You see a discharge of blood or pus from the ear. This could indicate a ruptured eardrum.
- The child is having hearing problems.
- The child's signals do not improve or signals worsen after he or she has been diagnosed by a health care provider.

Pain symptoms may be treated with ibuprofen or acetaminophen. In children younger than 2 years, watch for sleeplessness and irritability during or after an upper respiratory infection, such as a cold. Always consult the child's health care provider before giving any over-the-counter pain relievers.

Fever

Fever is an elevated body temperature of 100.4° F (38° C) or greater. Fever indicates a problem, and in a child or an infant, it often means there is a specific problem. Usually these problems are not life threatening, but some can be. A high fever in a child or an infant often indicates some form of infection. In a young child, even a minor infection can result in a high fever, usually defined as of 103° F (39.4° C) and above.

A rapid rise in body temperature can result in seizures. A febrile seizure is a convulsion brought on by a fever in infants or small children. It is the most common type of seizure in

children. Most febrile seizures last less than 5 minutes and are not normally life threatening. However, there are conditions in which the child may require additional care. To review care after a febrile seizure, go to Chapter 15.

Signals of Fever

Aside from discovering a fever when checking a child's temperature, there are other signals that may indicate a fever is present.

Older children with fever will often:

- Feel hot to the touch.
- Complain of being cold or chilled.
- Complain of body aches.
- Have a headache.
- Have trouble sleeping or sleep more than usual.
- Appear drowsy.
- Have no appetite.

Infants with fever will often:

- Be upset or fussy, with frequent crying.
- Be unusually quiet.
- Feel warm or hot.
- Breathe rapidly and have a rapid heart rate.
- Stop eating or sleeping normally.

When to Call 9-1-1

Call 9-1-1 or the local emergency number if the child or infant has signals of a life-threatening condition, such as unconsciousness or trouble breathing. Also, call if this is the first time that a child has had a febrile seizure, the seizure lasts longer than 5 minutes or is repeated, or the seizure is followed by a quick rise in the temperature of the child or infant. Child care providers should follow state or local regulations regarding emergency care and contact procedures whenever a child in their care becomes injured or ill.

When to Seek Professional Medical Care

A health care provider should be contacted for:

- Any infant younger than 3 months with a fever (100.4° F or greater).
- Any child younger than 2 years with a high fever (103° F or greater).
- Any child or infant who has a febrile seizure.

Care for Fever

If the child or infant has a fever, make him or her as comfortable as possible. Encourage the child to rest. Make sure that the child or infant is not overdressed or covered with too many blankets. A single layer of clothing and a light blanket usually is all that is necessary. To prevent dehydration, make sure that the child or infant drinks clear fluids (e.g., water or juice) or continues nursing or bottle-feeding.

Do not give the child or infant aspirin for fever or other signals of flu-like or other viral illness. For a child or infant, taking aspirin can result in an extremely serious medical condition called **Reye's syndrome**. Reye's syndrome is an illness that affects the brain and other internal organs. Acetaminophen or ibuprofen may be given for a fever, but always consult the child's health care provider before giving any over-the-counter pain relievers.

If the child has a *high fever*, it is important to gently cool the child. Never rush cooling down a child. If the fever caused a febrile seizure, rapid cooling could bring on other complications. Instead, remove any excessive clothing or blankets and sponge the child with lukewarm water. Do *not* use an ice water bath or rubbing alcohol to cool down the body.

Both of these approaches are dangerous. Continue caring for the child or infant with a high fever as described above.

Foreign Objects in the Nose

If a child has an object in the nose, *do not* try to remove the object. Special lighting and instruments are necessary to remove objects. It is important to go to a health care provider for removal of the object. Also, try to calm the child and parents or guardians as best as possible.

Injuries

Injury is the number one cause of death for children over 6 months of age in the United States. Many of these deaths are the result of motor vehicle crashes. The greatest dangers to a child or infant involved in a motor vehicle incident are airway obstruction and bleeding. Severe bleeding must be controlled as quickly as possible. A relatively small amount of blood lost by an adult is a large amount for a child or an infant.

Because a child's head is large and heavy in proportion to the rest of the body, the head is the most often injured area. A child or an infant injured as the result of force or a blow may also have damage to the organs in the abdominal and chest cavities. Such damage can cause severe internal bleeding. A child secured only by a lap belt may have serious abdominal or spinal injuries in a car crash. Try to find out what happened, because a severely injured child or infant may not immediately show signals of injury.

To avoid needless deaths of children and infants caused by motor vehicle crashes, laws have been enacted requiring that children and infants ride in the back seat of cars in approved safety seats or wear safety belts. As a result, more children's lives are saved. You may have to check and care for an injured child or infant while he or she is in a safety seat.
A safety seat does not normally pose any problems while you are checking a child or an infant. Leave the child or infant in the seat if the seat has not been damaged. If the child or infant is to be transported to a medical facility for examination, he or she can often be safely secured in the safety seat for transport.

Poisoning

Poisoning is one of the top 10 causes of unintentional death in the United States for adolescents, children and infants. Children younger than 6 years account for half of all exposures to poisonous substances in the United States. Children in this age group often become poisoned by ingesting household products or medications (typically those intended for adults). Although children in this age group are exposed more often than any other, only 3 percent of these cases result in death.

There has been a decrease in child poisonings in recent years due in part to child-resistant packaging for medications. This packaging makes it harder for children to get into these substances. The decrease also is a result of preventive actions taken by parents and others who care for children. Care and prevention for poisoning is discussed in Chapter 16.

SIDS

Sudden infant death syndrome (SIDS) is the sudden, unexpected and unexplained death of an apparently healthy baby. In the United States, approximately 2,300 infants die every year of SIDS. SIDS is the third leading cause of death for infants between 1 month and 1 year of age. It occurs most often in infants between 4 weeks and 7 months of age. SIDS usually occurs while the infant is sleeping.

The condition does not seem to be linked to a disease. In addition, the cause(s) of SIDS are not yet understood. It is not thought to be hereditary, but it does tend to recur in families. Because of these factors, there is no way of knowing if an infant is at risk for SIDS. Sometimes, it is mistaken for child abuse because of the unexplained death in an apparently healthy baby. In addition, SIDS sometimes causes bruise-like blotches to appear on the infant's body. However, SIDS is not related to child abuse.

Care for SIDS

By the time the infant's condition has been discovered, he or she will be in cardiac arrest. Make sure someone has called 9-1-1 or the local emergency number or call yourself. Perform CPR on the infant until EMS personnel take over, an automated external defibrillator (AED) becomes available or you see an obvious sign of life, such as breathing.

An incident involving a severely injured or ill child or infant or one who has died can be emotionally upsetting. After such an episode, find someone you trust with whom you can talk about the experience and express your feelings. If you continue to be distressed, seek some professional counseling. The feelings engendered by such incidents need to be dealt with and understood, otherwise they can result in serious stress reactions.

See *Lowering the Risk for SIDS* (below) for ways you can lessen the chance of SIDS occurring.

LOWERING THE RISK FOR SIDS

Because it cannot be predicted or prevented, SIDS makes many new parents feel anxious. However, there are several things you can do to lower the risk for SIDS. In October 2011, the American Academy of Pediatrics updated its guidelines for safe sleep. These latest recommendations include:

- Always place your baby on his or her back for every sleep time.
- Always use a firm sleep surface. Car seats and other sitting devices are not recommended for routine sleep.
- The baby should sleep in the same room as the parents, but not in the same bed (room sharing without bed sharing).
- Keep all soft objects or loose bedding out of the crib. This includes pillows, blankets and bumper pads.
- Wedges and positioners should not be used.
- Pregnant women should receive regular prenatal care.
- Don't smoke during pregnancy or after birth.
- Offer a pacifier at nap time and bedtime.
- Avoid covering the infant's head or allowing the infant to become overheated.
- Do not use home monitors or commercial devices marketed to reduce the risk of SIDS.
- Infants should receive all recommended vaccinations.
- Supervised, awake tummy time is recommended daily to facilitate development and minimize the occurrence of positional plagiocephaly (flat head).
- Make sure your baby has received all recommended vaccinations. Evidence suggests that immunization reduces the risk for SIDS by 50%.
- Breastfeeding is associated with a reduced risk for SIDS and is recommended.

For more information on the new guidelines for sleep position for babies and reducing the risk for SIDS, visit *www.healthychildren.org/safesleep*. Additional information can be found on the National Institutes of Health website at: *www.nichd.nih.gov/sids/*.

SOURCES: American Academy of Pediatrics: Ages & Stages: Reduce the Risk of SIDS. *http://www.healthychildren.org/safesleep*. Accessed 12/1/11.

FIGURE 21-3 *In an older adult, arthritis may affect joints, causing movement to become painful.*

OLDER ADULTS

Older adults are generally considered those older than 65 years. They are quickly becoming the fastest-growing age group in the United States. Since 1900, life expectancy has increased by over 60 percent. For example, in 1900, the average life expectancy was 46 years for men and 48 years for women. Today, the average life expectancy is 75 years for men and 80 years for women. The main explanations for the increase in life expectancy are medical advancements and improvements in health care.

Normal aging brings about changes. People age at different rates, however, and so do their organs and body parts. For example, a person with wrinkled, fragile skin may have strong bones or excellent respiratory function.

Overall, however, body function generally declines as we age, with some changes beginning as early as age 30. The lungs become less efficient, so older adults are at higher risk for developing pneumonia and other lung diseases. The amount of blood pumped by the heart with each beat decreases, and the heart rate slows. The blood vessels harden, causing increased work for the heart. Hearing and vision usually decline, often causing some degree of sight and hearing loss. Reflexes become slower, and arthritis may affect joints, causing movement to become painful **(Figure 21-3)**.

Checking an Older Adult

The physical and mental changes associated with aging may require you to adapt your way of communicating and to be aware of certain potential age-related conditions, such as hearing loss.

As you learned in Chapter 5, to check an injured or ill older adult, attempt to learn the person's name and use it when you speak to him or her. Consider using Mrs., Mr. or Ms. as a sign of respect. Move to the person's eye level so that he or she can see and hear you more clearly. If the person seems confused at first, the confusion may be the result of impaired vision or hearing. If he or she usually wears eyeglasses and cannot find them, try to locate them. Speak slowly and clearly, and look at the person's face while you talk. Notice if he or she has a hearing aid. Someone who needs glasses to see or a hearing aid to hear is likely to be very anxious without them. If the person is truly confused, try to find out if the confusion is the result of the injury or a condition he or she already has. Information from family members or bystanders is frequently helpful. The person may be afraid of falling, so if he or she is standing, offer an arm or hand. Remember that an older adult may need to move very slowly.

Try to find out what medications the person is taking and if he or she has any medical conditions so that you can tell EMS personnel. Look for a medical alert tag, bracelet or necklace that will give you the person's name and address and information about any specific condition the person has. Be aware that an older adult may not recognize the signals of a serious condition. An older adult may also minimize any signals for fear of losing his or her independence or being placed in a nursing home.

Common Injuries and Illnesses in Older Adults

Certain problems are more prevalent in older adults. The following sections discuss some of these concerns.

Confusion

Older adults are at increased risk for altered thinking patterns and confusion. Some of this change is the result of aging. Certain diseases, such as ***Alzheimer's disease*** (see *Fading Memories* on the next page), affect the brain, resulting in impaired memory and thinking and altered behavior. Confusion that comes on suddenly, however, may be the result of medication, even a medication the person has been taking regularly. A person who has problems seeing or hearing may also become confused when injured or ill. This problem increases when the person is in an unfamiliar environment. A head injury can also result in confusion.

Confusion can be a signal of a medical emergency. An older adult with pneumonia, for example, may not run a fever, have chest pain or be coughing, but because sufficient oxygen is not reaching the brain, the person may be confused. An older adult can have a serious infection without fever, pain or nausea. An older adult having a heart attack may not have chest pain, pale or ashen skin or other classic signals, but may be restless, short of breath and confused.

Depression is common in older adults. A depressed older adult may seem confused at first. A depressed person may also have signals, such as sudden shortness of breath or chest pains, without apparent cause. Whatever the reason for any confusion, do *not* talk down to the person or treat the person like a child.

Falls

Older adults are at increased risk for falls. In fact, falls are the leading cause of death from injury for older adults. Falls in older adults are due to slower reflexes, failing eyesight and hearing, arthritis and problems such as unsteady balance and movement. Falls frequently result in fractures because the bones become weaker and more brittle with age.

Head Injuries

An older adult is also at greater risk for serious head injuries. As we age, the size of the brain decreases. This decrease results in more space between the surface of the brain and the inside of the skull. This space allows more movement of the brain within the skull, which can increase the likelihood of serious head injury. Occasionally, an older adult may not develop the signals of a head injury until days after a fall. Therefore, unless you know the cause of a behavior change, you should always suspect a head injury as a possible cause of unusual behavior in an older adult, especially if the person has had a fall or a blow to the head.

Problems with Heat and Cold

An older adult is more susceptible to extremes in temperature. The person may be unable to feel temperature extremes because his or her body may no longer regulate temperature effectively. Body temperature may change rapidly to a dangerously high or low level.

The body of an older adult retains heat because of a decreased ability to sweat and the reduced ability of the circulatory system to adjust to heat. This can lead to heat exhaustion or heat stroke.

An older person may become chilled and suffer hypothermia simply by sitting in a draft or in front of a fan or air conditioner. Hypothermia can occur at any time of the year. People can go on for several days suffering from mild hypothermia without realizing it. The older person with mild hypothermia will want to lie down frequently; however, this will lower the body temperature even further.

See Chapter 19 for information on how to care for heat-related illnesses and cold-related emergencies.

FADING MEMORIES

According to the Alzheimer's Association, Alzheimer's disease affects an estimated 5.4 million American adults, making it the only disease among the top 10 causes of death without prevention, a cure or a way to slow its progression. While most people with the disease are older than 65, Alzheimer's disease can strike people in their 40s and 50s. Men and women are affected almost equally. At this time, scientists are still looking for the cause.

Signals of Alzheimer's disease develop gradually and include confusion, progressive memory loss and changes in personality, behavior and the ability to think and communicate. Eventually, people with Alzheimer's disease become totally unable to care for themselves. While there are no treatments to stop or reverse a person's mental decline from Alzheimer's disease, several drugs are now available to help manage some of these signals. In addition, because a number of disorders have signals similar to those of Alzheimer's disease, and can be treated, it is very important for anyone who is experiencing memory loss or confusion to have a thorough medical examination.

Most people with illnesses such as Alzheimer's disease are cared for by their families for much of their illness. In fact, the Alzheimer's Association facts for 2010 state that 14.9 million family and friends provided 17 billion hours of unpaid care for persons with Alzheimer's disease and other dementias. Giving care at home requires careful planning. The home has to be made safe, and routines must be set up for daily activities, such as mealtimes, personal care and leisure.

It is important for anyone caring for a person with Alzheimer's disease or a related problem to realize that he or she is not alone. There are people and organizations that can help both you and the person with Alzheimer's disease. For health care services, a physician—perhaps your family physician—or a specialist can give you medical advice, including help with difficult behavior and personality changes.

If you are caring for a person with Alzheimer's disease living at home, you may also need help with basic services such as nutrition and transportation. A visiting nurse or nutritionist and volunteer programs such as Meals-on-Wheels may be helpful, and volunteer or paid transportation services may be available. Visiting nurses, home health aides and homemakers can come to your home and give help with health care, bathing, dressing, shopping and cooking. Many adult day care centers provide recreational activities designed for people with Alzheimer's disease. Some hospitals, nursing homes and other facilities may take in people with Alzheimer's disease for short stays.

For persons with Alzheimer's disease who can no longer live at home, group homes or foster homes may be available. Nursing homes offer more skilled nursing care, and some specialize in the care of those with Alzheimer's or similar diseases. A few hospice programs accept persons with Alzheimer's disease who are nearing the end of their lives. Search to find out which, if any, services are covered by Medicare, Medicaid, Social Security, disability or veterans' benefits in your state. A lawyer or a social worker may be able to help you.

To locate services that can help you, the person with Alzheimer's disease and other family members, search for social service organizations and state and local government listings on the Internet or in the phone book. You can also contact your local health department, area office on aging and department of social services or senior citizens' services. Senior centers, as well as churches, synagogues and other religious institutions may also have information and programs. Another great resource is the Alzheimer's Association. To locate a chapter near you, call the association's 24-hour, toll-free number: 800-272-3900 or log onto *www.alz.org*.

SOURCES: Alzheimer's Association, *www.alz.org*. Accessed 12/1/11.

American Red Cross, *Caring for a Loved One with Alzheimer's Disease or Dementia*, StayWell, Yardley, PA, 2004.

PEOPLE WITH DISABILITIES

According to the Americans with Disabilities Act (ADA), a person with a ***disability*** is someone who has a physical or mental ***impairment*** that substantially limits one or more major life activities such as walking, talking, seeing, hearing or learning. This includes, for example, a blind person who cannot read information posted on a bulletin board or a deaf person who may need a sign language interpreter.

The Centers for Disease Control and Prevention (CDC) estimates that over 33 million people in the United States have disabilities. When giving care to people with disabilities, communicating with them can be a challenge. It may be difficult to find out what has happened and what might be wrong in an emergency situation.

Physical Disabilities

A person is considered to have a physical disability if his or her ability to move (also called ***motor function***) is impaired. A person also is considered to have a physical disability if his or her ***sensory function*** is impaired. Sensory function includes all of the senses: sight, hearing, taste, smell and touch. A person with a physical disability may have impairments in motor function, sensory function or both.

General hints for approaching an injured or ill person whom you suspect may have a physical disability include:

- Speaking to the person before touching him or her.
- Asking, "How can I help?" or "Do you need help?"
- Asking for assistance and information from the person who has the disability—he or she has been living with the disability and best understands it. If you are not able to communicate with the person, ask family members, friends or companions who are available to help.
- Not removing any braces, canes, other physical support, eyeglasses or hearing aids. Removal of these items may take away necessary physical support for the person's body.
- Looking for a medical alert tag, bracelet or necklace at the person's wrist or neck.
- Being aware that a service animal, such as a guide or signal dog, may be present and may be protective of the person in an emergency situation. Allow the animal to stay with the person, if possible, which will help reassure both of them.

Deaf and Hard of Hearing

Hearing loss is a partial or total loss of hearing. Some people are born with a hearing loss. Hearing loss can also result from an injury or illness affecting the ear, the nerves leading from the brain to the ear or the brain itself. You may not initially be aware that the injured or ill person has a hearing loss. Often, the person will tell you, either in speech or by pointing to the ear and

What if...

A person has a service animal? Will that change how I give care?

No. The presence of a service animal should not change the care given, although there are several things to consider in such a situation. For starters, you should never touch, pet or provide the animal with any food or treats without the permission of the owner. Any dog that is wearing a harness is considered to be "on duty." If you are asked to take the dog, hold the dog by the leash, not the harness. If the scene becomes unsafe while caring for the person, it will be necessary to evacuate the animal with the owner; never separate them. Finally, persons with a psychiatric and/or emotional disability may also have a companion animal. Their animals are just as important to them as they are for persons with a physical disability. Be understanding of this and treat the animal as a service animal.

shaking the head no. Some people carry a card stating that they have hearing loss. You may see a hearing aid in a person's ear.

The biggest obstacle you must overcome in caring for a person with a hearing loss is communication. You will need to figure out how to get that person's consent to give care, and you need to find out what the problem may be.

Sometimes, the injured or ill person can read lips. To assist him or her, position yourself where the person can see your face clearly. Look straight at the person while you speak and speak slowly. Do not exaggerate the way you form words. Do not turn your face away while you speak. Many people with a hearing impairment, however, do not read lips. In these cases, using gestures and writing messages on paper may be the most effective way to communicate in an emergency.

If you and the person know sign language, use it **(Figure 21-4, A)**. Some people who are hearing impaired have a machine called a telecommunications device for the deaf (TDD). You can use this device to type messages and questions to the person, and the person can type replies to you **(Figure 21-4, B)**. Many people who have hearing impairments can speak, some distinctly, some not so clearly. If you have trouble understanding, ask the person to repeat what he or she said. Do not pretend to understand.

Blind or Visually Impaired

Vision loss is a partial or total loss of sight. Vision loss can have many causes. Some people are born with vision loss. Others lose vision as a result of disease or injury. Vision loss is not necessarily a problem with the eyes. It can result from problems with the vision centers in the brain.

It is no more difficult to communicate orally with a person who has a partial or total loss of sight than with someone who can see. You do not need to speak loudly or in overly simple terms. Checking a person who has a vision loss is like checking a person who has good vision. The person may not be able to tell you certain things about how an injury occurred, but he or she can usually give you a generally accurate account based on his or her interpretation of sound and touch.

FIGURE 21-4, A–B *Communicate with a person with hearing loss in the best way possible. For example,* **A**, *use sign language or* **B**, *a TDD.*

When caring for a person with vision loss, help to reassure him or her by explaining what is going on and what you are doing. If you must move a visually impaired person who can walk, stand beside the person and have him or her hold onto your arm. Walk at a normal pace, alert the person to any obstacles in the way such as stairs and identify whether to step up or down. If the person has a service animal, try to keep them together. Ask the person to tell you how to handle the dog or ask him or her to do it.

Motor Impairment

A person with ***motor impairment*** is unable to move normally. He or she may be missing a body part or have a problem with the bones or muscles or the nerves controlling them. Causes of motor impairment include stroke, **muscular dystrophy**, **multiple sclerosis**, paralysis, **cerebral palsy** or loss of a limb. In caring for an injured or ill person with motor impairment, be aware that the person may view accepting help as failure and may refuse your help to prove that he or she does not need it.

Determining which problems are pre-existing and which are the result of immediate injury or illness can be difficult. Care for all problems you detect as if they are new. Be aware that checking one side of the body against the other in your check for non-life-threatening conditions may not be effective with a person with motor impairment, since body parts may not look normal as a result of a specific condition.

What if...

A person is deaf and blind but in need of care? How can I communicate?

This type of situation, while rare, can be a challenge to manage. However, there are some strategies that can help. The following communication methods are some of the options recommended by the National Federation of the Blind (*www.nfb.org*) based on the circumstances you find. For a person with hearing loss and low vision (or who became blind after already learning American Sign Language), try using American Sign Language—although a translator may be needed if you are not skilled in using it yourself. The person may be able to touch the hands of the person signing to communicate. For a person with hearing loss and no vision, you can also try print-in-palm, a technique in which you will "print" large block letters (not cursive) on the other person's palm using your index finger. Each letter is written in the same location on the person's palm. If you are helping someone with hearing loss and no vision at home, he or she may have a **Tellatouch,** a small typewriter keyboard used for communication. The person sits opposite the typist and places a finger on a small Braille "screen." As a letter is typed it appears briefly under the person's finger, allowing him or her to know what is being communicated.

Mental Impairment

Mental, or ***cognitive***, ***function*** includes the brain's capacity to reason and to process information. A person with mental impairment has problems performing these operations. Some types of mental impairment are genetic or are genetic alterations, such as **Down syndrome**. Others result from injuries or infections that occur during pregnancy, shortly after birth or later in life. Some causes are never determined.

You may not be able to determine if a person is mentally impaired, or it may be obvious. Approach the person as you would any other person in his or her age group. When you speak, try to determine the person's level of understanding. If the person appears not to understand you, rephrase what you were saying in simpler terms. Listen carefully to what the person says. People who are mentally impaired often lead very orderly and structured lives. A sudden illness or injury can disrupt the order in a person's life and cause a great deal of anxiety and fear. Take time to explain who you are and what you are going to do. Offer

reassurance. Try to gain the person's trust. If a parent, guardian or caregiver is present, ask that person to help you care for the person.

People with certain types of mental illness might misinterpret your actions as being hostile. If the scene becomes unsafe, you may need to remove yourself from the immediate area. Call 9-1-1 or the local emergency number and explain your concerns about a potential psychiatric emergency. If possible, keep track of the person's location and what he or she is doing. Report this information to the emergency responders.

LANGUAGE BARRIERS

Getting consent to give care and communicate about signals with a person with whom you have a language barrier can be a problem. Find out if any bystanders speak the person's language and can help translate. Do your best to communicate nonverbally. Use gestures and facial expressions. If the person is in pain, he or she will probably be anxious to let you know where that pain is. Watch his or her gestures and facial expressions carefully. When you speak to the person, speak slowly and in a normal tone. The person probably has no trouble hearing you.

When you call 9-1-1 or the local emergency number, explain that you are having difficulty communicating with the person and say what language you believe the person speaks. The EMS system may have someone available who can help with communication. If the person has a life-threatening condition, such as severe bleeding, consent is implied. The person will most likely be willing for you to give care in such a case.

CRIME SCENES AND HOSTILE SITUATIONS

In certain situations, such as a giving care to a person at a crime scene or an injured person who is hostile, you will need to use extreme caution. Although your first reaction may be to go to the aid of a person, in these situations you should call 9-1-1 or the local emergency number and stay at a safe distance.

Do *not* enter the scene of a suicide. If you happen to be on the scene when an unarmed person threatens suicide, call 9-1-1 or the local emergency number. Do *not* argue with the person. Remain at a safe distance.

Leave or avoid entering any area considered to be a crime scene, such as one where there is a weapon, or the scene of a physical or sexual assault. Call 9-1-1 or the local emergency number and stay at a safe distance.

You may encounter a situation in which there is a hostile or angry person. A person's rage or hostility may be caused by the injury, pain or fear. Some individuals, afraid of losing control, may act resentful and suspicious. Hostile behavior also may result from the use of alcohol or other drugs, a lack of oxygen or a medical condition. If a person refuses your care or threatens you, remove yourself from the situation and stay at a safe distance. Never argue with or restrain an injured or ill person. Call 9-1-1 or the local emergency number if someone has not already done so. Never put your own safety at risk.

Uninjured family members also may display anger. This anger may stem from panic, anxiety or guilt. Try to remain calm and explain what you plan to do for giving emergency care. If possible, find a way for family members to help, such as by comforting the person.

SUMMARY

No two emergency situations are alike. Situations involving people with special needs, problems and characteristics require your awareness and understanding. To give effective care to a child or an infant, an older adult, a person with a disability, or anyone with whom communication is a challenge, you may need to adapt your approach and your attitude. Situations may also occur in which you should not intervene. If a situation is in any way unsafe, do not approach the person and if you have already approached, withdraw. Call 9-1-1 or the local emergency number for help. Likewise, if the situation is a crime scene, keep your distance from the scene and call for appropriate help.

READY TO RESPOND?

Think back to Grandma Mary in the opening scenario and use what you have learned to respond to these questions:

1. What factors could have been responsible for Grandma Mary's collapse?
2. What steps should you take to communicate better with Grandma Mary while helping her, given her poor hearing?

STUDY QUESTIONS

1. Match each term with the correct definition.

    a. Sensory function
    b. Child abuse
    c. Alzheimer's disease
    d. Disability
    e. Impairment
    f. Motor impairment

_____ The absence or impairment of motor, sensory or mental function

_____ The most common type of dementia in older people, in which thought, memory and language are impaired

_____ The total or partial inability to move or to use a body part

_____ Action that results in the physical or psychological harm of a child; can be physical, sexual, verbal and/or emotional

_____ Damage or reduction in quality, quantity, value or strength of a function

_____ The ability to see, hear, touch, taste and smell

2. You are walking to the mailbox. A young child on a bicycle, about age 5, suddenly rolls into the street from between two parked cars. A car, moving very slowly, strikes the child, knocking him to the pavement. Three people in the vicinity run to the scene, and a woman comes running out of a house and to the child's side. She says she is the mother. The driver gets out of the car, looking shocked and stunned. The child begins to cry. Describe in order the steps you should take to find out what care the child needs.

3. A neighbor phones saying her grandmother has fallen and is lying on the bathroom floor. She asks you to come help. When you get there, the grandmother is conscious but unable to get up. She does not recognize her granddaughter. She says her left leg and hip hurt. What steps should you take to help?

In questions 4 through 9, circle the letter of the correct answer.

4. In which of the following ways should you move a person with vision loss who can walk?

    a. Grasp the person's arm or belt, and support the person as you walk.
    b. Walk in front of the person, and have him or her keep a hand on your shoulder.
    c. Walk behind the person with a hand on the person's back.
    d. Walk beside the person, and let him or her grasp your arm while you are walking.

5. The best position you can take in talking to an injured or ill young child is—

    a. Holding the child in your arms or lap.
    b. Being at eye level with the child.
    c. Standing up, looking down at the child.
    d. Behind the child, out of direct sight.

6. Which should you do if an injured or ill older adult appears to be confused?
   a. Assume the person is in a permanent state of confusion.
   b. Inquire about any medications the person is taking.
   c. Assume the person has fallen and injured his or her head.
   d. All of the above
7. What should you do if you become aware that a physical assault has taken place?
   a. Call 9-1-1 or the local emergency number and then approach the person.
   b. Call 9-1-1 or the local emergency number and do not enter the scene.
   c. Approach the person and have someone call 9-1-1 or the local emergency number.
   d. Assess the person for life-threatening conditions.
8. A small child in a car seat is in an automobile collision. How would you check the child?
   a. Remove the child from the car seat.
   b. Ask any relative of the child who is on the scene to remove the child from the seat.
   c. Check the child while the child is in the car seat.
   d. Wait until EMS personnel arrive.
9. A conscious person who does not appear to hear or understand what you say may—
   a. Be confused by medication.
   b. Have hearing loss.
   c. Speak a different language.
   d. All of the above
10. List four possible causes of confusion in an older adult.
11. List the steps you should take if a person you are trying to help becomes hostile or uncooperative.

Answers are listed in Appendix B.

Emergency Childbirth

22

You are enjoying a maternity yoga class with your best friend Lisa, who is expecting her first child in few weeks. You are waiting for her at the juice bar while she changes, but when she doesn't arrive after a while, you head back to the locker room to check on her. As you round the corner, you see Lisa grimacing in pain as a contraction begins. As it passes she gasps, "I'm sure glad to see you! My water broke and my phone has no reception in here. This baby is ready to come!"

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Understand the basics of pregnancy and the birth process.
- Describe the four stages of labor.
- Identify the factors you need to know to determine the mother's condition before the birth.
- Describe techniques the expectant mother can use to cope with labor pain and discomfort.
- Identify equipment and supplies needed to assist with the delivery of a newborn.
- Describe how to assist with the delivery of a newborn.
- Identify the priorities of care for a newborn.
- Describe the steps to take in caring for the mother after delivery.
- Identify the possible complications during pregnancy and childbirth that require immediate medical care.

KEY TERMS

Amniotic sac: "Bag of waters"; sac that encloses the fetus during pregnancy and bursts during the birthing process.

Birth canal: The passageway from the uterus to the outside of the body through which a baby passes during birth.

Braxton Hicks contractions: False labor; irregular contractions of the uterus that do not intensify or become more frequent as genuine labor contractions do.

Cervix: The lower, narrow part of the uterus (womb) that forms a canal that opens into the vagina, which leads to the outside of the body; upper part of the birth canal.

Contraction: During labor, the rhythmic tightening and relaxing of muscles in the uterus.

Crowning: The phase during labor when the baby's head is visible at the opening of the vagina.

Labor: The birth process, beginning with the contraction of the uterus and dilation of the cervix and ending with the stabilization and recovery of the mother.

Placenta: An organ attached to the uterus and unborn baby through which nutrients are delivered; expelled after the baby is delivered.

Pregnancy: Begins when an egg (ovum) is fertilized by a sperm, forming an embryo.

Umbilical cord: A flexible structure that attaches the placenta to the fetus, allowing for the passage of blood, nutrients and waste.

Uterus: A pear-shaped organ in a woman's pelvis in which an embryo forms and develops into a baby; also called the womb.

INTRODUCTION

Words such as exhausting, stressful, exciting, fulfilling, painful and scary are sometimes used to describe a planned childbirth: one that occurs in the hospital or at home under the supervision of a qualified health care provider. However, if you find yourself assisting with the delivery of a newborn, it is probably not happening in a planned situation.

Therefore, your thoughts and feelings, as well as those of the expectant mother, may be intensified by fear of the unexpected or the possibility that something might go wrong.

When presented with a possibility of delivering a child outside of a hospital, first and foremost remain calm and take control of the scene. Take comfort in knowing that things rarely go wrong during childbirth. Childbirth is a natural process. Thousands of children all over the world are born each day, without complications, in areas where no medical care is available.

By following a few simple steps, you can effectively assist in the birth process. This chapter will help you better understand the birth process and includes instruction on how to assist with the delivery of a newborn, how to give care for both the mother and newborn after the delivery and how to recognize and care for complications until emergency medical services (EMS) personnel arrive.

PREGNANCY AND THE BIRTH PROCESS

Pregnancy begins when an egg (ovum) is fertilized by a sperm, forming an **embryo**. The embryo implants itself within the lining of the mother's ***uterus***, a pear-shaped organ that lies at the top center of the pelvis and enlarges significantly during pregnancy. The embryo is surrounded by the ***amniotic sac***. This fluid-filled sac is also called the "bag of waters." The fluid helps protect the newborn from injury and infection.

As the embryo grows, its organs and body develop. After about 8 weeks, the embryo is called a **fetus**. To continue to develop properly, the fetus must receive oxygen and nutrients. The fetus receives these items from the mother through a specialized organ called the ***placenta***, which also removes carbon dioxide and waste products. The placenta is attached to the lining of the uterus and is rich in blood vessels. The placenta is attached to the fetus by a flexible structure called the ***umbilical cord***. The fetus will continue to develop for approximately 40 weeks (calculated by counting back from the women's last menstrual cycle), at which time the birth process normally will begin **(Figure 22-1)**.

Pregnancy is broken down into three trimesters, each lasting approximately 3 months.

Labor

Pregnancy culminates in ***labor*** (also called the birth process), during which the baby is delivered. Labor begins with rhythmic contractions of the uterus. As these contractions continue, they dilate the cervix. When the ***cervix*** is sufficiently dilated, it allows the baby to travel from the uterus through the ***birth canal*** and into the outside world. For first-time mothers, this process normally takes between 12 and 24 hours. Subsequent deliveries usually require less time. The labor process has four distinct stages. The length and intensity of each stage varies.

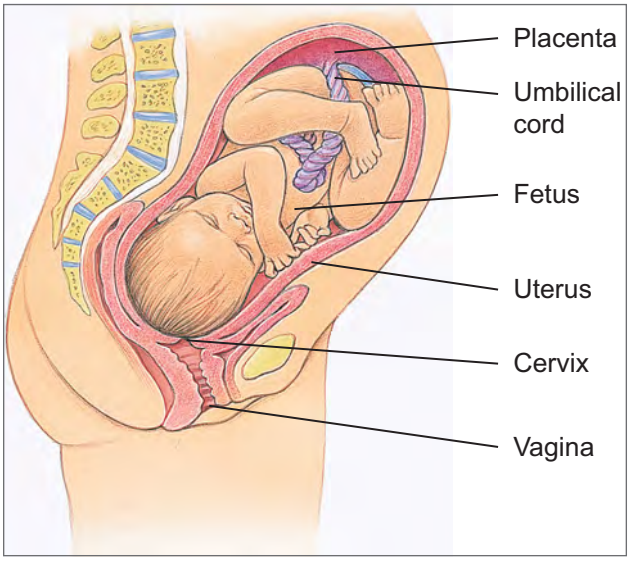


FIGURE 22-1 *Mother and fetus at 40 weeks.*

Stage One—Dilation

In the first stage of labor, the mother's body prepares for the birth. This stage covers the period of time from the first contraction until the cervix is fully dilated (although dilation can begin weeks before labor and delivery).

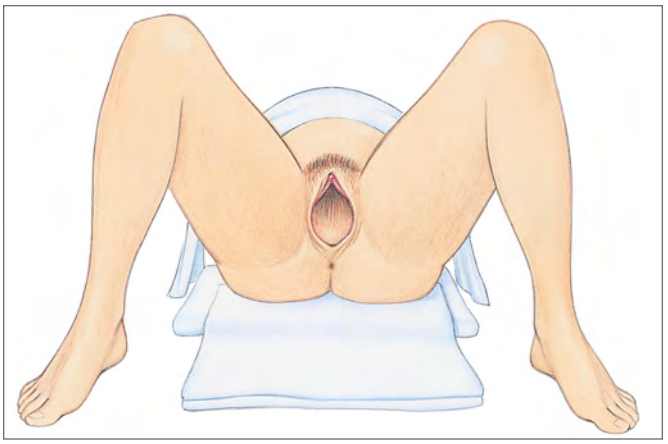


FIGURE 22-2 *When crowning begins, birth is imminent.*

A ***contraction*** is a rhythmic tightening of the muscles in the uterus to allow the mother's cervix to dilate, or expand, enough for the baby to pass through the canal during the birth. Like a wave, it begins gently, rises to a peak of intensity, and then subsides. A break occurs between contractions, and a contraction normally lasts about 30 to 60 seconds.

As the time for delivery approaches, the contractions occur closer together, last longer and feel stronger. Normally, when contractions are less than 3 minutes apart, delivery is near. The woman may be in considerable discomfort at this time.

Stage Two—Expulsion

The second stage of labor begins when the cervix is completely dilated and includes the baby's movement through the birth canal and delivery. During this stage of labor, the mother will experience enormous pressure, similar to the feeling she has during a bowel movement. This sensation is an indication that it is time for her to push, or "bear down," to help ease the baby through the birth canal. Considerable blood may come from the vagina at this time. Contractions are more frequent during this stage and may last between 45 and 90 seconds each. In a normal delivery, the baby's head becomes visible as it emerges from the vagina. The moment during labor when the top of the head begins to emerge is called ***crowning*** **(Figure 22-2)**. When crowning occurs, birth is imminent and you must be prepared to receive the newborn. Stage two ends with the birth of the baby.

Stage Three—Placental Delivery

The third stage of labor begins after the newborn's body emerges. During this stage, the placenta usually separates from the wall of the uterus and is expelled from the birth canal. This process normally occurs within 30 minutes of the delivery of the newborn.

Stage Four—Stabilization

The final stage of labor involves the initial recovery and stabilization of the mother after childbirth. Normally, this stage lasts approximately 1 hour. During this time, the uterus contracts to help control bleeding, and the mother begins to recover from the physical and emotional stress that occurred during childbirth.

Assessing Labor

If you must care for a pregnant woman, you will want to determine whether she is actually in labor and if birth is imminent. If she is in labor, you should determine what stage of labor she may be in and whether she expects any complications. You can determine these and other factors by asking a few key questions and making some observations.

Calm the mother and make her feel comfortable and confident that you are there to keep her and the baby safe. Ask the following questions:

- If 9-1-1 or the local emergency number has been called, how long ago were they reached and what was the response?
- Is this a first pregnancy? The first stage of labor normally takes longer with first pregnancies than with subsequent ones.

- Does the mother expect any complications? Is there a chance of multiple births? Labor does not usually last as long in a multiple birth situation. Also, if you know there are multiples, you can prepare what you need to care for more than one newborn.
- Is there a bloody discharge? This pink or light red, thick discharge from the vagina is the **mucous plug** that falls from the cervix as it begins to dilate, also signaling the onset of labor. This discharge is also known as the "bloody show."
- Has the amniotic sac ruptured (or water broken)? When the sac ruptures, fluid flows from the vagina in a sudden gush or a trickle. Some women think they have lost control of their bladder. The breaking of the sac usually signals the beginning of labor, but not always. People often describe the rupture of the sac as "water breaking."
- What are the contractions like? Are they very close together? Are they strong? The length and intensity of the contractions will give you valuable information about the progress of labor.
    - When the contractions are 5 minutes apart or longer, there is still time to transport the woman to a medical facility if possible.
    - If the contractions are 2 minutes apart, you will not have time to transport the woman, because the birth is imminent. If no one has called 9-1-1 or the local emergency number yet, immediately call.
- Does she have the urge to bear down, or push? If the expectant mother expresses a strong urge to push, this signals that labor is far along.
- Is the baby crowning (i.e., is the newborn's head visible)? If so, begin preparing for the delivery—the baby is about to be born.

False Labor

Be aware that the woman may be experiencing ***Braxton Hicks contractions,*** or false labor contractions. During false labor, the contractions do not get closer together, do not increase in how long they last and do not feel stronger as time goes on—as they would with true labor. Also, false labor contractions tend to be sporadic while true labor has regular intervals of contractions. Because there is no real, safe way to determine whether the labor is false, however, ensuring that the woman is seen by advanced medical personnel is a prudent decision.

ASSISTING WITH DELIVERY

If it becomes evident that the mother is about to give birth, you will need to help the mother through the birth process, at least until EMS personnel arrive. Although childbirth can be exciting, it can also be frightening to witness. Remember that you are only assisting in the process; the expectant mother is doing all the work. Therefore, it is important that you remain calm and confident. Try not to be alarmed by the loss of blood and bodily fluid. It is a normal part of the birth process. Take a deep breath and try to relax. By following a few simple steps, you can effectively assist in the birth process.

Preparing the Mother

Explain to the expectant mother that her baby is about to be born. Be calm and reassuring. A woman having her first child often feels fear and apprehension about the pain and the condition of the newborn. Labor pain ranges from discomfort, similar to menstrual cramps,

to intense pressure or pain. Many women experience something in between. Factors that can increase pain and discomfort during the first stage of labor include:

- Irregular breathing.
- Tensing up because of fear.
- Not knowing what to expect.
- Feeling alone and unsupported.

You can help the expectant mother cope with the discomfort and pain of labor. Begin by reassuring her that you are there to help. If necessary and possible, explain what to expect as labor progresses. Suggest specific physical activities that she can do to relax, such as regulating her breathing. Ask her to breathe in slowly and deeply through the nose and out through the mouth. Ask her to try to focus on one object in the room while regulating her breathing. By staying calm, firm and confident and offering encouragement, you can help reduce fear and apprehension. Reducing fear will help relieve pain and discomfort.

Breathing slowly and deeply in through the nose and out through the mouth during labor can help the expectant mother in several ways:

- It aids muscle relaxation.
- It offers a distraction from the pain of strong contractions as labor progresses.
- It ensures adequate oxygen to both the mother and the newborn during labor.

Many expectant mothers participate in childbirth classes, such as those offered at local hospitals, that help them become more competent in techniques used to relax during the birth process. If this is the case with the mother you are helping, this could greatly simplify your role while assisting with the birth process.

Expect delivery to be imminent when you observe the following signals:

- Intense contractions are 2 minutes apart or less and last 60 to 90 seconds.
- The woman's abdomen is very tight and hard.
- The woman reports feeling the newborn's head moving down the birth canal or has a sensation like an urge to defecate.
- Crowning occurs.
- The mother reports a strong urge to push.

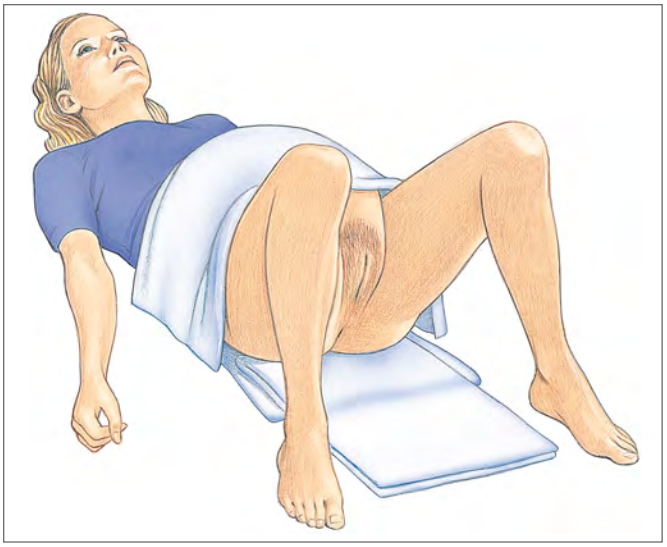


FIGURE 22-3 *To assist with delivery, position the mother on her back with her head and upper back raised, knees bent, feet flat and legs spread wide apart in a clean environment.*

Delivering the Newborn

Assisting with the delivery of the newborn is often a simple process. The expectant mother is doing all the work. She will be pushing down, using certain muscles. Your job is to create a clean environment and to help guide the newborn from the birth canal, minimizing injury to the mother and newborn.

Follow these steps:

- Position the mother so that she is lying on her back with her upper back raised, knees bent, feet flat and legs spread wide apart **(Figure 22-3)**. Be sure to control the scene so that the woman will have privacy.
- Establish a clean environment for delivery. Because it is unlikely that you will have sterile supplies, use

items such as clean sheets, blankets, towels or even clothes. Newspapers, which are very absorbent, can be used if nothing else is available. Place these items over the mother's abdomen and under her buttocks and legs (see Figure 22-3). Also keep a clean, warm towel or blanket handy to wrap the newborn.

- Because you will be coming in contact with the mother's and newborn's body fluids, be sure to wear disposable gloves. If gloves are not available, try to find some other item to use as a barrier. For example, a plastic bag or plastic wrap may be secured around your hands. Wear protective eyewear and put something on over your clothing, if possible, to protect yourself from splashing fluids.
- If available, other helpful items to gather include a bulb syringe to suction secretions from the infant's nose and mouth immediately after birth, gauze pads or sanitary pads to help absorb secretions and vaginal bleeding, and a large plastic bag or towel to hold the placenta in after delivery.
- As crowning begins, place a hand on the top of the newborn's head and apply light pressure. In this way, you allow the head to emerge slowly, not forcefully. This will help prevent tearing of the vagina and avoid injury to the newborn.
- At this point, the expectant mother should stop pushing. Instruct the mother to concentrate on her breathing techniques. Ask her to pant. This technique will help her stop pushing and help prevent a forceful birth.

Once the head is out, the newborn will turn to one side. Support the head **(Figure 22-4)**. The rotation to one side will enable the shoulders and the rest of the body to pass through the birth canal.

Slide your forefinger along the newborn's neck to see if the umbilical cord is looped around it. If the umbilical cord is around the neck, gently slip it over the newborn's head. If this cannot be done, slip it over the newborn's shoulders as they emerge. The newborn can slide through the loop.

- Guide one shoulder out at a time. Do *not* pull the newborn. As the newborn emerges, he or she will be wet and slippery. Use a clean towel to catch the newborn.
- Place the newborn on his or her side, between the mother and you so that you can give care without fear of dropping the newborn.
- If possible, note the time the newborn was born.

While assisting with delivery, also remember there are a few things you should *not* do. These include:

- Do *not* let the woman get up or leave to find a bathroom (most women will want to use the restroom).
- Do *not* hold the woman's knees together to try to slow the birth process; this will not work and may complicate the birth or harm the baby.
- Do *not* place your fingers in the vagina for any reason.
- Do *not* pull on the baby.

FIGURE 22-4 *As the infant emerges and turns, be sure to support the head.*

What if...

The expectant mother insists on getting up to go to the bathroom during delivery? What should I do?

An expectant mother who is about to deliver should not be allowed to go to the bathroom during active labor. The pressure most women feel during labor to defecate is normally the baby putting pressure on the rectum. In fact, passing some stool during labor is common. Allowing a woman to go to the bathroom for a bowel movement, however, could damage the cervix.

CARING FOR THE NEWBORN AND MOTHER

Your first priority after delivery of the newborn is to take some initial steps of care for him or her. Once these steps are accomplished, you can care for the mother.

Caring for the Newborn

The first few minutes of the newborn's life are a difficult transition from life inside the mother's uterus to life outside. Always be sure to support the newborn's head. You have two priorities at this point.

Your first is to see that the newborn's airway is open and clear. Because a newborn breathes primarily through the nose, it is important to immediately clear the mouth and nasal passages thoroughly. You can do this by using a bulb syringe, or your finger or a gauze pad if a bulb syringe is not available. When using a bulb syringe, clean the mouth first, and then each nostril. Also, make sure you compress the bulb *before* you place it in the newborn's mouth or nostril. The tip of the syringe should not be placed more than 1 to 1½ inches into the newborn's mouth and no more than ½ inch into the newborn's nostril.

What if...

I suction a newborn's nose first and then the mouth, rather than the mouth first, then the nose? Does it make a difference?

Yes, it does matter. When caring for a newborn, you should always suction the mouth (or oral airway) first using a bulb syringe (inserted 1 to 1.5 inches; two or three times), followed by the nose (or nasal airway) (0.5 inches into the nostrils). Suctioning the nose before the mouth may stimulate the newborn to take a breath, causing him or her to inhale and aspirate any fluids or secretions still in the mouth.

Most babies begin crying and breathing spontaneously. If the newborn does not make any sound, stimulate the newborn to elicit the crying response by flicking your fingers on the soles of the newborn's feet or rubbing the lower back **(Figure 22-5, A–B)**.

Crying helps clear the newborn's airway of fluids and promotes breathing. If the newborn does not begin breathing on his or her own within the first minute after birth, and stimulating the newborn as describe above does not work, begin CPR. You can review this technique in Chapter 6. Remember the newborn's lungs are very small and they need very small puffs of air.

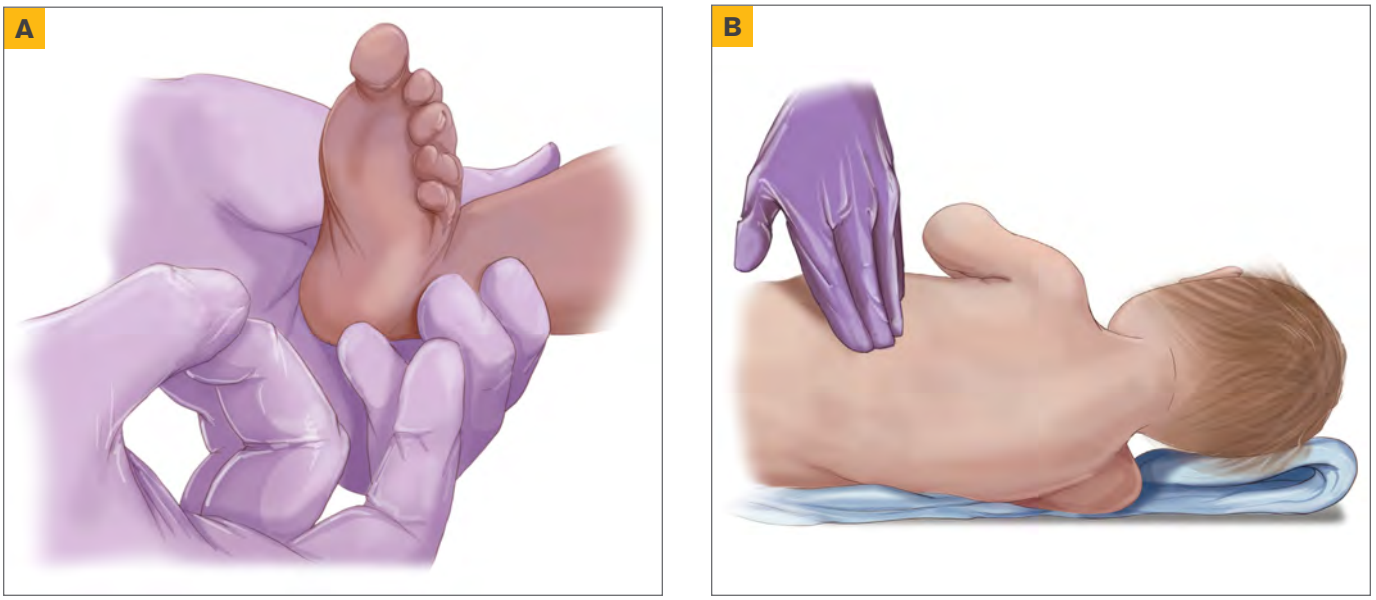


FIGURE 22-5, A–B *You may need to stimulate the infant to breath by* **A**, *flicking the bottom of the foot or* **B**, *rubbing the lower back.*

Your second responsibility to the newborn is to maintain normal body temperature. Newborns lose heat quickly; therefore, it is important to keep him or her warm. Dry the newborn and wrap him or her in a clean, warm towel or blanket. Continue to monitor breathing and skin color. You may place the baby on the mother's abdomen.

Caring for the Mother

You can continue to meet the needs of the newborn while caring for the mother. Help the mother to begin nursing the newborn if possible. This will stimulate the uterus to contract and help slow bleeding. The placenta will still be in the uterus, attached to the newborn by the umbilical cord. Contractions of the uterus will usually expel the placenta within 30 minutes. Do not pull on the umbilical cord. Catch the placenta in a clean towel or container. It is not necessary to separate the placenta from the newborn. In the event that you or another citizen responder must transport the mother and child to the hospital, leave the placenta attached to the newborn and place the placenta in a plastic bag or wrap it in a towel.

What if...

An expectant mother delivers a newborn before EMS arrives? Should I cut the umbilical cord?

No, you should never cut the umbilical cord, and in fact, there is no rush to cut the cord. Instead, keep the baby close to the mother so the cord is not pulled tight. The umbilical cord will stop pulsating approximately 10 minutes after the baby is born. When it does stop pulsating, the cord can be tied in two places very securely with gauze between the mother and child. Secure the first tie approximately 6 to 9 inches from the baby. Secure the second tie 3 inches from the first tie. However, do not delay emergency care to the newborn or mother if needed to do this.

Expect some additional vaginal bleeding when the placenta is delivered. Gently clean the mother using gauze pads or clean towels. Place a sanitary pad or a towel over the vagina. Do *not* insert anything inside the vagina. Have the mother place her legs together. Feel for a grapefruit-sized mass in the lower abdomen. This is the uterus. Gently massage the lower portion of the mother's abdomen. Massage will cause the uterus to contract and slow bleeding.

Many new mothers experience shock-like signals, such as cool, pale, moist skin; shivering; and slight dizziness. Keep the mother positioned on her back. Keep her from getting chilled or overheated, and continue to monitor her condition.

SPECIAL CONSIDERATIONS

Complications During Pregnancy

Complications during pregnancy are rare; however, they do occur. Because the nature and extent of most complications can only be determined by medical professionals during or following a more complete examination, you should not be concerned with trying to diagnose a particular problem. Instead, concern yourself with recognizing signals that suggest a serious complication during pregnancy.

Two important signals you should be concerned about are vaginal bleeding and abdominal pain. Any persistent or profuse vaginal bleeding, or bleeding in which tissue passes through the vagina during pregnancy, is abnormal, as is any abdominal pain other than labor contractions.

An expectant mother showing these signals needs to receive advanced medical care quickly. Call 9-1-1 or the local emergency number. While waiting for EMS personnel, place a pad or other absorbent material between the mother's legs. Also, take steps to minimize shock. These include:

- Helping the mother into the most comfortable position.
- Keeping the mother from becoming chilled or overheated.

Complications During Childbirth

The vast majority of all births occur without complication. However, this fact is reassuring only if the birth you are assisting with is not complicated. For the few that do have complications, delivery can be stressful and even life threatening for the expectant mother and the newborn. More common complications include persistent vaginal bleeding, prolapsed umbilical cord, breech birth and multiple births. If you recognize the signals of any of these complications, call 9-1-1 or the local emergency number immediately if you have not already done so. All of these conditions require the help of more advanced medical care.

Persistent Vaginal Bleeding

The most common complication of childbirth is persistent vaginal bleeding. Persistent bleeding occurs when the uterus fails to contract after delivery, as this contraction facilitates the closing of blood vessels that were opened during the detachment of the placenta. It can also occur if the uterus was stretched too much during pregnancy or if a piece of the placenta remains inside the uterus following delivery. Abnormally long labors and multiple births also increase the risk for bleeding. While waiting for the ambulance to arrive, you should take steps to absorb the blood. Do *not* pack the vagina with dressings. Try to keep the mother calm and take steps to minimize shock, as explained in Chapter 9. In addition, remember that having the mother begin to nurse her newborn and gently massaging the lower portion of the mother's abdomen will stimulate the uterus to contract and slow bleeding.

FIGURE 22-6 *A prolapsed umbilical cord.*

Prolapsed Umbilical Cord

A **prolapsed umbilical cord** occurs when a loop of the umbilical cord protrudes from the vagina while the unborn baby is still in the birth canal **(Figure 22-6)**. This condition can threaten the unborn baby's life. As the unborn baby moves through the birth canal, the cord will be compressed between the unborn baby and the birth canal, and blood flow to the unborn baby will stop. Without this blood flow, the unborn baby will die within a few minutes because of lack of oxygen. If you notice a prolapsed cord, have the expectant mother assume a knee-chest position **(Figure 22-7)**. This will help take pressure off the cord. Call 9-1-1 or the local emergency number if they have not already been contacted.

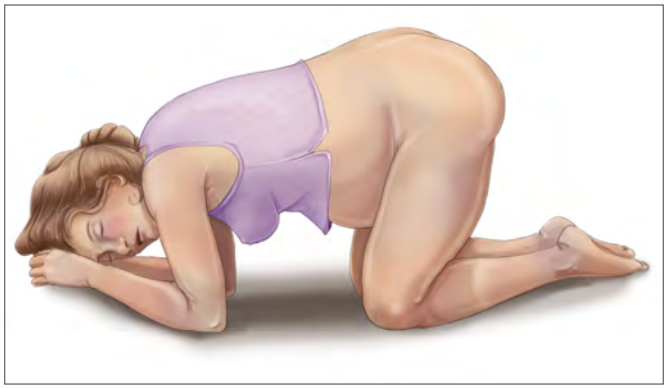


FIGURE 22-7 *If you notice a prolapsed cord, the knee-chest position will take pressure off the cord.*

Breech Birth

Most babies are born head-first. However, on rare occasions, the newborn is delivered feet- or buttocks-first. This condition is commonly called a **breech birth**. If you encounter a breech delivery, support the newborn's body as it leaves the birth canal while you are waiting for the head to deliver. Do not pull on the newborn's body. Pulling will not help deliver the head.

Because the weight of the unborn baby's head lodged in the birth canal will reduce or stop blood flow by compressing the umbilical cord, the unborn baby will be unable to get any oxygen. Should the unborn baby try

to take a spontaneous breath, he or she will also be unable to breathe because the face is pressed against the wall of the birth canal. When the unborn baby's head is delivered, check the infant for breathing. Be prepared to give rescue breaths and perform CPR as necessary.

Multiple Births

Although most births involve only a single newborn, a few will involve delivery of more than one newborn. If the mother has had proper prenatal care, she will probably be aware that she is going to have more than one newborn. Multiple births should be handled in the same manner as single births. The mother will have a separate set of contractions for each baby being born. There may also be a separate placenta for each baby, although this is not always the case. Remember that the risk for persistent bleeding increases with multiple births.

SUMMARY

Ideally, childbirth should occur in a controlled environment under the guidance of health care professionals trained in labor and delivery. In this way, the necessary medical care is immediately available for mother and newborn should any problem arise. However, unexpected deliveries may occur outside the controlled environment and may require your assistance. To assess the mother's condition before delivery and to assist in the delivery, be familiar with the four stages of labor and understand the birth process. By knowing how to prepare the expectant mother for delivery, assist with the delivery and give proper care for the mother and newborn, you can help bring a new child into the world.

READY TO RESPOND?

Think back to Lisa in the opening scenario, and use what you have learned to respond to these questions:

1. Which stage of labor is Lisa in? Why do you think so?
2. What information can Lisa give that will help you to assist with the delivery?

STUDY QUESTIONS

1. Match each term with the correct definition.

a. Amniotic sac	e. Crowning
b. Birth canal	f. Cervix
c. Placenta	g. Contraction
d. Umbilical cord	h. Uterus

_____ A pear-shaped organ in a woman's pelvis in which a fertilized egg develops into a baby

_____ The rhythmic tightening and relaxing of muscles in the uterus

_____ An organ attached to the uterus and unborn baby through which nutrients are delivered

_____ The phase during labor when the baby's head is visible at the opening of the vagina

_____ The upper part of the birth canal

_____ Sac that encloses the fetus during pregnancy and bursts during the birthing process

_____ A flexible structure that attaches the placenta to the fetus; allowing for the passage of blood, nutrients and waste

_____ The passageway from the uterus to the outside of the body through which the newborn passes during birth

2. Name and briefly describe the four stages of labor.

3. List the two priorities of care for a newborn.

Base your answers for questions 4 through 9 on the scenario below.

You happen upon a small gathering of people only to discover that a woman has gone into labor. The woman is lying on the floor in pain. She says this is her second child. She tells you that her labor pains started about an hour ago, but her contractions are already less than 3 minutes apart.

4. The fact that this is the woman's second child, and her contractions are less than 3 minutes apart, means—

   a. There should still be time to get this woman to the hospital to give birth.
   b. The woman may be about to give birth—when contractions are less than 3 minutes apart, delivery is near; and labor often moves more quickly in second pregnancies.
   c. The answer depends on whether her water has broken yet.
   d. The answer depends on whether she has had a bloody discharge.

5. The woman now reports an urge to push. To assist with delivery of the newborn, which seems imminent now, what preparations should you take?

   a. Ask a bystander to call 9-1-1 or the local emergency number and help control the crowd to give the woman privacy.
   b. Place clean sheets, blankets or towels under the mother's buttocks and on her abdomen.
   c. Have the mother lie on her back with her knees bent, feet flat and legs spread wide apart.
   d. All of the above

6. What can the woman do to help cope with the pain and discomfort of labor?

   a. Focus on an object in the room while regulating her breathing.
   b. Assume a knee-chest position.
   c. Hold her breath then suddenly release it.
   d. Alternately tense and relax all muscles in her body.

7. When the newborn's head is crowning at the vaginal opening, you should—

   a. Maintain firm finger pressure against the center of the newborn's head.
   b. Place your hand lightly on the top of the newborn's head.
   c. Place the palm of your hand firmly against the newborn's head.
   d. Place one hand on either side of the newborn's head.

8. If the mother has a breech delivery, what part of the newborn will be seen first?

   a. Head
   b. Arms
   c. Foot (feet) or buttocks
   d. Shoulder

9. If the newborn is not crying or does not appear to be breathing after you have cleared his or her airway with a bulb syringe, you should first—

   a. Hold the newborn up by its ankles and spank its buttocks.
   b. Suction the newborn's throat with the bulb syringe.
   c. Flick the soles of the newborn's feet with your fingers or rub the lower back.
   d. Begin rescue breathing.

Answers are listed in Appendix B.

Disaster, Remote and Wilderness Emergencies

23

You and a large group of friends are having fun along the river on a day-long canoe outing when the unexpected happens. One of the canoes flips over near the shore line, and Pete, who was in the back of the boat, receives a long gash across his arm and abdomen. As he struggles to stand up in the shallow water, you can see that both wounds are bleeding profusely. You are still 2 miles away from the pickup point arranged with the rental company and there is no cell phone reception in the location where the accident occurs.

LEARN AND RESPOND

OBJECTIVES

After reading this chapter, you should be able to:

- Define situations in which lay responders must modify first aid skills for long-term management of injured or ill person(s).
- Identify leadership and followership roles in extended care situations.
- Adapt the emergency action steps **CHECK—CALL—CARE** to incorporate scene management and long-term care of the injured or ill person.
- Describe the information to gather and consider when making a plan to get help.
- Identify evacuation considerations and describe four options for obtaining help when advanced care is delayed.
- Identify special considerations for first aid care in disaster, remote or wilderness settings.
- List three general types of preparation for venturing into an environment where help may be delayed.

KEY TERMS

Disaster: An event that causes widespread destruction, including possible large numbers of casualties; can be natural or man-made.

Remote: Far away from populated areas or resources.

Wilderness: An area that is uninhabited by human beings, is uncultivated and has been left in its natural condition.

INTRODUCTION

Depending on things such as the region where you live and how active a lifestyle you enjoy, particularly with regard to outdoor pursuits, you might encounter a situation that requires extra consideration and efforts in giving first aid care. For example, you may encounter a ***disaster*** involving widespread destruction or large numbers of injured or ill people, or you may be faced with an emergency that occurs in a ***remote*** area far from resources. Even if you do not live in an area prone to natural disasters or you prefer to stay in more populated areas, you never know when extraordinary circumstances might lead to a sudden need for emergency care on a large scale basis or with limited resources.

Consider these statistics: in the year 2011, some 87 federal disasters were declared requiring resources from all levels of the government and private sector in order to protect, support and help citizens. These disasters included floods, wildfires, tornadoes, earthquakes and blizzards that affected practically every region of the country. While emergency medical services (EMS) networks serve reliably in the United States, even the best system can be overwhelmed in a disaster, such as during the Joplin, Missouri F5 tornado in 2011, where an entire hospital was destroyed; or in the terrorist attacks of September 11, 2001.

EMS already relies on lay responders like you to activate the EMS system in an emergency, usually by calling 9-1-1 or the local emergency number. But particularly in a disaster, remote or ***wilderness*** first aid situation, there are opportunities for lay responders to make life-preserving differences before advanced medical assistance becomes available by stabilizing injuries and illnesses or preventing further harm. This chapter connects what you already know about these two functions with additional considerations, helping you prepare and respond in disaster, remote or wilderness settings when advanced medical care is delayed by minutes, hours, or days.

DISASTER, REMOTE AND WILDERNESS EMERGENCIES

When EMS personnel are not readily available, there are a number of interventions and scene management principles that lay responders can enact once someone recognizes that an emergency is developing, or one has occurred in which professional medical care will not be available within 30 minutes. You probably don't think about being away from advanced care very often, but imagine an emergency in a situation that cuts you off from communication.

Examples of such emergency situations include those that occur:

- On a boat or plane in transit.
- On a remote highway or isolated road.
- On a farm.
- While camping or hiking.
- With the occurrence of a tornado, earthquake or other natural disaster **(Figure 23-1, A—C)**.
- Due to winter hazard conditions.
- Due to human mistakes, criminal activity or terrorism.
- As a result of a pandemic flu outbreak.

FIGURE 23-1, A–C *Natural disasters, such as an* **A**, *flood* (courtesy of Robert Baker)*;* **B**, *earthquake* (courtesy of Chris Helgren) *or* **C**, *tornado* (courtesy of Joseph Songer)*, can leave entire communities incapacitated and large numbers of people seriously injured.*

Each of these situations create the potential for advanced care to be delayed. Factors you will need to consider along with your current first aid skills include:

- Time and/or distance that prevents access to swift advanced medical help.
- Hazards created by the environment, weather, location or time of day.
- Unavailability of EMS due to overwhelming need.
- Unavailability of EMS due to lack of workers or damaged equipment.
- Scene safety issues that demand special skills and resources.
- Lack of adequate first aid equipment.
- Issues related to managing resources, people and your own well-being for an extended amount of time.

The stress of these additional factors in first aid situations requires further mental and physical effort on your part. Additional skills and equipment to safely access, assess, care, and transport injured or ill persons may be needed or improvised. Furthermore, there may be a need to manage group dynamics in an emergency with multiple injured or ill persons or multiple bystanders.

Leadership and Followership

Based on each individual's experience, the leader who emerges in one emergency may not be the same leader in another type of emergency. A designated leader may also change if that person is the one who becomes injured or ill. For example, someone who was a leader when caring for an ankle injury may later experience a heat-related illness that requires another individual to take charge. Also keep in mind that the leader in an emergency may not be the person with the highest rank, position or age in the group, but rather the person with the best training for the particular situation.

With the primary goal to do the greatest good for the greatest number of people in the shortest time, and as safely as possible, leaders work to:

- Manage scene safety.
- Take a big-picture view of the scene.
- Care for life-threatening and non-life-threatening conditions (directly or indirectly).
- Provide evacuation direction for the group.

As much as a good leader depends on his or her own knowledge, skill, and experience, a good leader also depends on the cooperation and assistance of other people in the group. If someone else takes leadership, or you are in a situation in which you are assisting EMS personnel with a major disaster response, you can be a good follower by assuming responsibility for tasks given to you. Asking pertinent questions and providing the leader with information to make informed decisions contributes to better decisions and actions by the group. Likewise, if you are the leader, you need to listen to the followers and their information because of the complexity of these situations. Providing feedback to followers maintains this relationship and keeps everyone on the same page with regard to priorities. It is good to remember your own limitations as well as the limitations of others and realize that cases of dehydration, fatigue, or environmental stress affect the judgment of everyone in a situation.

TAKING ACTION USING MODIFIED CHECK-CALL-CARE

In disaster, remote or wilderness emergencies, the basics of giving care that you learned in earlier chapters still apply. In Chapter 1, you learned about the emergency action steps: **CHECK—CALL—CARE**. In this chapter, you will learn to apply these same steps in a modified fashion to meet the special needs of a disaster, remote or wilderness emergency. In general, these modifications include:

- Breaking up the **CHECK** action step into three separate components that give you the information to act appropriately:
  - Check scene safety.
  - Check the person or persons.
  - Check for resources.
- Recognizing that the **CALL** step will be more difficult and will require more information to be shared about the entire situation, not just the injured or ill person(s).
- Giving **CARE** for a longer term that will also require additional skills.

Each of these action steps needs a plan, based on what you see, hear and feel along with what you anticipate. Good judgment is imperative.

Check Scene Safety

Check the entire scene to get a general impression of what happened. Look for dangers that could threaten your safety or the safety of others. In a natural or human-caused disaster, this could include things such as downed wires, unstable structures, the potential presence of toxic fumes and similar hazards **(Figure 23-2)**. In a remote or wilderness situation, dangers might include such things as falling rocks or tree limbs, difficult terrain, wild animals and the like **(Figure 23-3)**. If you see any dangers, do not approach the person(s) until you have carefully planned how you will avoid or eliminate the danger to yourself and others. Also note any impending problems, such as a threatening storm or darkness. Make the scene safe if needed or remove the person(s) with an emergency move if you can do so without putting yourself or others in jeopardy. Moving a person in a disaster, remote or wilderness area will be covered more in-depth later in this chapter. This check will also give you clues to mechanisms of injury before you start checking the person.

FIGURE 23-2 *Check the scene for dangers that could threaten your safety or the safety of others, such as downed wires and unstable structures.*

FIGURE 23-3 *In a wilderness situation, check the scene for dangers such as changing weather conditions, wild animals, fire hazards, difficult terrain and falling rocks.*

FIGURE 23-4 *Check the person for life-threatening conditions.*

Check the Person or Persons

When you are sure it is safe, approach the person(s) carefully and check for life-threatening conditions. In disaster, remote or wilderness emergencies, the steps to identify priorities are slightly different than those taught in Chapter 5.

- First check for airway, breathing and circulation, including checking for severe bleeding systematically from head to toe and underneath clothing **(Figure 23-4)**.
- Follow with checking for disability of the extremities by checking circulation, ability to move, and ability to sense in each hand or foot. The absence of any of the three could be a sign of a life-threatening head, neck or spinal injury. If the person has fallen or if you do not know how the injury occurred, assume that he or she has a head, neck or spinal injury.
- Finally, consider the environment and protect the person from further harm. For example, if a disaster caused a loss of power or you are in a remote area and it is getting cold, you need to take steps to protect the person from hypothermia, which can be lethal.

Give care for any life-threatening conditions as you find them.

Next, check the person for any other problems that are not life threatening but may become so over time, using a second systematic and detailed assessment. In delayed-help situations, this check may need to occur before getting help. Ask the person or bystanders questions that describe what is now happening and any history that may have caused the situation but not be obvious to you (e.g., a person who fell is also a diabetic). Whenever possible, perform a head-to-toe check even if the person is unconscious or being treated for life-threatening conditions. Write down the information that you gather so that you remember it. If you do not have anything to write with, you'll have to take mental notes of the most important or unusual observations. This subjective and objective information about the person's condition and history will help in making a care and evacuation plan.

What if...

There are more injured or ill persons than I can handle?

By their nature, disasters often create situations with multiple injured or ill persons—and limited resources for responding to their needs. When things seem overwhelming, you can help by maintaining your composure and knowing your limitations. If you are the only one with training at the scene, direct bystanders in ways to help, and encourage persons to help themselves and each other if able. You will also need to apply some basic triage principles, including quickly assessing each person, then helping the person who needs care the most and who can be saved (i.e., caring for life-threatening emergencies quickly) before helping those with less serious injuries or illnesses. Finally, offering reassurance to others can help reduce chaos at the scene until the emergency is under control.

Check for Resources

Check the scene for resources. Resources include people available to help, communication or signaling devices available, food and water, shelter, first aid supplies and means of transportation. While checking bystanders, make sure everyone else nearby is okay, (e.g., if one person is hypothermic then other bystanders may also be cold). Check the surrounding environment for conditions or developing conditions that could endanger you or the person(s) during the time it will take to get help. Note any conditions that would make it

difficult for you to go get help. Also, consider whether you need to move the person(s) to prevent further harm.

As a leader, you should consider having other people do these checks, if they are able, so you can maintain control over the scene. Checking will be an ongoing step, so that you stay alert to developing dangers and deal with them in the context of the entire situation.

Call

Once you realize help is needed, the **CALL** step is divided into two phases: making a plan for getting help and executing the plan. Proper planning based on the needs of the injured or ill person(s), changing environmental conditions and the resources available will help guide you in what to do and in which order to do it. This includes everything from the first aid needs of the person(s), to the roles of other group members, to the evacuation plan. Be sure you have all the necessary information before calling for help, as you may only have one chance depending on the situation (e.g., if you have to send someone for help or phone lines are overwhelmed with callers).

Making a Plan

In a delayed-help situation, you have four options for getting help:

- Stay where you are and call, radio or signal for help.
- Send someone to go get help or leave the person alone so you can get help.
- Transport the person to help.
- Care for the person where you are until the person has recovered enough to move on his or her own.

Consider all of the information you have gathered during the **CHECK** step about the conditions at the scene, the condition of the injured or ill person(s), and the resources available or needed before making the plan. Discuss your options with others, including the person(s), if appropriate. To help decide on the best approach, ask yourself and others these questions:

- Is advanced medical care needed; if so, how soon? If you discovered any conditions for which you would normally call 9-1-1 or the local emergency number, or if these conditions seem likely to develop, you should plan to get help immediately.
- Is there a way to call from the scene for help or advice? If communication is possible, call 9-1-1 or the local emergency number as soon as you have enough information about the condition of the persons(s) and he or she is safe from dangers at the scene. Emergency medical personnel can tell you how to give care and advise you about getting help.
- If phone or radio communication is not possible, is there a way to signal for help? The advantages of signaling are that it is faster and safer than going for help. The disadvantages include not knowing if your signal has been received and not being able to communicate with the receiver exactly the type of help you need.
- If there is no way to call for help, is it possible to go get help yourself? Consider whether you can get help safely while not jeopardizing the safety of the person(s) or yourself as well as how long it might take. Carefully weigh the decision if going to get help means leaving a person alone and determine what to do before leaving to keep him or her safe.
- Is there a way to transport the person(s) to help? Consider whether you have a safe and practical way to transport the person(s), and whether any injuries allow for safe transport. If a person cannot walk, it will be extremely difficult to carry him or her any

distance, even if you have a large number of people to assist. Unless a vehicle or other means of transportation is available, you probably will not be able to transport the person to help without great difficulty or risk to others.

- Is it possible to give care where you are until the person(s) can travel? Think about the risks of caring for the person(s) without medical assistance and the possibility that serious complications may develop. On the other hand, consider how quickly the person(s) may be able to recover, allowing you to safely transport him or her to medical care.
- Is it safe to wait for help where you are? Environmental hazards, such as a threatening storm or falling temperatures, may make it unsafe to wait for help.

You will discover that there is no "best" plan for getting help in a disaster, remote or wilderness emergency. You may have to compromise, reducing overall risk by accepting certain risks. For example, if you are hiking in a remote area late in the afternoon on a cold, sunny day and one of your companions injures an ankle, generally, the safest thing to do for the person would be to immobilize the ankle in place, send someone for help and wait with the person until emergency transportation arrives. However, if you know that it will take until nightfall for someone to summon help and no one in your party is dressed to survive the low temperatures overnight, you may decide to immobilize the ankle and help the person walk to a shelter, even though following this plan may cause further injury to the ankle.

Calling for Help

If you have some means of quickly calling for help, such as a mobile phone or two-way radio, make sure you have gathered all the necessary information about the condition of the person(s) and your location so that EMS or rescue personnel will be able to plan their response. Having essential information when you call reduces confusion and improves the likelihood that the right type of help will be sent to the right location. In addition, if you include all essential information in your first communication call, emergency personnel will be able to respond even if later communication attempts fail.

Make sure you give the dispatcher specific information about your location. Identifying prominent landmarks and marking your area can help rescuers find your location. Consider that some landmarks are clearly visible during the day but are not visible at night, or may have been destroyed by a disaster. Flares are one way of marking your location, although you should not use flares in dry or heavily wooded areas that could ignite. You may need to send someone to meet EMS personnel at a main road or easy-to-identify location and have him or her guide EMS personnel to the person(s). Do not give mileage approximations to the EMS dispatcher unless you are sure of the distance.

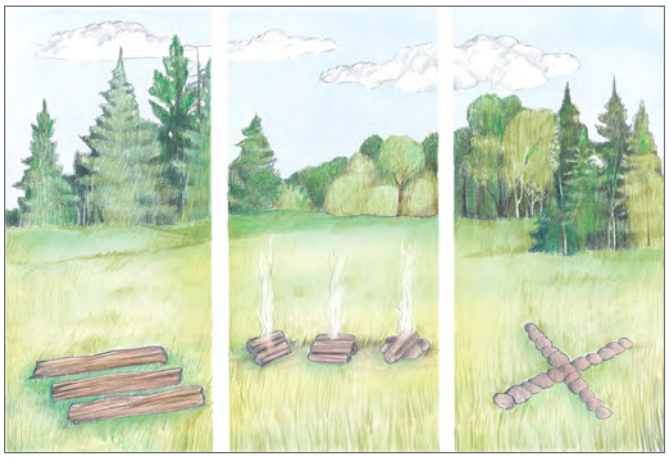


FIGURE 23-5 *A series or set of three signals or a ground-to-air signal can be used to signal "Help!"*

Improvised Distress Signals

If you have no way to call for help and it is dangerous or impractical to use flares or send someone for help, you may have to improvise. Two of the most widely used general distress signals are:

- Signals in threes. A series or set of three signals alert others to your call for "Help!" **(Figure 23-5)**. Three shots, three flashes of light, three shouts, three whistles or three smoky fires are all examples. Use extreme caution when building fires. Always remain

near the fire and have water or dirt close by to extinguish sparks. Do not use fires in dry areas. A small fire can easily get out of control. Build your fires in a triangle at least 50 yards (45 meters) apart so that they are visible as separate fires.

- Ground-to-air signals. To signal an aircraft, use either signals in threes (three fires or three flashes of light) or else mark a large "X" on the ground. The X ground-to-air signal is a general distress signal meaning "unable to proceed" or "need immediate help." If constructing an X signal, make sure that you choose a large open area and that the X you construct stands out against its background. The X signal should be at least 20 feet (6 meters) across.

In addition, smoke, mirrors, flare guns and whistles create visual or auditory signals to attract responders. Smoke signals can be effective because they can be seen for many miles. If you are on a boat, making an urgent call over marine radio indicates that you have an emergency. You should be familiar with various ways of signaling that are appropriate for your location and environment.

Sending for Help

If calling or signaling is not an option, such as in an area where no mobile service is available, consider sending two or three people to get help. Ideally, they should have the following information:

- A note indicating the condition of the injured or ill person(s)
- A map indicating the location of the person(s)
- A list of other members in the group
- A list of available resources
- A description of the weather, terrain and access routes if known
- A list of immediate and long-term plans, as well as contingency plans if needed

This information will help emergency personnel determine their needs for the rescue. The information should be carried in writing in the event that the individuals seeking help become lost or something happens to them.

The safety of the messengers seeking help is extremely important. Make sure you send enough people to ensure safety and success in delivering the message. If going for help involves hazards or challenges, do not send individuals who are not prepared to overcome these problems. Taking personal safety equipment, food, water and shelter is essential. Also, if the plan involves accessing a vehicle, for example at a trail head, be sure to send the keys with the individuals seeking help.

Another consideration in going for help is making sure those sent can lead rescuers back to the person. Whenever you find yourself in a large urban disaster, or a remote location such as a boat or the wilderness, the most accurate way to describe your location is to use maps, perhaps in coordination with a compass or other instrument. You should be trained in map and chart reading and know how to use a compass if you travel or work in delayed-help environments. Of course, in modern times, many people rely on global positioning units. While these can be helpful and often provide accurate information, they do have limitations, including the fact that they can run out of batteries or break.

If going for help, another important step is to always mark the way so that you can return more easily with rescuers. Regularly look back at the area you just traveled, which can assist you on your return trip. What you see behind you will look different from the area you are facing.

Finally, before sending anyone for help, consider whether tasks at the scene require everyone's help. For instance, moving an injured or ill person a short distance to a shelter or gathering fire wood is easier to do when everyone helps. When sending someone for help, make sure you also leave behind enough trained individuals to care for the injured or ill person(s) while waiting for help. Those remaining with the person should be equipped to care for the person and themselves.

Leaving a Person Alone

Generally, it is not a good idea to leave an injured or ill person alone. However, if you are alone with the person, have no way to call or signal for help and are reasonably sure that no one will happen by, then you may decide that it is best to leave the person and go get help.

Follow the guidance above for having a plan and executing it. Write down the route, the time you are leaving and when you expect to arrive, and then leave this information with the person. Be sure to provide for the injured or ill person's needs while you are gone. Ensure that the person has food, water and a container to use as a urinal or bedpan. If the person cannot move, make sure that these things are within reach.

Also make certain that the person has adequate clothing and shelter and that he or she is protected from the ground. See *Protection from the Elements* later in this chapter for more information. Recheck any splints or bandages, and adjust them if necessary so that they are not too tight. If the person is conscious, make sure he or she understands that you are going to get help. Give the person an idea of when to expect a response. Be as reassuring and positive as the situation allows.

If the person is unconscious or completely unable to move, place him or her in the modified high arm in endangered spine (H.A.IN.E.S.) recovery position, lying on one side with the face angled toward the ground, to maintain an open and clear airway or in case of vomiting. Be careful to keep the head and spine as straight as possible if you suspect an injury in those areas. For instructions on how to place an adult, child or infant in a modified H.A.IN.E.S recovery position, refer to Chapter 5.

Transporting a Person to Help

In situations involving injury or sudden illness, it is usually best to have help come to you. Consider transporting a person to help only if a vehicle or other means of transportation is available rather than simply carrying the person. Carrying a person is very difficult and can be hazardous, especially if the terrain is not smooth and flat.

Factors to consider when deciding to move a person include the extent of the injuries, distance to be traveled and available help at the scene. Remember that excessive movement may aggravate or worsen the person's condition. You should not attempt to move or transport a person with a suspected head, neck or spinal injury unless a potential for greater danger exists.

If you decide to transport a person to help, plan the route you will follow. Remember that you may need to travel more slowly to avoid further injury to the person or responders. Once you get to your vehicle, remember it is better to have someone come along in addition to the driver who will care for the person during transport. If possible, inform someone else of your route and alternate plans.

Care

In a delayed-help situation, your plan for caring for each person in need extends from the initial stabilization of an injury or illness to long-term care of those issues and personal care. The best care possible, whether for a few minutes or a few hours, will come if

BEING PREPARED … IN YOUR VEHICLE

If you plan to travel by car through remote areas, or live in an area prone to winter storms, making sure to stock your vehicle with some minimal survival supplies can make the difference between life and death should you find yourself stranded. In addition to the items listed below, you should also always be prepared by ensuring your vehicle is in proper working order, keeping the gas tank full and avoiding traveling when you know the weather could be severe.

At a minimum, your vehicle survival kit should include:

- Battery-powered radio and extra batteries.
- Flashlight and extra batteries.
- Blankets or sleeping bags.
- Jumper cables.
- Bottled water.
- Nonperishable snacks.
- Compass and road map.
- First aid kit.

Also consider including:

- A fire extinguisher (5lb, A-B-C).
- A small shovel.
- A tire repair kit and pump.
- Flares or reflective triangles.
- A sack of sand or cat litter (for traction).

SOURCE: American Red Cross, Central Illinois Region, www.redcrossillinois.org/car-kit.

you remain calm, use the information in all of the checks to create a sound plan, and demonstrate good leadership or followership. This provides you a focus and will support and reassure the person and bystanders until EMS takes over.

Monitoring the Person

After you complete your initial check of the person and give care for the conditions found, continue to monitor the person's condition. Monitoring provides you with ongoing information so you can modify your plan as needed and gives you reference points with regard to the person's improvement (or lack of improvement).

Continuously monitor the breathing of a person who is unconscious or has an altered level of consciousness. Listen to and watch the person's breathing. If the person stops breathing or vomits, you will need to give care by going back to your airway management skills. Refer back to Chapters 5 and 7. Otherwise, recheck the person about every 15 minutes until he or she is stable.

If the person can answer questions, ask the person if his or her condition has changed. You should also watch for changes in skin appearance and temperature and level of consciousness. Changes in these conditions may indicate developing problems, such as heat-related illnesses or cold-related emergencies and shock. Recheck any splints or bandages, and adjust them if they are too tight or loose. If minutes turn into hours, you will also have to provide a safe means for the person to eat as well as urinate and defecate. If hours turn into days, you will need to assess and care for wounds that may become infected.

Keep a written record, noting any changes you find and the time the changes occur, and describe the care you give.

Fractures, Dislocations, Sprains and Strains

In Chapters 11 and 12, you learned how to recognize and give care for musculoskeletal injuries and not to attempt to move a person with a serious musculoskeletal injury unless it is absolutely necessary. However, in delayed-help situations where advanced medical

FIGURE 23-6 *You may need to improvise a splint in a disaster, remote or wilderness situation.*

personnel will not arrive quickly to help, splinting may reduce pain and will allow you to more safely move a person with a musculoskeletal injury. First splint the injured part using the techniques learned earlier. It is more likely that you will need to improvise a splint in a disaster, remote or wilderness situation **(Figure 23-6)**. Be sure to continue to check the splinted area for feeling, warmth and color about every 15 minutes, and adjust the splint if necessary. Using the principles of RICE (rest, immobilize, cold and elevate) for this type of injury may help speed healing time, where a person could walk out versus being carried out, and will address pain issues. Refer to Chapter 11 for specifics about these care steps. For long-term care and faster healing, repeat RICE three to four times a day, until pain and swelling subside.

Bleeding

In delayed-help situations, use the same principles that you learned to control severe bleeding in Chapter 8. Direct pressure controls most external bleeding and should be maintained for at least 10 minutes to allow a blood clot to form. Long-term management of small and large wounds includes cleaning the wound with large amounts of clean water and protecting the wound from infection with ointments and dressings. The wound should be checked periodically for infection, cleaned and redressed as needed.

Also as taught in Chapter 8, if direct pressure fails to control external bleeding on an extremity or is not possible, application of a manufactured (commercial) tourniquet by a properly trained responder may be necessary. However, because of the dangers of using a tourniquet, and additional factors complicating delayed-help situations, it is recommended that any individual planning to be in a delayed-help situation get full training on the use of tourniquets to control bleeding, such as that offered in a specific wilderness first aid course.

Burns

General steps for caring for a burn in a delayed-help environment are the same as in any other situation. Refer back to Chapter 10 for details.

Keep in mind that using cold water on large or serious burns increases the possibility of hypothermia and shock, especially in a cold environment. Be careful not to use more water than necessary and focus on cooling only the burned area. In areas with limited water, you may need to reuse water so plan ahead.

Since the danger of infection is greater in delayed-help environments, keep a dressing over the cooled burn. Apply a thin layer of wound gel to the dressing first if available. If an emergency facility is more than a day away, you must redress the burn daily. Redressing includes taking old dressings off, cleaning the burned area with sterile water and mild soap, reapplying a thin layer of wound gel and covering with a clean dressing. If none of these materials are available, leave the burn alone; it will form a scab.

Partial- and full-thickness burns, or burns covering more than one body part, can cause serious loss of body fluids. Elevate burned areas above the level of the heart and keep the burned person from becoming chilled while treating for shock. Always monitor breathing and consciousness. A person with serious burns requires transport to a medical facility as soon as possible.

Sudden Illness

When caring for a person with sudden illness, such as someone experiencing a diabetic emergency or a seizure, follow the same procedures as if you were not in a delayed-help situation (see Chapter 15). However, there are additional factors to consider when you are far from help or transportation.

A person recovering from a diabetic emergency due to low blood sugar should rest after eating or drinking something sweet. If he or she does not show improvement within 5 minutes, you need to give the person water in the amounts described in the following section on shock. Consider a fast evacuation. Some wilderness first aid experts recommend rubbing small amounts of a sugar and water mixture (or some other sweet liquid, such as fruit juice or a sports drink) on the gums of an unconscious person. Remember, however, that while a person having a diabetic emergency needs to get a sugary substance into his or her system immediately, you should never attempt to give an unconscious person anything to eat or drink.

To care for someone experiencing a seizure in a delayed-help environment, first prevent additional harm, for example, by clearing the area around the person; then, complete a detailed check for injuries after the seizure ceases. Maintain the person's body temperature and help prevent shock by placing some form of insulation between the person and the ground. Cover the person with a blanket or coat if necessary. If you are on a recreational outing, such as a camping trip or hike, consider ending the trip if you suspect any injuries or possible recurrence of the seizure.

Shock

With all injuries and illnesses in a delayed-help situation, it is likely that you will have to give care for shock to minimize or delay its onset while waiting for advanced medical care. If untreated, shock will worsen and lead to death.

Remember that shock does not always occur right away, it may develop while you are waiting for help because of a hidden illness or injury. Check for signals of shock (see Chapter 9) every time you check the person's condition. Be alert for conditions that may cause shock to develop slowly, such as internal bleeding, vomiting, diarrhea or heat loss.

For those in shock, if medical care is more than 2 hours away, you should consider providing the conscious person cool water or clear juices. This fluid will help the body compensate for fluid loss in an injury or illness. You can give an adult about 4 ounces (½ cup) or more of water to sip slowly over a 20-minute period if it is tolerated. For a child, give 2 ounces (¼ cup) and for an infant, 1 ounce (⅛ cup), over the same 20-minute period. Giving frequent, small amounts of fluid, rather than fewer large amounts, reduces the chance of vomiting.

Even in a delayed-help situation, do not give fluids if the person is unconscious, having seizures, has a serious head or abdominal injury, or if vomiting is frequent and sustained. If you give fluids and the person then starts to vomit, wait before giving the person any more to drink. Remember to keep the person from becoming chilled or overheated.

If you or someone you are with is susceptible to anaphylaxis or anaphylactic shock as a result of an allergy, bite or sting, be sure someone knows the location of necessary medication, such as oral antihistamines or injectable epinephrine (see Chapters 16 and 17), and knows how to use it. Anaphylactic shock is life threatening if the person does not receive care immediately. Advanced medical support for a person who shows signals of anaphylactic shock, such as swelling and trouble breathing, is needed as quickly as possible, as the condition is often reversible with specific drugs, but life threatening without.

FIGURE 23-7 *Place an insulating barrier between the person and the ground.*

Head, Neck and Spinal Injuries

If you suspect a head, neck or spinal injury based either on the cause or your assessment of a person, the goal and the care are the same as in any other emergency: prevent further injury by providing manual stabilization.

Caring for a person with a head, neck or spinal injury who will be exposed to the elements for an extended period is more difficult, as the person will not be able to maintain normal body temperature without your help. The person will need help drinking, eating, urinating and defecating. Help the person maintain normal body temperature by placing insulation underneath him or her or providing shelter from the weather. If two or more people are available, roll the person onto one side to place insulation underneath the body, being careful not to twist the head, neck or spine **(Figure 23-7)**.

What if...

I need to leave someone who needs manual stabilization in order to complete another task important to giving care or ensuring scene safety?

Because performing manual stabilization effectively takes you or someone else away from other work that may need to be done, having a mechanical means of stabilizing a person's head in a neutral position may be helpful in delayed-help situations. If the person holding manual stabilization needs to free him- or herself, an improvised cervical collar can be made from such things as a jacket or flexible splint placed gently around the front of the neck to hold the chin in a neutral position. In addition, you will need to place two padded heavy objects (e.g., rocks wrapped in clothes) next to each side of the head to hold it in line in the position being maintained. Before doing this, remember to insulate or move the person to protect him or her from the elements.

DIFFICULT DECISIONS

Dealing with a life-threatening condition when advanced medical care is not easily obtainable is one of the most emotionally charged and stressful situations you can face as a lay responder. The most difficult question of all in a delayed-help situation may be how long to continue resuscitation efforts if the condition of a person in cardiac arrest does not improve and advanced medical help is hours away. While there is no simple answer, following are some general principles that can help you decide.

As you learned in Chapter 6, the purpose of CPR is to partially and temporarily substitute the functions of the respiratory and circulatory systems. However, CPR is not designed for and is not capable of sustaining a person's life indefinitely. Usually, the longer CPR is continued, the less likely it is that the person will survive. Prolonged CPR efforts may be unsafe for you or the group due to exhaustion or environmental changes.

The person's survival depends largely on what caused the heart to stop in the first place. If the cause was a direct injury to the heart, such as from a heart attack or from crushing or penetrating trauma to the chest, little chance exists that the person will survive in a delayed-help environment, regardless of whether CPR is performed. On the other hand, if the heart is not injured but stops as a result of hypothermia, suffocation (e.g., from an avalanche), a lightning strike, or drowning (especially in cold water), the person's heart has a better chance of restarting. CPR can limit brain damage in case the heart starts and may

even improve the chance that the heart will start. In such a case, CPR should be continued until one of the following occurs:

- You find an obvious sign of life such as breathing.
- You are relieved by another trained responder.
- EMS personnel arrive and take over.
- You are too exhausted to continue.
- The scene becomes unsafe.

If a person dies or is found dead, you will then need to manage the physical and emotional needs of yourself and the group. Try yourself, and encourage others, to begin functioning normally (e.g., sleeping, eating), and take steps to decrease the intensity of the emotional experience (e.g., by covering the body or performing a service). You will also need to notify authorities and protect the body. Document and do not disturb the area as best as possible.

PROTECTION FROM THE ENVIRONMENT

When caring for a person(s) in a disaster, remote or wilderness emergency where help will be delayed, it is critical to protect the person(s) from environmental conditions, such as heat, cold, wind, rain, sleet or snow, while waiting. You may need to construct a shelter using whatever materials you have on hand.

Protecting the Person

An injured or ill person who is not able to move may develop a heat-related illness or cold-related emergency that is life threatening. To keep the person from getting chilled or overheated, you will need to provide some type of insulation to protect the person. If the ground is dry, you can use cloth items such as towels, blankets, clothing or sleeping bags to insulate the person from the ground; also, dry leaves or grass may serve as natural insulators. If the ground is wet, you will also need a moisture barrier, such as a waterproof tarp, raincoat or poncho, between the insulating material and the ground.

Constructing a Shelter

A person exposed to hot sun, rain, snow or chilling wind needs appropriate shelter **(Figure 23-8, A–D)**. Remember that you may need to protect bystanders as well; and they may also be a good resource for constructing or finding shelter. The following are four basic types of shelters:

- Natural shelters
- Artificial shelters
- Snow shelters
- Tents and bivouac bags

A car can also be an effective shelter. If stranded, your car generally offers more visibility and protection, so consider staying in it. If you need heat, running the heater for 15 to 20 minutes each hour should sustain you. Make sure nothing, such as snow, blocks the exhaust pipe and causes carbon monoxide fumes to back up into the car. Leave the window opened a little to prevent carbon monoxide poisoning. You can also use candles as a source of heat. It is important, especially in the winter months, that you keep your car in good working condition, filled with gasoline, and carry a vehicle survival kit.

FIGURE 23-8, A–D *Types of shelters include:* **A**, *natural shelters;* **B,** *artificial shelters;* **C**, *snow shelters and* **D,** *a pole tent.*

Whether a shelter is natural or artificial, it should be well ventilated to prevent buildup of condensation or toxic fumes.

PREPARING FOR EMERGENCIES

If you live or work in a disaster-prone area or delayed-help environment or plan to be in one, develop a plan for how you will prepare and respond to emergencies that may arise. Ideally, everyone in the situation should know how to react, whether you are a part of a remote survey team, family farm or youth group outing.

As you have read, there are risks in everyday life and even more risks in delayed-help situations. Mitigating or preventing emergencies makes the most sense for enjoying and profiting from wilderness and remote locations. And, while disasters are generally thought of as unpredictable, you can mitigate many issues through preparedness activities and early

BEING PREPARED . . . ON THE FARM

To many, a farm or ranch may seem peaceful and idyllic. Yet historically, farming has been one of the most hazardous occupations in the United States. The very nature of farming puts workers—as well as the many children who live and help on family farms—at risk for injuries, illness and death.

Farms are often far from neighbors or towns, many roads in rural communities have no identifying signs and emergencies may occur in isolated areas of the farm where vehicle access is problematic. In addition, EMS is generally more limited than in urban areas, with responders who are often volunteers who have other duties and may be far from the scene of the emergency. As a result, the first person on the scene of a farm emergency, often a family member, is generally the person who gives the initial care and whose actions often determine whether a person who is injured or ill lives or dies.

Fortunately, there are many resources to help prepare those who live and work in agricultural settings for an emergency. One such organization is Farm Safety 4 Just Kids, which works to prevent farm-related childhood injuries, health risks and fatalities. It puts out a variety of resource materials and activity ideas, including a catalogue of items to teach farm safety. To learn more about this organization, visit *www.fs4jk.org*.

Another resource is the National Ag Safety Database, developed with funding from the National Institute of Occupational Safety and Health (NIOSH) to provide comprehensive access to prevention, safety and training information. To learn more about what is available, visit *www.nasdonline.org*.

detection of risk factors. Minor incidents can lead to major ones quickly and occur for a variety of reasons:

- Bad judgment, such as traveling unprepared, without water or other essentials; using inadequate equipment, such as an improper helmet or clothing; practicing poor sleep, hydration and hygiene habits; engaging in activities that exceed the abilities of one or more members of the group; and getting separated or stranded from the group.
- Environmental conditions, such as bad weather, darkness or falling debris, perhaps caused by disasters, such as earthquakes or hurricanes.
- Equipment failure, such as farm vehicles, deer stands, or bicycles that do not work properly or are not maintained.

Although not all factors that contribute to incidents or accidents are avoidable, many can be prevented through preparation.

Types of Preparation

There are three general types of preparation—knowledge, skills and equipment.

Knowledge

Knowledge includes learning about the emergency care resources available and how to access them, as well as educating yourself on how react in an emergency that may be common in the region where you live or travel. It also includes familiarizing yourself with local geography, including landmarks and hazards. For instance, if you are going on a hiking trip, talk with park rangers or others who know the environment. Plan your route and write

BEING PREPARED . . . REMOTE AND WILDERNESS ACTIVITIES

Planning for emergencies is an important part of preparation for any trip or activity. Adequate preparation will not only reduce the risk of certain problems, but will also help make your trip more enjoyable. When planning a trip, several major considerations will help you determine special safety needs. These include:

- Knowledge level of first aid training among group members.
- Distance you will be from medical help.
- Duration of the trip or activity.
- Level of risk associated with the activity and environment.
- Group-related factors, such as pre-existing medical or physical conditions.
- Requirements for special equipment and supplies for high-risk or other specific activities.
- Group size. It is best to travel in a group larger than two so that at least one person is always available to stay with an injured or ill person.

In addition, when you are traveling in a wilderness or backcountry area, the Boy Scouts of America recommend having the following with you at all times:

- A map, preferably a topographical map, of the area in which you will be traveling
- A compass—and know how to use it before you leave
- Matches in a waterproof container
- 24 hours of *extra* high-energy food
- Water (1 to 2 liters [2 to 3 quarts])
- Extra clothes, such as socks and a sweater
- Rain gear
- A pocket knife and whistle
- Sun protection, such as a wide-brimmed hat, sunglasses, and sunscreen
- First-aid kit with an emergency blanket

it down. Decide when and where you will check in and let others know about your timing, routes, destination and companions. Letting others know your destination and estimated time of arrival may lessen the response time in the event of an emergency.

If you are planning a boating expedition, consult the Coast Guard about possible weather hazards for that time of year. If you will be boating on inland waters, also consult the local authority with control over dam water releases. People in rural areas should meet with local EMS personnel and ask what to do if an emergency occurs and the estimated response time to their particular location.

Additionally, you should know the people in the group you are living, working, or traveling with, both to find out who has relevant training and to learn who might have special health concerns that put them at greater risk for an injury or illness. Youth programs, such as Girl Scouts of the USA, require individuals to have health forms that prepare leaders and individuals to understand health risks beforehand, and provide important information to care providers if something happens. Ideally, group members know what resources (i.e., skills and equipment) lay in the group or location you may be in; this will keep confusion down and efficiency up.

Skills

Skills preparation includes having proficiency in implementing disaster plans, and wilderness or survival techniques, along with having the technical skills necessary to safely engage in certain activities, such as scuba diving or rock climbing. In addition, if you plan to use a two-way radio, you need to know how to operate it and how to call for help. Rural

inhabitants should know how to safely handle the hazards they encounter on a regular basis, such as pesticides or farm machinery. Courses are available that address specific situations, such as wilderness first aid and farming emergencies.

Equipment

Equipment preparation includes having the essentials of water, food, and shelter prepared and available to help keep people alive during long-term events. Equipment includes appropriate clothing for your location and activities, first aid supplies suitable for your activities and expected hazards, and devices for signaling and communication.

First aid kits are also important as not all first aid materials can be improvised (e.g., sterile bandages). Chapter 1 lists supplies for a basic first aid kit, but you should modify the contents of a first aid kit to suit your particular needs. For example, boaters should waterproof their kits by placing the contents in a waterproof container. People driving on long trips may want to add flares, a blanket and a flashlight to their kits.

Here are some factors to help you adjust the contents of your basic first aid kit:

- The environment (e.g., bring prescription medications for high altitudes or anti-itch topical agents for lower altitudes with biting insects).
- The setting (e.g., if you are going to a wilderness area with few trees, pack splints; if you anticipate humidity, bring fragrance-free powder to prevent chafing).
- The season (e.g., if you expect cold or hot weather, include a high-sugar drink solution or ample amounts of sunscreen).
- The terrain (e.g., if paddling or hiking long distances, bring blister supplies).

The number of people in your location, or the number of days you will be in a remote area, will also affect the kit you bring. For example, if you are preparing a disaster-readiness kit, you should have a 3-day minimum supply. You will also want to know what other group members have in their kits as this will help you add to or reduce the size of a group kit. This becomes more important particularly in activities where you expect to travel a long distance from definitive medical care. To keep kits manageable, know what things could be improvised from personal equipment (e.g., a t-shirt for a sling). Evaluate and re-pack your first aid kit before every trip.

Medications

In standard first aid, there is no recommended routine use of medication, except for aspirin in cardiac cases, epinephrine auto-injectors for anaphylaxis, and wound gel for some soft tissue injuries. When preparing for disasters or extended trips, you should have an adequate supply of medicine for routine issues in your disaster or first aid kit. For anticipated trips, health care professionals may be able to provide instructions or medications specific to the conditions you expect to be encountering (e.g., prescribing a medicine for altitude sickness or nausea and vomiting). As a first aid provider, you are not licensed to give medications; a person you are helping needs to be able to decide to take over-the-counter medications (i.e., they are competent and of age, or you have permission from their guardian). The person should only take oral medication if he or she can swallow and has no known contraindications. You can assist or have the person read and follow all label or health care provider instructions. Check state and local regulations regarding the use of prescription and over-the-counter medications.

For the long term, renew medications that have reached expiration dates and replace items that have been damaged by heat, cold or moisture on a regular basis. Do not fill your kit with items you do not know how to use. You—and all members of your group—must

BEING PREPARED . . . HOMELAND SECURITY

Terrorism has been around for many years, yet the threat of terrorism is something that has been increasingly on the minds of Americans after the events of the past years and the uncertainty about what lies in the future. As with any type of disaster, however, being informed about what is happening in the areas in which you live or travel, and having an emergency plan in place, are steps you can take now to prepare for and respond to future threats.

In response to public concerns after the attacks of September 11, 2001, the U.S. government launched the website *www.ready.gov* in order to educate and empower Americans to prepare for a wide spectrum of emergencies, whether human-made, such as terrorist acts, or natural. Go there to learn how you can best "prepare, plan and stay informed" both at home and in the work setting. In addition, *www.redcross.org* provides tips and information on how to prepare for, and respond to, a terrorist attack or other disaster situation.

maintain a high level of familiarity with the proper uses of all the items in your disaster, remote or wilderness first aid kit. Remember that knowledge and skill are more valuable in an emergency than the contents of a kit.

Ensuring Adequate Preparation

Get trained. Take courses and talk to people with experience. Disaster professionals in your local health department, adventure guides, park rangers and Coast Guard personnel, as well as enthusiasts of the activity you will be engaged in, are good sources of information and training. You may find experienced people in clubs or in stores that sell equipment for the intended activity. Ask what preparations they recommend to make your experience safe and enjoyable. If possible, talk to more than one person to get a range of viewpoints.

Look for books, magazines and websites that include information on how to be prepared for common weather or natural events in your intended destination and risks associated with any activity. Find more than one source of written information so that you get more than one author's point of view. Also, find out about local emergency resources, including whether the emergency number is 9-1-1; and if not, what the local emergency number is. Get other important phone numbers, such as hospitals, clinics and law enforcement agencies. If traveling to a foreign country, find out whatever details you can about the medical care that is available.

As you work to be prepared individually and as a group, incorporate practice to assess knowledge, skills, and behaviors. This practice should include skills for successful experiences, physical fitness, and dealing with emergency scenarios. Scenario-based learning can be both fun and meaningful in developing skills and knowing limitations. The Wilderness and Remote First Aid program of the American Red Cross is one option for more in-depth training.

SUMMARY

Emergencies do not always happen where there is quick and easy access to advanced medical care. In delayed-help situations, such as those that may occur with disaster, remote and wilderness emergencies, you will need to be prepared to give care for a much longer time than usual.

As with all other emergencies, use the emergency action steps: **CHECK—CALL—CARE**. However, in a delayed-help situation, you will need to check the scene, the person, and resources in detail before calling for help. You will also need to develop a more detailed plan for getting help and caring for the person for the long-term. Getting help may involve calling for help, sending for help, leaving the person alone while you go for help, transporting the person to help or allowing the person to recover sufficiently so that he or she can walk to help.

In general, the care you give a person in a delayed-help situation is the same as what you have learned in previous chapters. However, you will spend more time caring for the person and assisting with his or her personal needs. Regularly checking the person's condition while waiting for help and writing down any changes that you find are important in a delayed-help situation. You may also need to protect the person from heat and cold by constructing a shelter if help is delayed for an extended period.

If you live in a region that is prone to natural disasters, or if you live in, work in or are planning to venture into a delayed-help environment, think about how you can reduce the risk of emergencies. Adequately preparing yourself for a delayed-help environment includes early planning, talking to people with experience, researching your location, finding out about local weather conditions and emergency resources, planning your route and constructing plans to deal with emergencies should they arise.

READY TO RESPOND?

Think back to Pete in the opening scenario, and use what you have learned to respond to these questions:

1. Is this a delayed-help situation? If so, what factors make it a delayed-help situation?
2. What dangers should you look for at the scene of Pete's injury?
3. What life-threatening conditions might Pete have, and what conditions might shortly become life threatening?
4. What do you think would be the best method for getting help in this situation? Why?

STUDY QUESTIONS

1. List five factors that contribute to delay help, requiring lay responders to act differently.

2. List the four primary roles of a leader in a disaster, remote or wilderness emergency.

3. List four options for getting help in a delayed-help situation.

In questions 4 through 7, circle the letter of the correct answer.

4. During the emergency action steps, your priorities should include checking—

   a. The scene.
   b. The person.
   c. The resources.
   d. All of the above.

5. Periodically rechecking the person's condition while giving care until help arrives is necessary because—

   a. It helps you remember changes in his or her condition.
   b. The person may become hungry.
   c. It provides information for planning and action.
   d. The person needs to be comfortable.

6. A series or set of _____ signals can be used to signal "Help!"

   a. One
   b. Three
   c. Five
   d. Ten

7. Which would you do if you would have to leave the person alone for an extended period?

   a. Write down the route you are going to take and the time you are leaving.
   b. Make sure the person has a shelter, food and water.
   c. Adjust any splints or bandages to ensure they are not too tight.
   d. All of the above.

8. In the following scenario, circle the information you should consider before making a plan to get help.

   You are trekking with your hiking club in Greenleaf National Forest, and are now on a trail about 5 miles from the main road. As you are crossing a stream, a group member slips and falls into the icy water. You all help her out and sit her on the bank. She is shivering violently in the cool breeze. She says her right knee is very painful and feels as if it is swelling. You notice overcast skies and estimate the temperature to be about 50° F (10° C). The sun will begin to set in about 4 hours. A group member gives you a sweater, which you substitute for the person's soaked jacket. Other group members provide clothing.

9. In the above scenario, what information would you share if you sent a small group to get help?

10. What are the three general types of preparation?

Answers are listed in Appendix B.

APPENDIX

A

A Safer and Healthier Life

INTRODUCTION

Injuries and illness have a significant impact on our society. The costs in lost wages, medical expenses, insurance, property damage and other indirect costs are staggering—many billions of dollars a year. But illness and injury are not simply unpleasant facts of life to be shrugged off as inevitable. Often, you can prevent them by taking safety precautions and choosing a lifestyle that promotes optimal health.

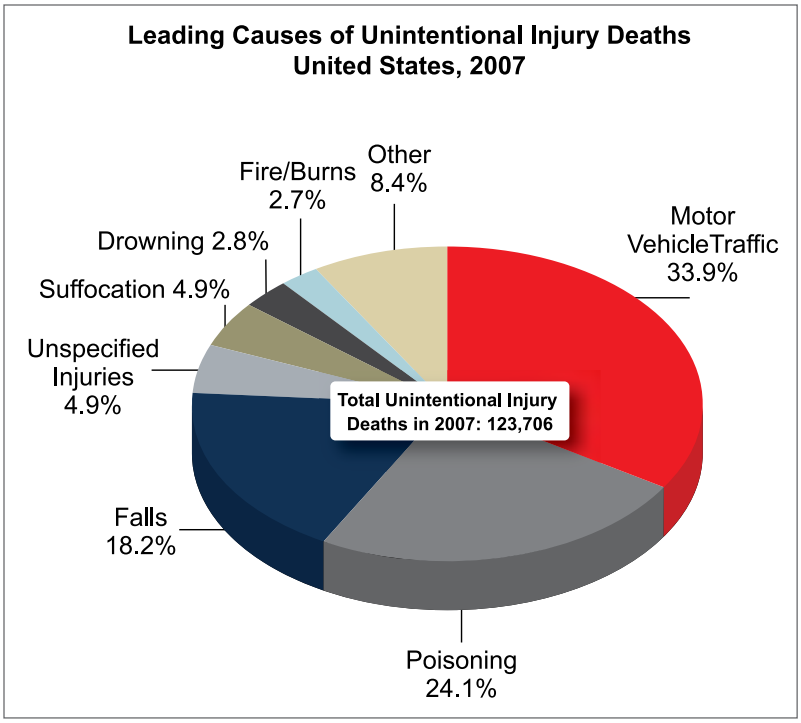


FIGURE A-1 *The leading causes of unintentional death in the United States in 2007. Source: National Center for Injury Prevention and Control*

INJURIES

Each year in the United States millions of people suffer unintentional injuries. In 2007, nearly 124,000 people died from these injuries, making unintentional injury the leading cause of death for people ages 1 to 44 years **(Figure A-1)**.

Injury Risk Factors

Several factors affect a person's risk for being injured. These factors include age, gender, geographic location, economic status and alcohol misuse and abuse:

- Nonfatal injury rates remain highest among people younger than 39 years; however, deaths from injury are more common in people 40 years of age and older. Also of note is that this age group has the highest rate of injuries that result in death.
- Gender also is a significant factor in risk for injury. Males are at greater risk than females for any type of injury. In general, men are about twice as likely to suffer a fatal injury as women.
- Environmental and economic factors influence injury rates. Living on a farm or in the city, having a home made of wood or brick, using a specific type of heat in your home and your local climate all affect your degree of risk. For instance, death rates from injury are higher in rural areas as opposed to metropolitan areas. The death rate from injuries is twice as high in low-income areas as in high-income areas.

DEVELOPING A PLAN OF ACTION

Emergencies can happen quickly. There may not be time to consider what to do, only time to react. You can improve your response and the outcome of emergencies by developing a plan. Meet with your family or household members to gather information for an emergency action plan and consider the points that follow.

Think about your home:

- Style of home (e.g., mobile, high-rise apartment, single-family home) and type of construction (e.g., wood, brick)
- Location of sleeping areas (e.g., basement, ground floor, second floor)
- Location of windows
- Number and location of smoke alarms
- Location of gasoline, solvent or paint storage
- Number and types of locks on doors
- Location of telephones, flashlights, fire extinguisher and first aid kit

Think about who lives in your home:

- Total number of people and number of people older than 65 or younger than 6 years of age
- Number of people sleeping above or below the ground floor
- Number of people who are unable to exit without help

- Alcohol misuse and abuse is a significant factor in many injuries and fatalities, in both teenagers and adults. In 2008, 32 percent of all motor-vehicle deaths were alcohol related. It is estimated that a significant number of persons who die as a result of falls, drowning and fires are under the influence of alcohol at the time.

Reducing Your Risk for Injury

Statistics show that people of certain ages and gender are injured more often than others. However, the chances of injury have more to do with a person's behavior. Many injuries are preventable and result from the way people interact with potential dangers in the environment.

The risk for injury can be reduced by taking the following steps

- Be aware of the risk.
- Take measures that make a difference. Change behaviors that increase your risk for injury and your risk for injuring others.
- Think safety. Be alert for and avoid potentially harmful conditions or activities that increase your risk for injury. Take precautions, such as wearing appropriate protective devices, including helmets, padding and eyewear. Always buckle up when driving or riding in motor vehicles.
- Learn and use first aid skills. There have been dramatic improvements in emergency medical systems nationwide over the past decade; however, you are the person who often makes the difference between life and death. Apply your first aid training when necessary.

In addition to these personal steps, laws and consumer protection regulations have been put in place to reduce or prevent injury. Examples include laws on the mandatory use of motor-vehicle safety belts, manufacturers' requirements to build air bags into motor vehicles and restrictions on the use of cell phones while driving.

It also is important to develop a plan of action in case of an emergency. Being prepared for an emergency before it actually occurs will help you, and those with whom you live, to react calmly in a stressful situation. See *Developing a Plan of Action* below for more information.

Think about the types of possible emergencies that you may face:

- Injuries (e.g., fall or cut)
- Illnesses (e.g., stroke or heart attack)
- Natural disasters (e.g., tornado or earthquake)
- Fire

Write down the list of emergencies that you could face. Under each one write:

1. How the emergency would affect your home.
2. How you would like the people in your home to react. Specifically, what would be the responsibilities for each member of the household in an emergency?
3. The steps you have already taken to prevent or minimize the effect of the emergency.
4. The steps you still need to take.

Try to imagine as many situations as possible for each emergency. Gather information from sources such as insurance companies, your city or county emergency management office and your police, fire or rescue department. When thinking about emergencies away from home, use the same process to decide what to do.

- When you reach a decision, write it down. You now have a personal emergency plan.
- Practice it.
- Keep it current.

SPECIFIC SAFETY ACTIONS

Vehicle Safety

Tens of thousands of people in the United States die in motor-vehicle crashes each year. Crash injuries result in nearly 5 million emergency department visits annually. The economic burden of these motor-vehicle-related deaths and injuries is significant.

To lessen your risk, follow these guidelines:

- Do not drink and drive. If you are going to consume alcohol, plan ahead to find a ride, or take a cab or public transportation. If you are with a group, designate a driver who agrees not to drink on this occasion.
- Do not become distracted. Doing things that take your eyes off the road, your hands off the wheel or your mind off of driving are distractions that can be dangerous or even fatal. The use of electronic devices while driving, such as talking on hand-held cell phones and text messaging, causes thousands of collisions and highway fatalities. Other distractions while driving include eating and drinking, talking to passengers, reading, using navigation systems, and operating audio equipment. Many states and the District of Columbia have enacted laws restricting the use of hand-held cell phones and electronic devices.
- When riding in a motor vehicle, always buckle up. Although cars more often are equipped with airbags than not, wearing a safety belt is the easiest and best way to prevent injury in a motor-vehicle collision. Always wear a safety belt, including a shoulder restraint, when riding in either the front or back seat. In 49 states and the District of Columbia, wearing a safety belt is required by law. In 2007, safety belts saved more than 13,000 lives.

Although air bags have saved many lives, they pose several risks to children. The amount of force during airbag deployment can kill or severely injure a child occupying the front seat. Even when in a car seat, infants could be at risk. An infant in a rear-facing car seat is close to the dashboard and therefore could easily be struck by the airbag with sufficient force to cause serious harm or even death. Always have children younger than 13 years sit in the back seat, away from air bags.

FIGURE A-2 *Infants and children should always ride in an approved safety seat.*

Child Safety Seats

Motor-vehicle crashes are the leading cause of injury-related deaths for children. All 50 states and the District of Columbia require the use of child safety seats and child safety belts. Always have infants and children ride in the back seat in safety seats that are approved for the child's weight and/or age **(Figure A-2)**.

Choosing the proper child safety seat to fit the weight and age of your child is only the first step. Another important child-safety-seat issue is making sure that the seat is installed correctly in your vehicle. The National Highway Traffic Safety Administration (NHTSA) estimates that three out of four parents do not properly use child restraints. It is essential to always read the instruction manual. Every manufacturer of child safety seats provides specific instructions about how to use and install its seat. To make sure that you installed your child safety seat correctly in your vehicle, you can have it checked by professionals. Contact the NHTSA for information on finding a nearby child-safety-seat inspection station.

Fire Safety

Fire safety in the home and in hotels is essential. You should learn how to prevent fires but also know what to do in case a fire does occur.

Home Fire Safety

In 2010, fire departments responded to 384,000 home fires in the United States, which claimed the lives of 2,640 people and injured another 13,350 (not including firefighters).

To prevent fires:

- Install a smoke alarm on every floor of your home. Check the batteries once a month, and change the batteries at least twice a year.
- Keep fire extinguishers where they are most likely to be needed (i.e., kitchen, garage), and keep matches out of children's reach.
- Always keep electric space heaters away from curtains and other flammable materials.
- Install guards around fireplaces, radiators, pipes and wood-burning stoves.

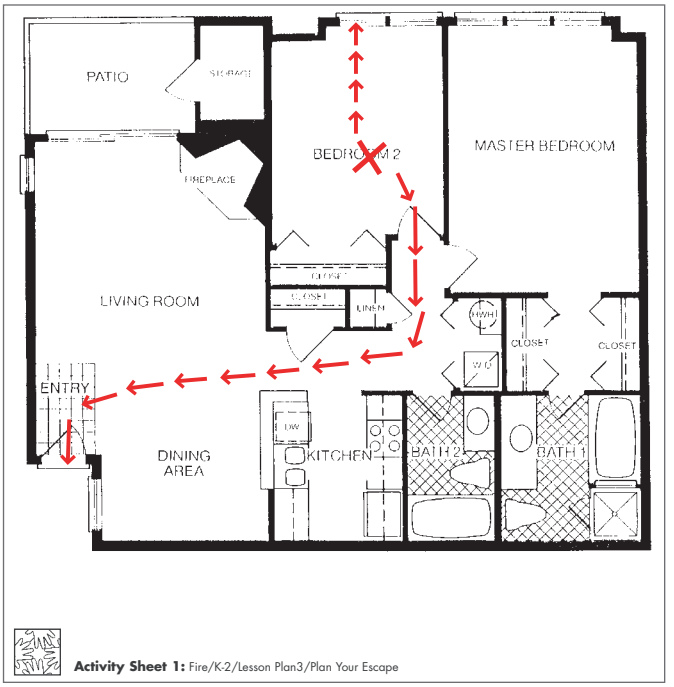


FIGURE A-3 *Plan and practice a fire escape route with your family or roommates.*

Regardless of the cause of fires, everyone needs to know how to respond in case of fire. Plan and practice a fire escape route with your family or roommates **(Figure A-3)**:

- Gather everyone together at a convenient time.
- Sketch a floor plan of all rooms, including doors, windows and hallways, for all floors of the home.
- Draw the escape plan with arrows showing two ways, if possible, to get out of each room. Sleeping areas are the most important, since many fires happen at night.
- Plan to use stairs only, never an elevator.
- Plan where everyone will meet after leaving the building or dwelling.
- Designate who should call the fire department and from which phone.
- Plan to leave the burning building first and then call from a nearby phone, if possible.

Remember and use the following guidelines to escape from fire:

- If smoke is present, crawl low to escape. Because smoke rises in a fire, breathable air is often close to the floor.
- Make sure that children can open windows, go down a ladder and lower themselves to the ground. Practice this with them before an actual emergency. Always lower children to the ground first before you go out of a window.
- Get out quickly and do not, under any circumstances, return to a burning building.
- If you cannot escape, stay in the room and stuff door cracks and vents with wet towels, rags or clothing. If a phone is available, call the fire department—even if rescuers are already outside—and inform the call taker of your location.

Contact your local fire department for additional fire safety guidelines.

Hotel Fire Safety

In addition to fire safety at home, knowing how to exit a hotel in a fire could save your life. Locate the fire exits on your floor. If you hear an alarm while in your room, feel the door first and do *not* open it if it is hot. Do *not* use the elevator. If the hall is relatively smoke-free, walk to the stairs to exit; if the hall is filled with smoke, crawl to the exit. If you cannot get to the exit, return to your room. Turn off the ventilation system, stuff door cracks and vents with wet towels and call the front desk or the fire department to report the fire and your location.

Safety at Home

In 2007, 44 percent of all nonfatal injuries requiring medical attention in the United States occurred in or around the home. Removing hazards and practicing good safety habits will make your home safer. You can get a good start on this by making a list of needed improvements. Safety at home is relatively simple and relies largely on common sense. Taking the following steps will help make your home a safer place:

- Post emergency numbers—9-1-1 or the local emergency number, poison control center, physician, as well as other important numbers—near every phone.
- Make sure that stairways and hallways are well lit and free of debris.
- Equip stairways with handrails, and use nonslip treads or securely fastened rugs.
- Secure rugs to the floor with double-sided tape.
- If moisture accumulates in damp spots, correct the cause of the problem. Clean up spills promptly.
- Keep medicines and poisonous substances separate from each other and from food. They should be out of reach of children and in secured cabinets.
- Keep medicines in their original containers, with safety caps, and out of reach of children.
- Keep your heating and cooling systems and all appliances in good working order. Check heating and cooling systems annually before use.
- Read and follow manufacturers' instructions for electrical tools, appliances and toys.
- Turn off the oven and other appliances when not using them. Unplug non-essential appliances, such as an iron, curling iron, coffee maker or portable heater, after use. These items can easily overheat or spark a fire when unattended.
- Make sure that your home has at least one working, easily accessible fire extinguisher and everyone knows how to use it.
- Keep any firearms unloaded in a locked location out of the reach of children. Store ammunition separately in another locked location. Practice safe firearms handling and safety education.
- Ensure that cords for lamps and other items are not placed where someone can trip over them.

This list does not include all of the safety measures needed in your home. If young children or elderly or ill people live with you, you will need to take additional steps, depending on the individual characteristics of your home.

Try crawling around your home to see it through the eyes of an infant or a young child. You may become aware of unsuspected hazards. See *Making Your Home Safe for Kids* for additional safety measures geared for young children.

MAKING YOUR HOME SAFE FOR KIDS

To see how safe your home is for curious infants and young children, answer these questions. If any answers are "no," be sure to make fixes where needed.

General Safety Precautions Inside the Home

- Are stairways kept clear and uncluttered?
- Are stairs and hallways well lit?
- Are safety gates installed at tops and bottoms of stairways?
- Do window and balcony doors have childproof latches or window guards?
- Do balconies have protective barriers to prevent children from slipping through the bars?
- Are guards installed around fireplaces, radiators, hot pipes and wood-burning stoves?
- Are sharp edges of furniture cushioned with corner guards or other material?
- Are safety covers placed on all unused electrical outlets?
- Are matches and lighters stored out of the reach of children?
- Are curtain cords and shade pulls wound up and not dangling?
- Are fire extinguishers installed where they are most likely to be needed?
- Is there at least one approved smoke alarm installed and operating on each level of the home? Are batteries changed at least every 6 months?
- Do you have an emergency plan to use in case of fire? Does your family practice this plan?
- Is the water set at a safe temperature? A setting of 120° F or less prevents scalding from tap water in sinks and in tubs. Let the water run for 3 minutes before testing it.
- If you own a firearm, is it stored in a locked cabinet so that your child and other unauthorized users cannot use it?
- Are all purses, handbags, briefcases and similar items, including those belonging to visitors, kept out of children's reach?
- Are all poisonous plants kept out of children's reach?
- Is a list of emergency phone numbers posted near telephones?
- Is a list of instructions posted near telephones for use by children or babysitters?
- Is there a first aid kit properly stocked and stored away?
- Are there working flashlights, a battery-operated radio and extra batteries available for use in case of emergency?

Storage Areas

- Are pesticides, detergents and other household chemicals stored in locked cabinets and kept out of children's reach?
- Are tools stored in locked cabinets or locked storage areas out of children's reach?

Bathrooms

- Are the toilet seat and lid kept down when the toilet is not in use?
- Are cabinets equipped with safety latches and kept closed?
- Are all medicines in child-resistant containers and stored in a locked medicine cabinet?
- Are shampoos and cosmetics stored out of children's reach?
- Are razors, razor blades and other sharp objects kept out of children's reach?
- Are hair dryers and other appliances stored away from the sink, tub or toilet?
- Does the bottom of the tub or shower have nonslip surfacing?
- Are bathroom doors kept closed at all times?
- Are children always watched by an adult while in the bathroom?

Kitchens

- Do you cook on back stove burners when possible and turn pot handles toward the back of the stove?
- Are hot dishes kept away from the edges of tables and counters?
- Are hot liquids and foods kept out of children's reach?

(*continued*)

MAKING YOUR HOME SAFE FOR KIDS (*continued*)

- Are knives and other sharp items kept out of children's reach?
- Is the highchair placed away from stove and other hot appliances?
- Are matches and lighters kept out of children's reach?
- Are all appliance cords secured and out of children's reach?
- Are cabinets equipped with safety latches?
- Are cleaning products stored in locked cabinets out of children's reach?
- Do you test the temperature of heated food before feeding children?

Children's Rooms

- Is the bed or crib placed away from radiators and other hot surfaces?
- Is the bed or crib placed away from curtain and blind cords?
- Are crib slats no more than 2⅜ inches apart?
- Does the mattress fit the sides of the crib snugly? Are toys, blankets, bumpers and pillows removed from the crib?
- Is paint or finish on furniture and toys nontoxic?
- Is children's clothing, especially sleepwear, flame resistant?
- Does the toy box have ventilation holes? If there is a lid, it is lightweight and removable? Does it have a sliding door or panel, or is it hinged lid with a support to hold it open?
- Are electric cords secured and kept out of children's reach?
- Are toys in good repair?
- Are toys appropriate for children's ages?

Adult Bedrooms

- Are space heaters kept away from curtains and flammable materials?
- Are cosmetics, perfumes and breakable items stored out of children's reach?
- Are small objects, such as jewelry, buttons and safety pins, kept out of children's reach?

Outside the Home

- Are trash and recycling materials stored in tightly covered containers?
- Are walkways, stairs and railings in good repair?
- Are walkways and stairs free of toys, tools and other objects?
- Are sandboxes and wading pools emptied when not in use?
- Are nearby swimming pools completely enclosed with a 4-foot-high self-locking, self-latching gate or fence? Does the pool have an alarm system?
- Is the backyard pool separated from the home by a fence?
- Is playground equipment safe? Is it assembled according to the manufacturer's instructions?

For elderly people, you may need to install handrails in the bathtub or shower and beside the toilet. You may need a bath chair or bench. Always have a mat with a suction base if your tub does not have built-in nonslip strips. A safe temperature for bath water is 101° F.

Safety at Work

Most people spend approximately one-third of their day at work. To improve safety at work, you should be aware of the following:

- Fire evacuation procedures
- How to activate your emergency response team and how to call 9-1-1 or the local emergency number

- Location of the nearest fire extinguisher and first aid kit
- How to use recommended safety equipment and how to follow safety procedures if you work in an environment where hazards exist
- Workplace safety training programs

Safety at Play

Make sports and other recreational activities safe by always following accepted guidelines for the activity. Before undertaking an activity that is unfamiliar to you, such as boating, skiing or riding a motorcycle, take lessons to learn how to perform the activity safely. Many accidents result from inexperience. Make sure that your equipment is in good working order.

Bicycle Safety

Each year, approximately 500,000 people are injured while riding a bicycle, and most bicycle accidents happen within a mile of home. The NHTSA estimates that motorcycle helmets reduce the likelihood of crash fatality by 37 percent. The head or neck is the most seriously injured part of the body in most fatally injured cyclists. Children should wear a properly fitted helmet even if they are still riding along the sidewalk on training wheels.

When cycling, always wear an approved helmet. The Snell Memorial Foundation is an example of an organization with rigorous standards for helmet safety; its recommendations include replacing a helmet every 5 years. Make sure that the helmet is the correct size and that it fits comfortably and securely. Laws on wearing bicycle helmets, including age-specific requirements, vary by state and county. For more information about helmet laws in your area, contact state or local officials.

Observe these rules of the road for bike safety:

- Avoid roads that are busy or have no shoulder.
- Wear reflective clothing at night.
- Use a headlight, taillight and high-visibility strobe lights on your bicycle wheels.
- Keep bicycles properly maintained.

Eye Safety

Wear protective goggles while doing any activity in which eyes could be injured, such as racquetball, or using tools such as electric drills or power saws.

Foot Safety

Appropriate sport-specific footwear also is important for preventing injuries. Shoes often are designed to perform a particular function and provide support for certain movements. Basketball shoes, for example, offer lateral (side-to-side) support, and the durable, rubber soles on hiking boots improve traction to help prevent slipping on varied terrain.

Jogging and Running Safety

If you run, jog or walk, plan your route carefully and exercise in well-lit, well-populated areas. Consider exercising with another person. Avoid roads that do not easily accommodate pedestrian traffic. If you must exercise outdoors after dark, wear reflective clothing and run,

jog or walk facing traffic. Be alert for cars pulling out at intersections and driveways. If you listen to music, keep the volume low enough that you can still hear external noises such as cars.

Swimming and Water Safety

If you or a family member does not know how to swim, or you would like to improve your swimming skills, visit Redcross.org, where you can sign up for a Red Cross swimming and water safety class.

Always wear an appropriate flotation device if you are going to be in, on or around the water and do not know how to swim. Many people who drown never intended to be in the water. Be careful when walking beside rivers, lakes and other bodies of water. Dangerous undercurrents, even in shallow water, can overcome the best of swimmers.

To prevent water-related injuries, you also should:

- Always closely supervise children in, on or near water. Stay within arm's reach of them. Even a small amount of water can be dangerous to a child.
- Empty and cover wading pools when not in use.
- Keep toilet seat lids down when the toilet is not being used.
- Never drink alcohol while you drive a boat, and do not travel in a boat operated by a driver who has been drinking. The U.S. Coast Guard reports that alcohol is the most common factor in fatal boating accidents.

If you own your own pool, you should also follow these additional guidelines:

- Make sure that it is separated from any door in your home by a fence. The fence should completely enclose the pool. It should be designed so that children cannot easily climb over it. The fence should be equipped with a self-closing, self-latching gate that cannot be easily opened by a young child.
- Never leave furniture or toys near the fence that would enable a child to climb over the fence.
- Post pool rules and enforce them without exception. For example, never allow anyone to swim alone, do not allow bottles or glass around the pool, do not allow running or pushing and do not allow diving unless your pool meets the safety standards.
- Post depth markers and "No Diving" signs, as appropriate. Use a buoyed line to show where the depth changes from shallow to deep. Limit non-swimmer activity to shallow water. Consult the National Spa and Pool Institute, state law and local building codes for pool dimension guidelines to help you establish rules for your pool to ensure safe diving activities.
- Keep toys away from the pool and out of sight when it is not in use. Toys can attract young children into the pool.
- Pool covers should always be completely removed prior to pool use and completely secured when in place.
- Have an emergency action plan to address potential emergencies.
- Learn and post CPR and first aid instructions. Insist that babysitters, grandparents and others who care for your children know these lifesaving skills.
- Keep a telephone near the pool or bring a fully charged cordless or mobile phone poolside. Post emergency telephone numbers on the telephone as well as your address and the nearest cross streets so that anyone can read them to an emergency call taker.

- Always keep basic lifesaving equipment by the pool and know how to use it. A reaching pole, rope and flotation devices, such as ring buoys, rescue tubes and life jackets, are recommended. A well-stocked first aid kit should also be available. Store the safety gear in a consistent, prominent, easily accessed location. A "safety post" may be used.
- If a child is missing, check the pool first. Go to the edge of the pool and scan the entire pool, bottom and surface, as well as the surrounding pool area.
- Keep the pool water clean and clear. Water should be chemically treated and tested regularly. If you cannot clearly see the bottom of the deep end, close the pool. Contact a local pool store or health department for information and instruction.
- Store pool chemicals—chlorine, soda ash, muriatic acid, and test kits—in childproof containers and out of children's reach. Clearly label the chemicals. Follow manufacturer's directions and safety instructions.
- Make sure your homeowner's insurance policy covers the pool.

REDUCING YOUR RISK FOR ILLNESS

In addition to steps you can take to prepare and prevent emergencies, the choices you make about your lifestyle affect your health and general well-being. Informed choices can reduce or eliminate your risk for cancer, stroke, cardiovascular disease, pneumonia, diabetes, human immunodeficiency virus infection and disease of the liver. These diseases are the leading causes of chronic illness and death in the United States.

Nutrition

Nutrition is the science that deals with the food you eat and how your body uses it. Studies indicate that poor diet is a contributing factor to many diseases. Therefore, changing your diet to make it healthier and more nutritious is one of the lifestyle decisions you may decide to make. While this appendix touches on a few basic facts about nutrition, to understand this important subject in more detail, you should take a nutrition course, consult a nutritionist or at least read a book or visit a reputable website recommended by a health care professional or nutritionist (one to try is the U.S. Department of Agriculture (USDA) Dietary Guidelines: *http://www.cnpp.usda.gov/dietaryguidelines.htm*). However, learning to interpret the nutritional information on packaged food labels is a basic and important step you can take toward ensuring that you eat a proper diet.

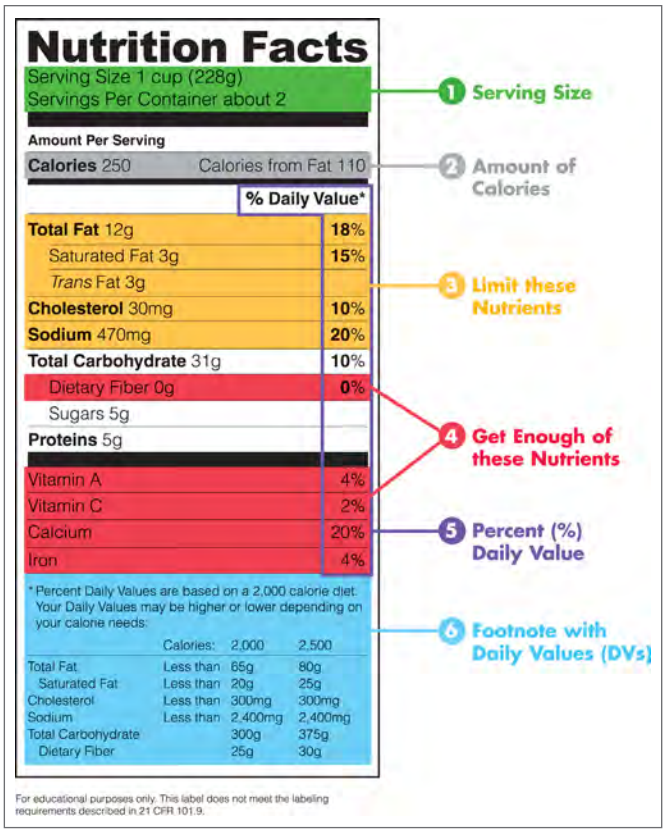


FIGURE A-4 *Sample nutrition facts label*

Food Labels

Food labels describing a product's nutritional value are required by law on most packaged food and began appearing on many food products in 1993 **(Figure A-4)**. These nutrition facts labels provide specific information about certain nutrients, substances found in foods that are required by the body because they are essential elements

of a nutritious diet. Weights and percentages are provided so that consumers can evaluate the nutrients as to how they fit as part of a total daily diet.

Of course, food nutrition labels are most effective when you know how to read and compare them. The U.S. Food and Drug Administration (FDA) has directed the industry so that each label provides information on:

- The serving size and number of servings in each package that relate to the nutritional information provided. These are standardized to make it easier to compare similar foods. Nutritional information is always based on one defined serving, although it is important to keep in mind that many packages include more than one serving.
- The number of calories, including calories from fat, in each serving. Calories are a measure of the energy value of a food. Fat should provide no more than 25 to 30 percent of the daily calories in a well-balanced diet—approximately 65 grams per day for a 2000-calorie diet. Eating too many calories is linked to being overweight or obese.
- Total fat, cholesterol and sodium. These are things you want to limit in your diet as much as possible. For instance, eating foods that are low in saturated fat, trans fat and cholesterol reduces your risk for heart disease, and limiting your intake of sodium reduces your risk for high blood pressure—both of which contribute to cardiovascular disease.
- Total carbohydrates. Carbohydrates are the main source of energy for all body functions, but they are not all created equally. Healthy sources, such as fruits, vegetables, beans, and whole grains, can reduce the risk for heart disease and improve digestive functioning. Sugars, however, only add calories without other nutrients. In addition to looking on the nutritional facts label for sugar, you should make sure that sugars are not one of the first few ingredients listed. Most Americans do not get enough dietary fiber, which is important for digestive health and may reduce the risk for heart disease.
- Amount of protein. Protein contains the basic material for cell growth and repair, and thus is an important part of your diet. However, it does not always come from healthy sources. When consuming proteins, look for those that are low in fat or fat free.
- Nutrients. Food labels list important nutrients such as dietary fiber, vitamins A and C, potassium, calcium and iron. As with dietary fiber, most Americans do not get enough of these nutrients, all of which are important for improving your health and reducing your risk for some diseases and conditions. Your best bet is to look for foods that have a high nutrition content for the calories the food contains.
- % daily value (DV). The % DV helps you determine what a food is contributing to your overall daily diet. It is based on a 2,000-calorie diet. Essentially, a food with 5% or less of a nutrient would be considered low in that nutrient. A food with 20% or more is high in a nutrient. Over the course of the day, hopefully all of the food you consume will add up to at least 100% of the daily recommended intake of important nutrients, and less than 100% of the things you should limit, such as fats and sodium. Not all of the elements listed will have a % DV. These include trans fats, which should simply be avoided if possible; sugars, for which no specific recommendation has been made by experts; and proteins, as evidence suggests that protein intake is not a public health concern.

To learn more about nutrition facts labels and what they mean to your diet, visit *www.fda.gov/Food/ResourcesForYou/Consumers/*.

My Plate

In 2011, the USDA offered new guidelines to help consumers make healthier food choices **(Figure A-5)**. Called MyPlate, these new guidelines replace the Food Pyramid and include tips such as:

- Enjoy your food, but eat less.
- Avoid oversized portions.
- Make half your plate fruits and vegetables. Vary your veggies, and focus on fruits.
- Make at least half of your grains whole grains.
- Switch to fat-free or low-fat (1%) milk.
- Compare sodium in foods such as soup, bread, and frozen meals—and choose the foods with lower numbers.
- Drink water instead of sugary drinks.
- Choose lean proteins.

To learn more about the USDA's recommendations for how to fill your plate with healthy foods, go to *www.ChooseMyPlate.gov*.

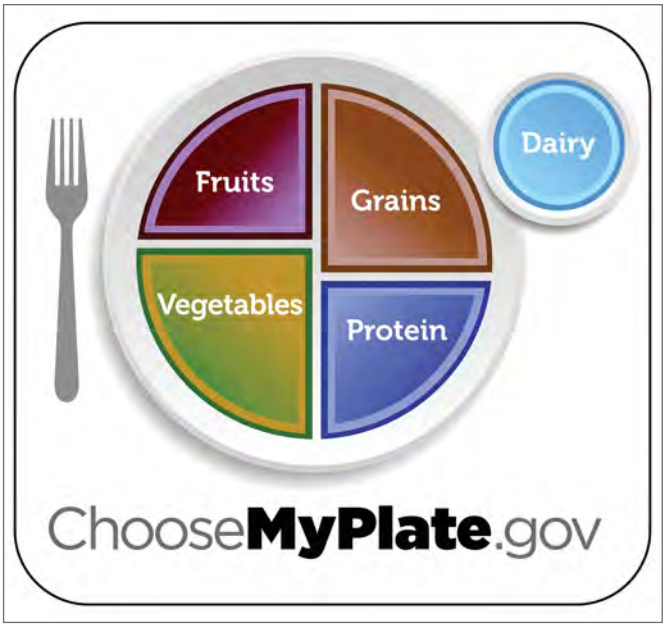


FIGURE A-5 *The MyPlate guidelines help you choose how to best fill your plate at each meal. See* www.chooseMyPlate.gov *for details.*

Water Intake

Next to oxygen, water is the substance we need most to survive. Water regulates the body temperature through perspiration and carries oxygen and nutrients to the cells as part of the blood. Water lubricates the joints, removes wastes and aids respiration by moistening the lungs, which facilitates the intake of oxygen and the removal of carbon dioxide. Most health care professionals advise drinking six to eight 8-ounce glasses of water a day and more if you exercise regularly or drink alcohol or caffeine.

Weight

Many adults are overweight. Some are overweight to the point of obesity. Obesity, defined as a condition characterized by excess body fat, contributes to heart disease, high blood pressure, diabetes and gallbladder disease. For adults, a body mass index (BMI) between 25 and 29.9 is considered overweight. A BMI of 30 or more is considered obese. See your physician or health care provider for help if you want to have your BMI measured.

Losing weight, especially fat, is no easy task. Calories that are not used as energy are stored as fat. Weight loss and gain depend on the balance of caloric intake and energy output. If you take in more calories than you use, you gain weight. If you use more calories than take in, you lose weight.

There are several guidelines to help with weight control, but the most important things are to set reasonable goals, follow a healthy diet, including portion control, get active and reduce sedentary time. Weight loss or gain should always be combined with regular exercise, which is always a part of a healthy lifestyle. Any activity—walking to the bus, climbing the stairs, cleaning the house—uses calories. You even burn off a few while you sleep. The more active you are, the more calories you will use. See *Weight-Loss Strategies* for more information.

WEIGHT-LOSS STRATEGIES

Use some of the following strategies to reach your weight-loss goals:

- Keep a log of the times, settings, reasons and feelings associated with your eating.
- Set realistic, long-term goals (e.g., losing 1 pound per week instead of 5).
- Occasionally reward yourself with small amounts of foods you enjoy.
- Eat slowly, and take time to enjoy the taste of the food.
- Be more physically active (take stairs instead of elevators, or park in the distant part of the parking lot).
- Reward yourself when you reach your goals (e.g., with new clothes or sporting equipment).
- Share your commitment to losing weight with family and friends who will support you.
- Keep a record of the food you eat each day.
- Weigh yourself once a week at the same time of day, and record your weight.
- Be prepared to deal with occasional plateaus as you lose weight.

Your eating habits should change as you grow older. A person who eats the same number of calories between the ages of 20 to 40 and maintains the same level of activity during this time will be considerably heavier at 40 than at 20. It is more important as you grow older to eat foods that provide your body with essential nutrients but are not high in calories.

Pregnant women should follow their physician's advice regarding diet. Severely limiting calories and fat can be detrimental to the developing fetus.

Fitness

Many of us would like to be fit. In general, fitness involves cardiorespiratory endurance, muscular strength, muscular endurance and flexibility. You do not need to take part in sports, such as tennis, basketball or soccer, to achieve fitness. You can become fit for health purposes by taking part in such activities as walking, jogging, swimming, cycling, hiking and weight training, among others.

Exercise

The "no pain, no gain" theory is not a good approach to exercise. In fact, experiencing pain usually means you are exercising improperly. You achieve the health benefits of exercise when it is somewhat uncomfortable, but not painful. Be sure to warm up to prepare the body before vigorous exercise and cool down afterward. Make flexibility exercises part of the warm-up and cool-down process. When possible, add exercises or activities that strengthen the muscles to your fitness routine. Turn your daily activities into exercise. Walk briskly instead of driving, whenever possible. Take the stairs instead of the elevator or the escalator. Pedal an exercise bike while watching TV, listening to music or reading.

Many training programs, books and websites are available for those who want to improve their fitness and develop an exercise program. You can become physically fit, regardless of the condition you are in when you start. Set realistic goals and you will see regular progress. Make a commitment to exercise each week. Whatever activities you choose to achieve fitness, you must exercise regularly and maintain a level of activity to stay fit.

The many benefits include loss of body fat, more resistance to disease, an ability to reduce the negative effects of stress and increased energy. It is never too late to start exercising. People in nursing homes, many of them in wheelchairs, are able to experience and demonstrate the benefits of flexibility and strength training. Just remember, if you have been sedentary or have health problems, see your physician before starting an exercise program.

Cardiorespiratory Endurance

If you have limited time for limited exercise, it is best to build up cardiorespiratory endurance, the ability to take in, deliver and extract oxygen for physical work. Cardiorespiratory endurance is the foundation for total fitness. The best way to accomplish cardiorespiratory endurance is through aerobic exercise. The term aerobic refers to activities that require additional effort by the heart and lungs to meet the body's increased demand by the skeletal muscles for oxygen. Aerobic exercise is sustained, rhythmic exercise, using the large muscle groups, for at least 30 to 45 minutes within your target heart rate.

Taking part in aerobic exercise can:

- Reduce the risk for cardiovascular disease.
- Develop stronger bones that are less susceptible to injury.
- Promote joint stability.
- Contribute to fewer lower back problems.
- Improve self-image.
- Help control diabetes.
- Stimulate other lifestyle changes.

Talk to a fitness expert or your physician to learn how to use your target heart range (THR) to achieve cardiorespiratory endurance. Your target heart rate will help you know whether you are exercising in the most effective way. For example, your exercise must be continuous and vigorous to stay within your THR. As you build cardiorespiratory endurance, you will eventually be able to exercise for longer periods of time and at a higher THR.

Stress

Everyone experiences stress. Stress in itself is not harmful. How we deal with what we view as stress is what determines whether it has a positive or negative effect on our lives. Stress is a physiological or psychological response to real or imagined influences that alter an existing state of physical, mental or emotional balance. The reaction to stress can take such varied forms as muscle tension, dizziness, increased heart rate, acute anxiety, sleeplessness, anger, excitement, energy and even joy. A stressor is an event or condition that triggers the stress response. Stressors may be as varied as taking a test, speaking in public, poverty, loneliness, poor self-esteem, being stuck in traffic or winning a prize. A stressor for one person may not be a stressor for another, although some stressors, such as injury or loneliness, tend to be stressful for everyone.

Positive, or "good," stress is productive. Good stress is the force that produces, for example, enhanced thinking ability, improved relationships with others and a greater sense of control. It can be part of the experience of being in a play, making a new friend or succeeding at a difficult task, for example. Good stress can help you perform better and be more efficient. Stress judged as "bad" (distress) can result in negative responses, such as sadness, fatigue, guilt and disease.

Many stressful situations involve harm and loss, threat or challenge. Harm and loss situations, for example, include the death or loss of a loved one, physical assault and physical injury. Threat situations, real or perceived, can be frightening or menacing and make it more difficult to deal with life. They can result in anger, anxiety or depression. Challenging situations often involve major life changes, such as moving, getting a new job, leaving home and forming or leaving a close relationship.

The Effects of Stress

Any stressful situation has an effect on the body. Because it affects the immune system, stress can be a major contributor to disease. The effects of stress on body systems can result in increased susceptibility to headaches, high blood pressure, clogging of the arteries, cancer and respiratory problems. When someone reacts to stress by over- or undereating, overusing caffeine or alcohol, smoking or eating foods high in sugar and fat, for example, the physiological balance in the body is upset.

The first step in learning to deal with stress is to become aware of the accompanying physical and mental signals. Some of the physical indicators of negative stress include severe headaches, sweating, lower back pain, weakness, sleep disturbance and shortness of breath. Other indicators, both emotional and mental, include depression, irritability, denial that a problem exists, increased incidences of illness, an inability to concentrate, feelings of unreality, inability to relax and becoming "accident prone." Becoming aware of how your body reacts to stress can help you recognize situations and conditions that are stressful for you.

Managing Stress

Stress management is a person's planned attempt to cope and deal with stress. Managing potentially harmful stress may require using a variety of techniques, including using time effectively, evaluating the activities that are important for you and establishing achievable goals. Perhaps the most difficult form of coping is change. It is especially hard to change an outlook or way of life, even if it has become unproductive and a source of negative stress. The advice and help of a professional counselor can be useful in such situations.

Relaxation techniques can also be helpful for reducing or avoiding the negative effects of stress. A few of these techniques are exercise, yoga, meditation, listening to quiet or soothing music and relaxation exercises, including deep breathing and muscle relaxation. Biofeedback, another technique, involves using instruments that measure bodily functions, such as heart rate and blood pressure. By receiving immediate feedback on responses such as muscle tension and skin temperature, the person can learn to consciously control these reactions. Autogenics uses self-suggestion to produce relaxation, using deep breathing, a conscious effort to relax and repeated phrases that carry a message of calming. Imagery involves using the imagination to create various scenes and wished-for situations. Various relaxation guides and books on stress management are available in print and online.

Smoking

According to the Centers for Disease Control and Prevention, every year, some 443,000 Americans die prematurely from smoking or exposure to second-hand smoke. Another 8.6 million live with a disease caused by smoking. Smoking costs the United States over $96 billion each year in health care costs and another $97 billion in lost productivity.

Cigarettes contain at least 69 distinct cancer-causing chemicals. During the past few decades, studies have made the negative effects of smoking clear. As a result, smoking has been banned or restricted in many work sites and public places around the nation. The nicotine in cigarettes is an addictive substance and a poison. The tars are carcinogenic (cancer causing). Nicotine, carbon monoxide and tars are all inhaled when you smoke.

Next time you are tempted to light up, consider that cigarette smoking is the single most preventable cause of heart and lung disease. In fact, it harms nearly every organ in the body, causes cancer of the lungs, esophagus, pancreas, bladder, larynx and more; and causes stroke, aortic aneurysm, chronic obstructive pulmonary disease, asthma, cataracts and more. A pregnant woman who smokes harms herself and her unborn baby. The carbon monoxide in cigarettes travels to the fetus through the umbilical cord and into the fetus's circulatory system. Smoking mothers have more stillbirths and babies with low birth weight and respiratory problems than nonsmokers. Inhaling the smoke generated by smokers is a health risk for nonsmokers, including infants and children.

Those who use smokeless tobacco also face serious risks. Nicotine is absorbed through the membranes of the mouth and cheeks. Chewing tobacco and snuff cause cancer of the mouth and tongue, so these products should also be avoided.

Also consider this: your risk for developing a disease or other condition starts to go down *as soon as* you stop smoking, with some benefits occurring within a few hours, days or weeks of quitting. Others improve over the long term.

Stopping smoking or stopping the use of smokeless tobacco can be difficult, but most ex-smokers and former users say they feel better physically and emotionally. Many programs designed to help the smoker break the habit are available. If you want to quit smoking or know someone who does, the agencies listed in *Sources of Help to Quit Smoking* may be able to help you.

Alcohol

Alcohol is the most popular drug in Western society. While the health benefits of drinking some alcohol have been well publicized in recent years, the hazardous relationship between drinking alcohol and driving, and consuming alcohol in large amounts cannot be denied.

A blood alcohol concentration (BAC) of 0.05 percent or higher impairs judgment and reflexes and makes activities such as driving unsafe. How much drinking leads to this blood alcohol level? On an empty stomach, an average 160-pound person can reach this level after just two ordinary-size drinks—two bottles of beer, 10 ounces of wine or two drinks with 1 ounce of alcohol in each—in an hour or less. The faster alcohol enters the bloodstream, the faster the BAC increases. A small amount of alcohol enters the body quickly from the stomach, where food slows alcohol absorption. The major portion passes into the bloodstream from the small intestine, where food does not affect absorption. From the bloodstream, alcohol goes directly to the brain and to other parts of the body, such as the liver. Because of the time it takes for the body to process alcohol, you should always limit yourself to one drink per hour.

Only time can make a person sober after having too much to drink. Black coffee and a cold shower may

SOURCES OF HELP TO QUIT SMOKING

American Heart Association: *www.americanheart.org*

American Lung Association: *www.lung.org*

American Cancer Society: *www.cancer.org*

National Cancer Institute: *www.nci.nih.gov*

make a person feel more alert, but the body must process the alcohol over time for the impairment of judgment and coordination to pass. Therefore, any group driving to a party should always have a designated, nondrinking driver for the return trip.

Whether hosting a party or participating in one, you can act responsibly by keeping alcohol consumption under control. To do this, remember these general principles:

- Drink slowly. Have no more than one drink per hour.
- As a host, have nonalcoholic beverages available.
- Do not drink before a party.
- Avoid drinking when angry or depressed.
- Eat plenty of food before and while drinking.
- Avoid salty foods—they may make you thirsty and cause you to drink more. As a host, do not provide foods that are high in salt.
- Do not play or promote drinking games.
- When mixing drinks, always measure the amount of alcohol. Do not just pour. As a host, hire a bartender and give clear instructions about measuring drinks or mix all the drinks yourself.
- As a host, do not have an open bar or serve someone who has had too much to drink.
- Stop drinking alcohol 1 hour before the party is over. If you are a host, stop serving alcohol.
- Do not drink and drive. Have a designated nondrinking driver or call a cab.

For help with an alcohol problem, refer to Chapter 18 for a list of organizations that provide help and support for substance abuse problems.

SUMMARY

You can help prevent injury and disease by taking safety precautions and making lifestyle choices that promote health. To reduce your risk for injury, it is important to take safety precautions in vehicles, at work, at play and in your home. To reduce your risk for illness, you need to make healthy choices about your lifestyle. Making healthy choices will reduce your chances of cancer, stroke, heart attack, cardiovascular disease and other diseases that are the leading causes of chronic illness and death. Eating a healthy diet, exercising regularly, managing stress and avoiding harmful substances all contribute to a person's health and well-being.

APPENDIX

B

CHAPTER 1

Answers to Ready to Respond Questions

1. One person can call 9-1-1 or the local emergency number on a mobile phone, or find a phone nearby; another can begin helping the person in the car if trained, or find a trained lay responder. Someone can keep the area free of onlookers and traffic. Someone could go find supplies, blankets or a first aid kit if needed.

2. Although you may feel ill and be incapacitated by the sight of blood or cries of pain, you can still help. If possible, turn away for a moment and try to control your feelings. If you are still unable to proceed, make sure EMS personnel have been called. Then find other ways to help, such as asking bystanders to assist you or helping to keep the area safe.

Answers to Study Questions

1. a. I was fixing sandwiches and talking with my next-door neighbor, Mrs. Roberts, who had come by to borrow a book. My 3-year-old, Jenny, was in her room playing with some puzzles. As Mrs. Roberts got up to leave, **I heard a loud thump and a shriek from upstairs**.

   b. I was on the bus headed for work. A man from the back of the bus came down the aisle, and I noticed that **he was moving unsteadily**. It was cold in the bus, but **I noticed he was sweating and looked very pale**. **"I don't know where I am," I heard him mumble to himself**.

   c. On my way into the grocery store from the parking lot, **I heard the loud screech of tires and the crash of metal**. **I saw that a car had struck a telephone pole**, **causing the telephone pole to lean at an odd angle**. **Wires were hanging down from the pole onto the street**. It was very frightening.

2. The common barriers to act at the scene of an emergency are: panic or fear of doing something wrong; being unsure of the person's condition and what to do; assuming someone else will take action; type of injury or illness; fear of catching a disease; fear of being sued; being unsure of when to call 9-1-1 or the local emergency number.

3. A lay responder can overcome these barriers to action by thinking about these barriers and mentally preparing him- or herself to face these challenges ahead of time.

4. c, e, a, d, b, f

5. Bystanders can help at the scene of an emergency by calling, meeting and directing the ambulance; keeping the area free of unnecessary traffic; or giving

first aid. Bystanders can go for additional supplies or give comfort to others on the scene. Finally, bystanders may be able to give you important information about the person or what happened.

CHAPTER 2

Answers to Ready to Respond Questions

1. The main danger in the garage could be the presence of carbon monoxide. Another danger could be fumes from a spilled toxic substance or an electrical hazard.
2. The presence of poisonous fumes would be the major factor that could make you decide to move your dad immediately. Avoid breathing in poisonous fumes as you execute the move.
3. You would call 9-1-1 or the local emergency number. Since you are alone, and your dad is unconscious, it is a *call first* situation.

Answers to Study Questions

1. CHECK—CALL—CARE
2. Downed power lines; traffic; fire; dangerous fumes; freezing rain; broken glass; metal shards; spilled fuel.
3. Do not approach the person. Make sure you are a safe distance away and call 9-1-1 or the local emergency number.
4. The exact location of the emergency (in this case, mile marker posts or landmarks can be helpful). What happened. The number of people involved. The person's condition. The care being given. Tell him or her to report back to you after making the call and tell you what the EMS call taker said.
5. *Call first*, that is, call 9-1-1 or the local emergency number before giving care since the driver is unconscious.

CHAPTER 3

Answers to Ready to Respond Questions

1. After checking the scene to make sure it is safe, and obtaining consent to give care, you should take steps to prevent disease transmission, such as wearing gloves to avoid contact with the boy's blood before checking him.
2. You should immediately wash your hands after giving care.

Answers to Study Questions

1. a
2. d
3. b
4. a
5. c

6. When you are faced with immediate danger. When you have to get to another person who may have a more serious problem. When it is necessary to give proper care.

7. Any dangerous conditions at the scene. The size of the person. The distance the person must be moved. Your physical ability. Whether others (bystanders) can help you. The person's condition. Any aids or equipment to facilitate moving the person at the scene.

8. Use your legs, not your back, when you bend. Bend at the knees and hips, and avoid twisting your body. Maintain a firm grip on the person. Walk forward when possible, taking small steps and watching where you are going. Avoid twisting or bending anyone with a possible head, neck or spinal injury. Do not move a person who is too large to move comfortably. Use good posture.

9. Walking assist. Two-person seat carry. Pack-strap carry. Clothes drag. Blanket drag. Ankle drag.

CHAPTER 4

Answers to Ready to Respond Questions

1. The impact of an injury or a disease is rarely restricted to one body system. An injury to the head could affect the brain and nervous system, which could in turn affect breathing.

2. Respiratory—his breathing is changing, becoming faster, then slower. Nervous—he is unconscious. Integumentary—he has a cut on his head.

Answers to Study Questions

1. (a) Respiratory (b) airway, lungs (c) circulatory (d) transports oxygen and other nutrients to cells and removes wastes (e) skin, hair, nails (f) helps keep fluids in, prevents infection, sweat glands and pores in skin help regulate temperature, helps make vitamin D, stores minerals (g) bones, ligaments, muscles, tendons (h) supports body, allows movement, protects internal organs and structures, produces blood cells, stores minerals, produces heat (i) nervous (j) brain, spinal cord, nerves.

2. g, e, f, c, d, a, b

3. a

4. c

5. c

6. c

7. b

8. b

9. d

CHAPTER 5

Answers to Ready to Respond Questions

1. Because of the person's location on the bike trail, you should try to guard against the possibility that another biker might round the curve and hit you or the person.
2. You will need to call 9-1-1 or the local emergency number. If you do not have a mobile phone with you, and no one else is around or responds to a shout for help, you will need to leave the person to call 9-1-1 or the local emergency number. First, however, you must position the person on one side in the modified H.A.IN.E.S recovery position. After calling 9-1-1 or the local emergency number, return to the person as soon as possible. You may be asked to meet EMS personnel and take them to the person.
3. Interview the person and check the person from head to toe.

Answers to Study Questions

1. b, a, a, b, a
2. Unconsciousness; trouble breathing or breathing that is not normal; absence of breathing; severe bleeding.
3. There's a stopped car in the road and a mangled bicycle that could cause another accident. There are also dangers from being in the middle of the street. You can use bystanders to direct traffic.
4. If the person is conscious and has no life-threatening conditions, you can begin to check for other conditions that may need care. Checking a conscious person with no immediate life-threatening conditions involves two basic steps: Interview the person and bystanders and check the person from head to toe.
5. 4, 1, 5, 2, 3
6. b
7. c
8. b
9. a
10. b

CHAPTER 6

Answers to Ready to Respond Questions

1. Yes. The exertion of mowing grass in the heat can add an extra burden on the body, increasing its demand for oxygen. The heart works harder to keep up with the body's demand for oxygen, increasing its own oxygen needs. If the arteries are narrowed as a result of atherosclerosis, the delivery of oxygen-rich blood to the heart is severely restricted or completely cut off, causing the heart to beat irregularly or stop beating.
2. Resting eases the heart's need for oxygen.
3. If Mr. Getz is suffering cardiac arrest, his greatest chance of survival occurs when you follow the Cardiac Chain of Survival, starting with early recognition of the

cardiac emergency and early access to the EMS system, followed by early CPR, early defibrillation and early advanced medical care.

4. CPR—the combination of chest compressions and rescue breaths—helps maintain a low level of circulation in the body, but if Mr. Getz also has an abnormal heart rhythm (such as V-fib or V-tach), it needs to be corrected by defibrillation. Prompt CPR, early defibrillation and other advanced cardiac life support measures in combination are needed to sustain life.

Answers to Study Questions

1. c, f, d, b, a, e
2. The person will be unconscious and not breathing. The person's skin may be pale, ashen or bluish, particularly around the face. The skin may also be moist from perspiration.
3. You notice an obvious sign of life, such as breathing. An AED becomes available and is ready to use. Another trained rescuer or EMS personnel arrive and take over. You are too exhausted to continue. The scene becomes unsafe.
4. Airway and breathing problems (such as airway obstruction, smoke inhalation, asthma attack and severe epiglottitis) and trauma (such as an automobile crash or a hard blow to the chest, drowning, electrocution, poisoning, firearm injuries and falls).
5. b
6. d
7. d
8. c
9. d
10. c
11. c
12. b
13. Her chest and shoulder hurt; she is sweating heavily; she is breathing fast; she looks ill.
14. 3, 2, 1, 4, 5
15. c
16. a
17. d

CHAPTER 7

Answers to Ready to Respond Questions

1. If James could cough forcefully, cry or speak at all, you would know his airway was only partially blocked.
2. If James's airway was only partially blocked, you would encourage James to keep coughing to try to dislodge the object. If James could no longer speak, cough, cry or breathe, however, that would be a signal of a complete airway obstruction. You would

need to give James 5 back blows, followed by 5 abdominal thrusts in order to try to dislodge the object.

3. Carefully lower James to the ground, open his mouth and look for the object. If an object is seen, remove it with your finger. If no object is seen, open James's airway using the head-tilt/chin-lift technique and attempt 2 rescue breaths.

Answers to Study Questions

1. a, b, d, e, c
2. When Rita walked into Mr. Boyd's office, **she found him collapsed** across his desk. His eyes were closed but she could hear him breathing, **making a high whistling noise**. He was **flushed**, **sweating** and seemed to be **trembling uncontrollably**. When he heard Rita, he raised his head a little. **"My chest hurts," he gasped**, **"and I feel dizzy and can't seem to catch my breath."** He looked frightened.
3. Trying to swallow large pieces of poorly chewed food; drinking alcohol before or during meals; dentures; eating while talking excitedly or laughing or eating too fast; walking, playing or running with food or objects in the mouth.
4. c, a, b
5. d
6. b
7. a
8. b
9. c
10. a
11. 3, 4, 2, 1, 5

CHAPTER 8

Answers to Ready to Respond Questions

1. The bleeding from Joe's wound is probably from a vein. The blood is flowing rather than spurting. Spurting would indicate that the bleeding is from an artery.
2. If not controlled, severe bleeding can reduce the blood volume in the body and become life threatening. An adequate amount of blood is needed to maintain the flow of oxygen-rich blood to the body, particularly to the vital organs.
3. You should use a barrier, such as disposable gloves or plastic wrap. If these items are not available, you can also use a clean folded cloth or have Joe use his hand to control the bleeding. You should also wash your hands after giving care even if you wore gloves.

Answers to Study Questions

1. b, a, d, g, f, e, c
2. Blood spurting from the wound; bleeding that fails to stop after all measures have been taken to control it.

3. Put on disposable gloves. If blood has the potential to splatter, you may need to wear eye and face protection. Cover the wound with a dressing and press firmly against the wound with a gloved hand. Apply a pressure bandage over the dressing to maintain pressure on the wound and to hold the dressing in place. If blood soaks through the bandage, do not remove the blood-soaked bandages. Instead, add more pads and bandages to help absorb the blood and continue to apply pressure. Continue to monitor the person's condition. Observe the person closely for signals that may indicate that the person's condition is worsening, such as faster or slower breathing, changes in skin color and restlessness. Take steps to minimize shock. Keep the person from getting chilled or overheated. Have the person rest comfortably and reassure him or her. Wash your hands immediately after giving care, even if you wore gloves.
4. Tender, swollen, bruised or hard areas of the body, such as the abdomen; rapid breathing; skin that feels cool or moist or looks pale or bluish; vomiting blood or coughing up blood; excessive thirst; an injured extremity that is blue or extremely pale; an altered mental state, such as the person becoming confused, faint, drowsy or unconscious.
5. Apply an ice pack (preferred method) or a chemical cold pack to the injured area to help reduce pain and swelling. Place something, such as a gauze pad or a towel, between the source of cold and the skin to prevent damage to the skin.
6. Internal bleeding.
7. a

CHAPTER 9

Answers to Ready to Respond Questions

1. Her body could not compensate for her significant injuries, which probably involved significant bleeding.
2. You could minimize shock by controlling any external bleeding as possible in the situation; helping the woman maintain her normal body temperature (e.g., covering her if she was getting chilled); offering reassurance; and giving any additional care that she needed.

Answers to Study Questions

1. False. Shock can result from severe blood loss, as well as the loss of other body fluids; failure of the heart to pump enough oxygenated blood (i.e., resulting from disease, poisoning, respiratory distress); abnormal dilation of the blood vessels (i.e., resulting from neck fractures/spinal cord injury, infection, anaphylaxis); or injury to the chest, obstruction of the airway or any respiratory problem that decreases the amount of oxygen in the lungs.
2. Apprehension, anxiety, restlessness or irritability; altered level of consciousness; nausea or vomiting; pale, ashen or grayish, cool, moist skin; rapid breathing; excessive thirst.
3. Severe vomiting or diarrhea.
4. Be sure his airway is open and clear. Take steps to control any external bleeding and prevent further blood loss. Immobilize his leg (using the ground for support) to prevent movement that could cause more bleeding and damage. Have him stay lying down. Help maintain normal body temperature. Do not give him anything to eat or drink, even though he is likely to be thirsty and may ask. Talk to him in a calm and reassuring

manner to reduce the harmful effects of emotional stress on the person. Continue to monitor his breathing and for any changes in his condition.

5. d
6. b
7. d
8. b

CHAPTER 10

Answers to Ready to Respond Questions

1. Jeremy has sustained a partial-thickness heat (thermal) burn, signaled by his red skin and the formation of blisters caused by exposure to the heat.
2. Jeremy's burns will require medical attention as the burn is to his hands.
3. Call 9-1-1 or the local emergency number. Stop the burning by removing Jeremy from the source of the burn. Check for life-threatening conditions. As soon as possible, cool the burn with large amounts of cold running water, at least until pain is relieved. Cover the burn loosely with a sterile dressing. Take steps to minimize shock. Keep Jeremy from getting chilled or overheated. Comfort and reassure Jeremy.

Answers to Study Questions

1. c, f, a, d, e, b
2. c, d, a, b
3. a, b, d, c
4. The area around the wound becomes swollen and red; the area may feel warm or throb with pain; there may be a pus discharge; more serious infections may cause a person to develop a fever and feel ill; red streaks may develop that progress from the wound in the direction of the heart.
5. Bandages are used to hold dressings in place, to apply pressure to control bleeding, to protect a wound from dirt and infection and to provide support to an injured limb or body part.
6. Abrasion (skin that is rubbed or scraped away); laceration (cut with jagged or smooth edges); avulsion (a portion of the skin and sometimes other soft tissue is partially or completely torn away); amputation (a body part is severed); puncture/penetration (skin is pierced with a pointed object; sometimes results in an embedded objected); crushing injury (a body part, usually an extremity, is subjected to a high degree of pressure).
7. Heat (thermal), electricity, chemicals, radiation.
8. a. Involves only the top layer of the skin (first degree). Skin is red and dry, and the burn is usually painful. The area may swell. Usually heals within a week without permanent scarring.

   b. Involves the top layers of the skin (second degree). May look red and have blisters. Blisters may open and weep clear fluid. Burned skin may look mottled. Burns are painful and often swell. Usually heals in 3 or 4 weeks. May scar.

c. May destroy all layers of the skin and some or all of underlying structures (third degree). Skin may look brown or charred (black). Tissues underneath may appear white. Burns can be extremely painful or painless if the burn destroyed nerve endings. Healing may require medical assistance. Scarring is likely.

9. a

10. d

11. d

12. b

13. a

14. b

15. d

16. b

17. d

18. b

19. b

20. d

21. d

22. c

CHAPTER 11

Answers to Ready to Respond Questions

1. Kelly likely sprained or strained her ankle or foot. A fracture is also a possibility.
2. A snapping sound at the time of the injury. The injured area is very painful to touch or move. There is significant bruising and swelling. There is significant deformity. She is unable to use the affected part normally. There are bone fragments sticking out of a wound. She feels bones grating. The injured area is cold, numb and tingly. The cause of the injury suggests that it may be severe.
3. Help Kelly rest in the most comfortable position; immobilize her foot, using the ground to support it; apply cold to the injured area for periods of 20 minutes on, 20 minutes off (if 20 minutes of icing cannot be tolerated, apply ice for periods of 10 minutes); and elevate the injury, only if it does not cause more pain.

Answers to Study Questions

1. h, b, f, c, a, i, k, d, j, g, e
2. There is obvious deformity; there is moderate or severe swelling and discoloration; bones sound or feel like they are rubbing together; a snap or pop was heard or felt at the time of the injury; there is a fracture with an open wound at, or bone piercing through, the injury site; the injured person cannot move or use the affected part normally; the injured area is cold and numb; the injury involves the head, neck or spine; the injured

person has trouble breathing; the cause of the injury suggests that the injury may be severe; it is not possible to safely or comfortably move the person to a vehicle for transport to a hospital.

3. Splint only if you have to move the injured person and you can do so without causing more pain and discomfort to the person. Splint an injury in the position in which you find it, do not move, straighten or bend angulated bones or joints. Splint the injured area and the joints or bones above and below the injury site. Check for proper circulation (feeling, warmth and color) before and after splinting.

4. c

5. b

6. b

7. a

8. b

CHAPTER 12

Answers to Ready to Respond Questions

1. Yes; Sue's wrist is bleeding and she cannot move it without pain.

2. You should call 9-1-1 or the local emergency number since there are signals of a possible open fracture; stabilize the injury in the position found (do not use a splint as you cannot transport Sue yourself with no vehicle); control external bleeding (do not use direct pressure on an open fracture; instead apply pressure around the wound); apply cold if available; and take steps to minimize shock. You should also help reassure Sue until EMS personnel arrives.

Answers to Study Questions

1. c, b, d, a

2. Falling on the hand of an outstretched arm.

3. A dislocation or fracture of the shoulder and a fractured leg.

4. Left arm looks deformed at the shoulder. No sensation in the fingers of that arm, arm is beginning to look bruised and is painful. Unable to move the leg, which is beginning to swell.

5. Call 9-1-1 or the local emergency number; immobilize the injured parts in the position found; apply ice, placing gauze or cloth between the source of cold and the skin; help the person rest in the most comfortable position; prevent him from becoming chilled or overheated; reassure him. Continue to monitor the person's level of consciousness, breathing, skin color and temperature. Be alert for any signals, such as changes in breathing rate, skin color or level of consciousness that may indicate the person's condition is worsening. If needed, take steps to minimize shock.

6. Injured leg is noticeably shorter than the other leg; injured leg is turned outward. Additional signals include severe pain; inability to move the lower extremity.

7. Soft, rigid and anatomic.

8. b

9. c

10. Support the injured leg in the position in which you find it. Check the body part that is on the other side of the injury from the heart for circulation (feeling, warmth and color) before and after splinting to make sure the splint is not too tight. Cover any bleeding or open wounds, including open fractures, with sterile dressings, and carefully bandage with minimal pressure before splinting. Do not try to push protruding bones back below the skin. Apply the splint to immobilize the bones or joints above and below the injured area (in this case, the knee and ankle). Cut off or remove any clothing around the injury site. Do not attempt to straighten any angulated fracture; always splint the limb in the position found. Pad the splints you are using so that they will be more comfortable and conform to the shape of the injured body part. Secure the splint in place with cravats, roller bandages or other wide strips of cloth. Avoid securing the splint directly over an open wound or the injury. Do not allow the person to bear weight on an injured lower extremity. Elevate the splinted part if doing so does not cause the person discomfort.

CHAPTER 13

Answers to Ready to Respond Questions

1. No. Signals could develop later. He did strike his head and could have a concussion or have injured his neck or back in doing so.

2. Since the person cannot move his arms, you should suspect a serious head, neck or spinal injury and provide manual stabilization of the person's head in the position found until more advanced medical personnel arrive. In addition, you should continue to monitor the person's consciousness and breathing, scan for severe bleeding, and take steps to minimize shock.

Answers to Study Questions

1. d, b, a, c

2. A person is unconscious; was involved in a motor vehicle crash or subjected to another significant force; was injured as a result of a fall from greater than the person's standing height; is wearing a safety helmet that is broken; complains of neck or back pain; has tingling or weakness in the extremities; is not fully alert; appears to be intoxicated; appears to be frail or older than 65 years; is a child younger than 3 years with evidence of a head or neck injury.

3. Changes in the level of consciousness; severe pain or pressure in the head, neck or spine; tingling or loss of sensation in the extremities; partial or complete loss of movement of any body part; unusual bumps or depressions on the head or neck; sudden loss of memory; blood or other fluids in the ears or nose; profuse external bleeding of the head, neck or back; seizures in a person who does not have a seizure disorder; impaired breathing or impaired vision as a result of injury; nausea or vomiting; persistent headache; loss of balance; bruising of the head, especially around the eyes or behind the ears.

4. Place the person in a face-up position and enlist someone to help stabilize the person's head. Do not attempt to remove any object embedded in the eye. Stabilize the object

by encircling the eye with a gauze dressing or soft sterile cloth, being careful not to apply any pressure to the area. Position bulky dressings around the impaled object, such as roller gauze, and then cover it with a shield such as a paper cup. Do not use Styrofoam®-type materials, as small particles can break off and get into the eye. The shield should not touch the object. Bandage the shield and dressing in place with a self-adhering bandage and roller bandage covering the person's injured eye, as well as the uninjured eye, to keep the object stable and minimize movement. Comfort and reassure the person. Do not leave the person unattended.

5. d
6. d
7. c
8. c
9. a
10. b
11. d
12. Do not put direct pressure on the wound; attempt to control bleeding with pressure on the area around the wound; secure the dressings with a roller bandage or triangular bandage; call 9-1-1 or the local emergency number.

CHAPTER 14

Answers to Ready to Respond Questions

1. The person is holding his chest and his breathing sounds shallow as if it is painful to breath. Both are common signals of a rib fracture.
2. You should have the man rest in a position that will make breathing easier and encourage him to take deep, slow breaths if tolerated. You should also give him a blanket, pillow or other similar available object to hold against his ribs to support and immobilize the area. If supplies are available, you could also use a sling and binder to hold the person's arm against the injured side of the body. In addition, you should monitor breathing and take steps to minimize shock.

Answers to Study Questions

1. c, a, b, e, d
2. Call 9-1-1 or the local emergency number; limit movement; monitor breathing and signs of life; control bleeding; take steps to minimize shock.
3. Trouble breathing or no breathing; severe pain at the site of the injury; flushed, pale, ashen or bluish skin; obvious deformity, such as that caused by a fracture; coughing up blood (may be bright red or dark like coffee grounds); bruising at the site of a blunt injury, such as that caused by a seat belt; a "sucking" noise or distinct sound when the person breathes.
4. Severe pain; bruising; external bleeding: nausea; vomiting (sometimes vomit containing blood); weakness; thirst; pain, tenderness or a tight feeling in the abdomen; organs protruding from the abdomen; rigid abdominal muscles; signals of shock.

5. a

6. A sucking chest wound.

7. Trouble breathing; severe pain at the site of the injury; a sucking sound when person breathes.

8. Call 9-1-1 or the local emergency number; cover the wound with a large occlusive dressing, taping the dressing in place except for one side or corner than remains loose; monitor the person's breathing; take steps to minimize shock.

CHAPTER 15

Answers to Ready to Respond Questions

1. Paul is likely having a diabetic emergency based on the information given by the receptionist that he has diabetes, and skipped lunch after exercising vigorously on his break—risk factors for hypoglycemia. A change in consciousness is also a signal of a diabetic emergency.

2. Because Paul is not responding, you should ask the receptionist to call 9-1-1 or the local emergency number, and then care for Paul as you would any unconscious person. This includes making sure Paul's airway is clear, checking for breathing and giving care until advanced medical personnel take over.

3. If a person is unconscious or about to lose consciousness, you should not give the person anything by mouth—including a form of sugar for a diabetic emergency.

Answers to Study Questions

1. f, c, h, g, e, d, b, i, a

2. A person with a sudden illness may have any of these signals: Changes in level of consciousness, such as feeling lightheaded, dizzy, drowsy or confused, or becoming unconscious; breathing problems (i.e., trouble breathing or no breathing); signals of a possible heart attack, including persistent chest pain, discomfort or pressure lasting more than a few minutes that goes away and comes back or that spreads to the shoulder, arm, neck, jaw, stomach or back; signals of a stroke, including sudden weakness on one side of the face (facial droop); sudden weakness, often on one side of the body; sudden slurred speech or trouble forming words; or a sudden, severe headache; loss of vision or blurred vision; signals of shock, including rapid breathing, changes in skin appearance and cool, pale or ashen (grayish) skin; sweating; persistent abdominal pain or pressure; nausea or vomiting; diarrhea; seizures.

3. Do no further harm; monitor the person's level of consciousness and breathing; help the person rest in the most comfortable position; keep the person from getting chilled or overheated; comfort and reassure the person, but do not provide false hope; give any specific care as needed.

4. After the seizure passes, position the person on his or her side in a modified H.A.IN.E.S position so that fluids (saliva, blood, vomit) can drain from the mouth. Check to see if the person was injured during the seizure. Offer comfort and reassurance, especially if the seizure occurred in public, as the person may feel embarrassed and self-conscious. If this is the case, keep bystanders well back to provide maximum privacy and stay with the person until he or she is fully conscious and aware of the surroundings.

5. a
6. c
7. c
8. a
9. b
10. a
11. c
12. a

CHAPTER 16

Answers to Ready to Respond Questions

1. Your cousin is wiping something from Sophia's mouth. Sophia is seated next to cleaning supplies that were on the floor.
2. Although Sophia is young, you could try to have her tell you what bottles she might have touched or tasted. You should also call the PCC for advice and information, and watch for any signals that might develop if Sophia ingested or absorbed a poison. You'll need to tell the PCC what substances she potentially had contact with.

Answers to Study Questions

1. e, b, f, c, a, d
2. Remove the person from the source of poison if the scene is dangerous. Do this only if you are able to without endangering yourself. Check the person's level of consciousness and breathing. For life-threatening conditions, such as if the person is unconscious or is not breathing, or if a change in the level of consciousness occurs, call 9-1-1 or the local emergency number immediately and care for any life-threatening conditions. If the person is conscious, ask questions to get more information. Look for any containers and take them with you to the telephone. Call the National Poison Control Center Hotline at 800-222-1222 and follow any directions given.
3. The type and amount of the substance; the time elapsed since the poison entered the body; and the person's age, size, weight and medical conditions.
4. Follow standard precautions and then immediately rinse the affected area thoroughly with water. In the case of poison ivy, using soap cannot hurt, but soap may not do much to remove the poisonous plant oil that causes the allergic reaction. Before washing the affected area, you may need to have the person remove any jewelry. This is only necessary if the jewelry is contaminated or if it constricts circulation due to swelling. Rinse the affected areas for at least 20 minutes, using a shower or garden hose if possible. If a rash develops, advise the person to seek additional advice from a pharmacist or health care provider.
5. If a person is unconscious, confused or seems to be losing consciousness; has trouble breathing; has persistent chest pain or pressure; has pressure or pain in the abdomen that does not go away; is vomiting blood or passing blood in the stool or urine; has a seizure, severe headache or slurred speech; acts aggressively or violently.

6. Itching and burning hand; swollen fingers; red bumps all over her forearm.
7. Wear gloves to protect her hands when gardening.
8. d
9. c
10. a

CHAPTER 17

Answers to Ready to Respond Questions

1. Given Sara's report that she was bitten by a tick last week, and now she has rashes appearing in various spots on her body and does not feel well, Sara could potentially have Rocky Mountain spotted fever.
2. While you cannot provide first aid for Rocky Mountain spotted fever, you can help Sara by following general care guidelines for an unknown sudden illness. These steps include: do no further harm; monitor Sara's level of consciousness and breathing; help Sara rest in the most comfortable position; keep Sara from getting chilled or overheated; comfort and reassure Sara; and give any specific care as needed. In addition, you should advise Sara's parent's that you observed signals that could indicate a tickborne illness and recommend that she visit her health care provider for follow-up.

Answers to Study Questions

1. a, b, d, c
2. With a gloved hand, grasp the tick with fine-tipped, pointed, non-etched, non-rasped tweezers as close to the skin as possible and pull slowly, steadily and firmly upward. If you do not have tweezers, use a glove, plastic wrap, a piece of paper or a leaf to protect your fingers. Place the tick in a jar containing rubbing alcohol to kill it. Wash the bite area with soap and warm water. Apply antiseptic or antibiotic ointment to help prevent infection. Wash your hands thoroughly. If rash, flu-like signals or joint pain appears, seek medical attention.
3. Presence of a stinger; pain; swelling; redness; signals of an allergic reaction.
4. Call 9-1-1 or the local emergency number. Wash the site with soap and water. Apply an elastic (pressure immobilization) bandage to slow the spread of venom through the lymphatic system. To do so: check for feeling, warmth and color of the limb and note changes in skin color and temperature; place the end of the bandage against the skin and use overlapping turns; check above and below the injury for feeling, warmth and color, especially in the fingers and toes, after you have applied an elastic roller bandage; check the snugness of the bandaging—a finger should easily, but not loosely, pass under the bandage; keep the injured area still and lower than the heart. The person should walk only if absolutely necessary.
5. a
6. d
7. b
8. d

9. d

10. d

CHAPTER 18

Answers to Ready to Respond Questions

1. The signals exhibited by Michelle are talkativeness, then a sudden mood change and unconsciousness.

2. The signals of Michelle's condition, along with the fact that she has been drinking, seem to indicate a case of alcohol poisoning. There could, however, be some other type of emergency that caused the same signals.

3. Yes, you should call 9-1-1 or the local emergency number because EMS personnel should called in cases when someone seems to be losing consciousness.

Answers to Study Questions

1. f, c, d, e a, h, b, g

2. Behavioral changes not otherwise explained; sudden mood changes; restlessness, talkativeness or irritability; changes in consciousness, including loss of consciousness; slurred speech or poor coordination; moist or flushed skin; chills, nausea or vomiting; dizziness or confusion; abnormal breathing.

3. Stimulants; hallucinogens; depressants; narcotics; inhalants; cannabis products.

4. Read the product information and use products only as directed. Ask your physician or pharmacist about the intended use and side effects of prescription and over-the-counter medication. If you are taking more than one medication, check for possible interaction effects. Never use another person's prescribed medications. Always keep medications in their appropriate, marked containers. Destroy all out-of-date medications. Always keep medications out of the reach of children.

5. Check the scene to be sure it is safe to help the person. Do not approach the person if he or she is behaving in a threatening manner. Call 9-1-1 or the local emergency number immediately if the person is unconscious, confused or seems to be losing consciousness; has trouble breathing or is breathing irregularly; has persistent chest pain or pressure; has pain or pressure in the abdomen that does not go away; is vomiting blood or passing blood; has a seizure, a severe headache or slurred speech; or acts violently. If none of the above conditions are present, and you have good reason to suspect a substance was taken, call the National Poison Control Center Hotline at 1-800-222-1222 and follow the call taker's directions. Try to learn from the person or others what substances may have been taken. Calm and reassure the person. Keep the person from getting chilled or overheated.

6. b, c, a, d, e, f

7. c

8. b

CHAPTER 19

Answers to Ready to Respond Questions

1. Kelly is showing signals of hypothermia, including shivering and indifference (wanting to just stop walking despite the fact she is cold and the conditions are unpleasant).
2. The wind and rain; the fact that Kelly does not have enough layers to put on to keep her warm and dry in the conditions.
3. Your priority should be getting Kelly to a warmer place.

Answers to Study Questions

1. c, e, d, a, b
2. Air temperature; humidity; wind.
3. Heat cramps; heat exhaustion; heat stroke.
4. Cool, moist, pale, ashen or flushed skin; weakness; dizziness; shallow breathing; exhaustion; decreasing level of consciousness; heavy sweating; headache; nausea; muscle cramps.
5. The person's condition does not improve; the person refuses fluids; there is a change in the person's level of consciousness; the person vomits.
6. Rapidly cool the body by immersing the person up to the neck in cold water (preferred); douse the person with ice-water-soaked towels over the entire body, frequently rotating the cold, wet towels, spraying with cold water, fanning the person or covering the person with ice towels or bags of ice placed over the body.
7. Frostbite; hypothermia.
8. Avoid being outdoors in the hottest or coldest part of the day. Dress appropriately for the environment. Change your activity level according to the temperature. Take frequent breaks by removing yourself from the environment. Drink large amounts of nonalcoholic or noncaffeinated fluids before, during and after activity.
9. a
10. d
11. Lack of feeling in fingers; fingers look waxy and white and feel cold.
12. Keep your friend inside where it is warm. Handle the area gently. Because there is no reason to believe the part will refreeze, rapidly re-warm the affected part using skin-to-skin contact such as with a warm hand. Loosely bandage the area with dry, sterile dressings. Place dry, sterile gauze between the fingers to keep them separated. Avoid breaking any blisters. Take precautions to prevent hypothermia. Monitor the person and care for shock. Do not give any ibuprofen or other nonsteroidal anti-inflammatory drugs. Seek emergency medical care as soon as possible.
13. No response to your questions; glassy eyes; seems weak and exhausted; does not feel your touch.

14. Call 9-1-1 or the local emergency number. Make the person comfortable. Remove wet clothing and dry the person if needed. Keep the woman wrapped in blankets and plastic sheeting to hold in body heat. Also, keep her head covered to further retain body heat. Keep the woman positioned near a heat source and apply heat pads or other heat sources to the body, such as containers filled with warm water. Carefully monitor any heat source to avoid burning the person. If the person is alert, give warm liquids that do not contain alcohol or caffeine. Check breathing and monitor for any changes in the person's condition and care for shock.

CHAPTER 20

Answers to Ready to Respond Questions

1. You can make a reaching assist by firmly bracing yourself on the pool deck and using an object that you find near the pool to extend your reach. You may also attempt a reach by lying down on the pool deck and extending your arm or leg for the child to grab. Another option is to throw an item that floats, such as a picnic jug, an air mattress or an inflatable toy, out to the child with a line attached. Try to throw it over the child's shoulder, with the line resting on the shoulder. Remember that your first priority is to stay safe. By rushing into the water to help a person, you could become a drowning victim, too.

Answers to Study Questions

1. Reaching assist; throwing assist; wading assist.
2. A drowning victim—active victim could be at the surface or sinking. He or she could be positioned vertically in the water and leaning back slightly. This person is unlikely to have a supporting kick or the ability to move forward. The person's arms could be at the side pressing down in an instinctive attempt to keep the head above water to breathe. All energy is going into the struggle to breathe, and the person may not be able to call out for help.
3. d
4. c
5. c
6. Use the head splint technique to make sure the person is face-up in the water. Open the person's airway and check for breathing for no more than 10 seconds. If there is breathing, hold the person steady in the water until advanced help arrives. If the person is not breathing, remove the person from the water immediately and give 2 rescue breaths. If the chest clearly rises, begin CPR with chest compressions. If the chest does not clearly rise with the first rescue breath, retilt the airway and give another rescue breath. If the chest still does not rise, use the modified CPR technique.

CHAPTER 21

Answers to Ready to Respond Questions

1. Falls in older adults are often due to slower reflexes, failing eyesight and hearing, arthritis and problems such as unsteady balance and movement. However, Grandma Mary should be fully checked to ensure that another condition did not lead to her fall such as a sudden illness or musculoskeletal injury.
2. You should get at eye level with Grandma Mary so that she can see and hear you more

clearly. If she seems confused at first, the confusion may be the result of her impaired hearing. Speak slowly and clearly, and look at her face while you talk. Notice if she has her hearing aid in. If not, it may be helpful to have your friend find it so she can put it in. If Grandma Mary seems truly confused, try to find out if the confusion is the result of the injury or a condition she already has. Information from your friend may be helpful.

Answers to Study Questions

1. d, c, f, b, e, a
2. Check the scene for safety. Have a bystander call 9-1-1 or the local emergency number. Introduce yourself as someone who knows first aid and ask permission from the parent to give care. Observe the child before actually touching him or her. Look for signals that indicate changes in the level of consciousness, any trouble breathing and any apparent injuries and conditions. Realize that the situation may change as soon as you touch the child or infant because he or she may become more anxious and upset. Allow the child's mother to stay with the child to help comfort the child, and reassure both the parent and child. Ask the child simple questions to find out what is wrong. When possible, begin your check at the child's toes and work your way to the head.
3. Introduce yourself and explain that you are there to help. Get consent to give care. Ask the woman her name and use it when you speak to her. Tell her to lie still; try to find out from the neighbor if the woman is generally confused or is taking any medication, if you haven't done so already. Have the neighbor call 9-1-1 or the local emergency number. Reassure and comfort the person. Support and immobilize the injured area, probably using blankets and pillows.
4. d
5. b
6. b
7. b
8. c
9. d
10. Diseases such as Alzheimer's disease; medication; vision or hearing loss; head injury; medical emergency such as illness or infection; depression.
11. If a hostile person refuses your care or threatens you, remove yourself from the situation and stay at a safe distance. Never argue with or restrain an injured or ill person. Call 9-1-1 or the local emergency number if someone has not already done so. Never put your own safety at risk.

CHAPTER 22

Answers to Ready to Respond Questions

1. Because this is Lisa's first pregnancy, she is probably still in stage one of labor, but getting close to stage two. The fact that her water has broken is often a signal that labor is beginning.
2. Lisa can tell you if this is a first pregnancy; if she expects any complications; if there

has been a bloody discharge; how close and strong the contractions are, and when she began to have them; and if she has the urge to bear down or push.

Answers to Study Questions

1. h, g, c, e, f, a, d, b
2. Stage one: dilation—the mother's body prepares for birth; from the first contraction until the cervix is completely dilated. Stage two: expulsion—begins when the cervix is completely dilated and includes the baby's movement through the birth canal and delivery. Stage three: placental delivery—The placenta separates from the wall of the uterus and is expelled from the birth canal. Stage four: stabilization—the initial recovery and stabilization of the mother after childbirth.
3. See that the airway is open and clear; maintain normal body temperature.
4. b
5. d
6. a
7. b
8. c
9. c

CHAPTER 23

Answers to Ready to Respond Questions

1. The fact that you are traveling by canoe on a river, at least 2 miles from help without a vehicle or way to call, all make this a delayed-help situation as it will very likely take more than 30 minutes for you to get help for Pete.
2. When checking the scene, you should check for dangerous conditions due to the water, such as loose or slippery rocks where he is trying to stand up near the shore. You should be sure there are no environmental hazards, such as wild animals or impending severe weather.
3. Pete is bleeding profusely from several wounds, including one in his abdomen. If left uncontrolled, bleeding can be life-threatening. An injury to the abdomen could also cause internal injuries if the force was enough, and this could also be life-threatening. Because Pete is also wet, he could be prone to hypothermia as well, and is at increased risk for shock.
4. Because you have no means of calling for help, but know that there is a scheduled pick-up point 2 miles down the river, and there are enough people available with the proper equipment to go safely, you should send a canoe ahead for help in this situation. Ideally, you should send them with a note explaining Pete's condition, a map indicating the location of the emergency, a list of other members in the group, a list of available resources, a description of the weather, terrain and access routes if known and the group's plan for immediate and long-term plans, with possible contingency plans if needed.

Answers to Study Questions

1. Time and/or distance that prevents access to swift advanced medical help. The environment, weather, location or time of day creates hazards. Unavailability of EMS due to overwhelming need. Unavailability of EMS due to lack of workers or damaged equipment. Scene safety issues that demand special skills and resources. Lack of adequate first aid equipment. Issues related to managing resources, people and your own well-being for an extended amount of time.
2. Manage scene safety. Take a big-picture view of the scene. Care for life-threatening conditions and non-life-threatening conditions (directly or indirectly). Provide evacuation direction for the group.
3. Stay where you are and call, radio or signal for help. Send someone to go get help or leave the person alone to get help. Transport the person to help. Care for the person where you are until the person has recovered enough to travel on his or her own.
4. d
5. c
6. b
7. d
8. You are trekking with your hiking club in Greenleaf National Forest; and are now on a trail **about 5 miles from the main road**. As you are crossing **a stream**, a **group member slips and falls into the icy water**. You all help her out and sit her on the bank. **She is shivering violently** in the **cool breeze**. She says her **right knee is very painful and feels as if it is swelling**. You notice **overcast skies** and **estimate the temperature to be about 50° F** (10° C). The **sun will begin to set in about 4 hours**. **A group member gives you a sweater**, **which you substitute for the person's soaked jacket**. **Other group members provide clothing**.
9. Information you would share includes the person's name and condition; care given; names and contact information of all people in the group; resources available; and the plan for immediate and long-term care and survival.
10. Knowledge, skills and equipment.

Glossary

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

Abdomen: The middle part of the trunk, containing the stomach, liver, intestines and spleen.

Abrasion: The most common type of open wound; characterized by skin that has been rubbed or scraped away.

Absence seizure: A type of generalized seizure in which there are minimal or no movements; person may appear to have a blank stare; also known as petit mal or nonconvulsive seizure.

Absorbed poison: A poison that enters the body through the skin.

Acute: Having a rapid and severe onset, then quickly subsiding.

Addiction: The compulsive need to use a substance; stopping use would cause the user to suffer mental, physical and emotional distress.

Adhesive compress: A small pad of nonstick gauze on a strip of adhesive tape, applied directly to small injuries.

Advanced cardiac life support (ACLS): Techniques and treatments designed for use by EMS personnel with victims of cardiac emergencies.

Advanced emergency medical technician (AEMT): A person trained in emergency care, with the additional training to allow insertion of IVs, administration of medications, performance of advanced airway procedures, and setting up and assessing of electrocardiograms (ECGs or EKGs); formerly referred to as EMT-Intermediate.

Airway obstruction: Complete or partial blockage of the airway, which prevents air from reaching a person's lungs; the most common cause of respiratory emergencies.

Allergens: Substances that induce allergies.

Alzheimer's disease: The most common type of dementia in older people, in which thought, memory and language are impaired.

Amniotic sac: "Bag of waters"; sac that encloses the fetus during pregnancy and bursts during the birthing process.

Amputation: The complete removal or severing of an external body part.

Anaphylaxis: A form of distributive shock caused by an often sudden severe allergic reaction in which air passages may swell and restrict breathing; also referred to as anaphylactic shock.

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

Anatomy: The study of structures, including gross anatomy (structures that can be seen with the naked eye) and microscopic anatomy (structures seen under the microscope).

Aneurysm: An abnormal bulging of an artery due to weakness in the blood vessel; may occur in the aorta (main artery of the heart), brain, leg or other location.

Angina pectoris: Pain in the chest that comes and goes at different times; caused by a lack of oxygen reaching the heart.

Anorexia nervosa: An eating disorder characterized by a long-term refusal to eat food with sufficient nutrients and calories.

Antitoxins: Antibodies capable of neutralizing specific disease-producing poisonous substances.

Antivenin: A substance used to counteract the poisonous effects of venom.

Arteries: Large blood vessels that carry oxygen-rich blood from the heart to all parts of the body, except for the pulmonary arteries, which carry oxygen-poor blood from the heart to the lungs.

Aspirate: Inhale blood, vomit, saliva or other foreign material into the lungs.

Asthma: An ongoing condition in which the airways swell; the air passages can become constricted or blocked when affected by various triggers.

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

Atherosclerosis: A condition in which deposits of plaque, including cholesterol (a fatty substance made by the liver and found in foods containing animal products) build up on the inner walls of the arteries, causing them to harden and narrow, reducing the amount of blood that can flow through; develops gradually and can go undetected for many years.

Aura phase: The first stage of a generalized seizure, during which the person experiences perceptual disturbances, often visual or olfactory in nature.

Automated external defibrillator (AED): A portable electronic device that analyzes the heart's electrical rhythm and, if necessary, can deliver an electric shock to a person in cardiac arrest.

Avulsion: An injury in which a portion of the skin, and sometimes other soft tissue, is partially or completely torn away.

Bacteria: One-celled organisms that can cause infection; a common type of pathogen.

Bandage: Material used to wrap or cover a part of the body; commonly used to hold a dressing or splint in place.

Bandage compress: A thick gauze dressing attached to a gauze bandage.

Barriers to act: Reasons for not acting or for hesitating to act in an emergency situation.

Binder: A cloth wrapped around a person to securely hold the arm against the person's chest to add stability; also called a swathe.

Birth canal: The passageway from the uterus to the outside of the body through which a baby passes during birth.

Blood volume: The total amount of blood circulating within the body.

Body system: A group of organs and other structures that work together to carry out specific functions.

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

Braxton Hicks contractions: False labor; irregular contractions of the uterus that do not intensify or become more frequent as genuine labor contractions do.

Breathing emergency: An emergency in which breathing is impaired; can become life threatening; also called a respiratory emergency.

Breech birth: The delivery of a baby's feet or buttocks first.

Bronchitis: A disease resulting in inflammation of the lining of the trachea, bronchi and bronchioles.

Bulimia: An eating disorder characterized by eating excessively then purging unwanted calories by vomiting or using laxatives.

Burn: An injury to the skin or other body tissues caused by heat, chemicals, electricity or radiation.

Cannabis products: Substances such as marijuana and hashish that are derived from the *Cannabis sativa* plant; can produce feelings of elation, distorted perceptions of time and space, and impaired motor coordination and judgment.

Capillaries: Tiny blood vessels linking arteries and veins; they transfer oxygen and other nutrients from the blood to all body cells and remove waste products.

Cardiac arrest: A condition in which the heart has stopped beating or beats too irregularly or weakly to pump blood effectively.

Cardiopulmonary resuscitation (CPR): A technique that combines chest compressions and rescue breaths to circulate blood containing oxygen to the brain and other vital organs for a person whose heart and breathing have stopped.

Carpals: The bones of the wrist.

Cells: The basic units that combine to form all living tissue.

Cerebral palsy: A dysfunction of the central nervous system in which a person has little or no control of the muscles.

Certification: Credentialing at the local level; usually entails completing a probationary period and updating and/or recertification to cover changing knowledge and skills.

Cervix: The lower, narrow part of the uterus (womb) that forms a canal that opens into the vagina, which leads to the outside of the body; upper part of the birth canal.

Chest: The upper part of the trunk, containing the heart, major blood vessels and lungs.

Child abuse: Action that results in the physical or psychological harm of a child; can be physical, sexual, verbal and/or emotional.

Child neglect: The most frequently reported type of child abuse in which a parent or guardian fails to provide the necessary, age-appropriate care to a child; insufficient medical or emotional attention or respect given to a child.

Cholesterol: A fatty substance made by the liver and found in foods containing animal products; diets high in cholesterol contribute to the risk for heart disease.

Chronic: Persistent over a long period of time.

Chronic obstructive pulmonary disease (COPD): A progressive lung disease in which the person has difficulty breathing because of damage to the lungs; the airways become obstructed and alveolar sacs lose their ability to fill with air.

Circulatory system: A group of organs and other structures that carry oxygen-rich blood and other nutrients throughout the body and remove waste.

Clavicle: The collarbone; the slender, curved bone that extends from the sternum to the scapula (shoulder blade).

Clonic phase: The third phase of a generalized seizure, during which the person experiences the seizure itself.

Closed fracture: A type of fracture in which the skin over the broken bone is intact.

Closed wound: A wound in which soft tissue damage occurs beneath the skin and the skin is not broken.

Clotting: The process by which blood thickens at a wound site to seal an opening in a blood vessel and stop bleeding.

Compartment syndrome: Condition in which there is swelling and an increase in pressure within a limited space that presses on and compromises blood vessels, nerves and tendons that run through that limited space; usually involves the leg, forearm, arm, thigh, shoulder or buttock.

Competence: The injured or ill person's ability to understand the responder's questions and the implications of the decisions made.

Complex partial seizures: A type of partial seizure in which the person may experience an altered mental status or be unresponsive.

Concussion: A temporary loss of brain function caused by a blow to the head.

Consent: Permission to give care, given by the injured or ill person to the responder.

Contraction: During labor, the rhythmic tightening and relaxing of muscles in the uterus.

Contusion: An injury to the soft tissues that results in blood vessel damage (usually to capillaries) and leakage of blood into the surrounding tissues; caused when blood vessels are damaged or broken as the result of a blow to the skin, resulting in swelling and a reddish-purple discoloration on the skin; commonly referred to as a bruise.

Coronary arteries: Blood vessels that supply the heart muscle with oxygen-rich blood.

Coronary heart disease (CHD): A disease in which cholesterol and plaque build up on the inner walls of the arteries that supply blood to the heart; also called coronary artery disease (CAD).

Critical burn: Any burn that is potentially life threatening, disabling or disfiguring; a burn requiring advanced medical care.

Croup: A common upper airway virus that affects children under the age of 5.

Crowning: The phase during labor when the baby's head is visible at the opening of the vagina.

Crush injury: An injury to a body part, often an extremity, caused by a high degree of pressure; may result in serious damage to underlying tissues and cause bleeding, bruising, fracture, laceration and compartment syndrome.

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

Cyanotic: Bluish discoloration of the skin around the mouth or the fingertips resulting from a lack of oxygen in the blood.

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

Dependency: The desire or need to continually use a substance.

Depressant: A substance that affects the central nervous system and slows down physical and mental activity; can be used to treat anxiety, tension and high blood pressure.

Dermis: The deeper layer of skin; contains the nerves, sweat glands, oil glands and blood vessels.

Designer drugs: Potent and illegal street drugs formed from a medicinal substance whose drug composition has been modified (designed).

Diabetes: A disease in which there are high levels of blood glucose due to defects in insulin production, insulin action or both.

Diabetic coma: A life-threatening complication of diabetes in which very high blood sugar causes the person to become unconscious.

Diabetic emergency: A situation in which a person becomes ill because of an imbalance of insulin and sugar (glucose) in the bloodstream.

Diabetic ketoacidosis (DKA): An accumulation of organic acids and ketones (waste products) in the blood; occurs when there is inadequate insulin and high blood sugar levels.

Digestive system: A group of organs and other structures that digests food and eliminates wastes.

Direct contact transmission: Mode of transmission of pathogens that occurs through directly touching infected blood or body fluid, or other agents such as chemicals, drugs or toxins.

Direct pressure: Pressure applied on a wound to control bleeding.

Disability: The absence or impairment of motor, sensory or mental function.

Disaster: An event that causes widespread destruction, including possible large numbers of casualties; can be natural or man-made.

Disease transmission: The passage of a disease from one person to another.

Dislocation: The displacement of a bone from its normal position at a joint.

Distressed swimmer: A swimmer showing anxiety or panic; often identified as a swimmer who has gone beyond his or her swimming abilities.

Down syndrome: A condition caused by a genetic accident and characterized by varying degrees of mental retardation and physical defects.

Dressing: A pad placed directly over a wound to absorb blood and other body fluids and to prevent infection.

Drowning: An event in which a person experiences respiratory impairment due to submersion in water. Drowning may or may not result in death.

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

Elastic roller bandage: A bandage designed to keep continuous pressure on a body part; also called an elastic wrap.

Embedded object: An object that remains embedded in an open wound.

Embolus: A sudden blockage of a blood vessel by a traveling clot or other material, such as fat or air, that circulates in the bloodstream until it becomes lodged in a blood vessel.

Embryo: The term used to describe the early stage of development in the uterus from fertilization to the beginning of the third month.

Emergency: A situation requiring immediate action.

Emergency action steps: Three basic steps you should take in any emergency: **CHECK—CALL—CARE**.

Emergency medical dispatcher (EMD): A telecommunicator who has received special training to respond to a request for medical services via 9-1-1 or a local emergency number, and allocate appropriate resources to the scene of an emergency. Some EMDs are trained to provide pre-arrival medical instructions to a responder before more advanced medical personnel arrive.

Emergency medical responder (EMR): A person trained in emergency care who may be called on to give such care as a routine part of his or her job until more advanced medical personnel take over. EMRs can be paid or volunteer and often are the first trained professionals to respond to emergencies; formerly called “first responder.”

Emergency medical services (EMS) personnel: Trained and equipped community- based personnel who provide emergency care for injured or ill persons and who are often dispatched through 9-1-1 or the local emergency number.

Emergency medical services (EMS) system: A network of community resources and medical personnel that provides emergency care to people who are injured or suddenly become ill.

Emergency medical technician (EMT): A person who has successfully completed a state-approved emergency medical technician training program; EMTs take over care for the less-trained responder at the emergency scene and work on stabilizing and preparing the patient for transport; formerly referred to as EMT-Basic.

Emphysema: A chronic, degenerative lung disease in which there is damage to the alveoli.

Endocrine system: A group of organs and other structures that regulates and coordinates the activities of other systems by producing chemicals (hormones) that influence tissue activity.

Epidermis: The outer layer of skin; provides a barrier against bacteria and other organisms that can cause infection.

Epiglottitis: A serious bacterial infection that causes severe swelling of the epiglottis (the flap of tissue that covers the trachea during swallowing to keep food and liquid out of the lungs), which can result in a blocked airway, causing respiratory failure in children; may be fatal.

Epilepsy: A brain disorder characterized by recurrent seizures.

Expressed consent: Permission to receive emergency care granted by a competent adult either verbally or nonverbally; also referred to as consent.

External bleeding: Bleeding on the outside of the body; often, visible bleeding.

Extremity: A limb of the body; upper extremity is the arm; lower extremity is the leg.

Fainting: Temporary loss of consciousness; usually related to temporary insufficient blood flow to the brain; also known as syncope, "blacking out" or "passing out."

Febrile seizure: Seizure activity brought on by an excessively high fever in a young child or an infant.

Femoral arteries: The arteries that supply blood to the lower extremities.

Femur: The bone of the thigh.

Fetus: The term used to describe the stage of development in the uterus after the embryo stage, beginning at the start of the third month.

Fibula: One of the two bones of the lower leg.

First aid: Immediate care given to a person with an injury or sudden illness until more advanced care can be obtained.

Forearm: The part of the upper extremity from the elbow to the wrist.

Fracture: A break or disruption in bone tissue.

Frostbite: A condition in which body tissues freeze; most commonly occurs in the fingers, toes, ears and nose.

Full-thickness burn: A burn injury involving all layers of skin and underlying tissues; skin may be brown or charred, and underlying tissues may appear white; also referred to as a third-degree burn.

Gastric distention: A condition in which the abdomen becomes swollen with air.

Generalized tonic-clonic seizure: A seizure that affects most or all of the brain; types include petit mal and grand mal seizures.

Genitals: The external reproductive organs.

Genitourinary system: A group of organs and other structures that eliminates waste and enables reproduction.

Glucose: A simple sugar that is the primary source of energy for the body's tissues.

Good Samaritan laws: Laws that protect people who willingly give first aid without accepting anything in return.

Grand mal seizure: A type of generalized seizure; involves whole-body contractions with loss of consciousness.

Hallucinogen: A substance that affects mood, sensation, thinking, emotion and self-awareness; alters perception of time and space; and produces hallucinations or delusions.

Head-tilt/chin-lift technique: Technique used to open a person's airway by pushing down on the forehead while pulling up on the bony part of the jaw.

Hearing loss: Partial or total loss of hearing.

Heart attack: A sudden illness involving the death of heart muscle tissue when it does not receive oxygen-rich blood; also known as myocardial infarction.

Heat cramps: A form of heat-related illness; painful involuntary muscle spasms that occur during or after physical exertion in high heat, caused by loss of electrolytes and water from perspiration; may be a sign that a more serious heat-related illness is developing; usually affects the legs and abdomen.

Heat exhaustion: A more severe form of heat-related illness; results when fluid and electrolytes are lost through perspiration and are not replaced by other fluids; often results from strenuous work or wearing too much clothing in a hot, humid environment.

Heat stroke: The most serious form of heat-related illness; life-threatening and develops when the body's cooling mechanisms are overwhelmed and body systems begin to fail.

Hemorrhage: A loss of a large amount of blood in a short time or when there is continuous bleeding.

Humerus: The bone of the arm from the shoulder to the elbow.

Hyperglycemia: A condition in which too much sugar (glucose) is in the bloodstream, resulting in higher than normal blood glucose levels; also known as high blood glucose.

Hyperventilation: Rapid, deep or shallow breathing; usually caused by panic or anxiety.

Hypodermis: A layer of skin located beneath the dermis and epidermis; contains fat, blood vessels and connective tissues.

Hypoglycemia: A condition in which too little sugar (glucose) is in the bloodstream, resulting in lower than normal blood glucose levels; also known as low blood glucose.

Hypothalamus: Control center of the body's temperature; located in the brain.

Hypothermia: The state of the body being colder than the usual core temperature, caused by either excessive loss of body heat and/or the body's inability to produce heat.

Immobilize: To use a splint or other method to keep an injured body part from moving.

Impairment: Damage or reduction in quality, quantity, value or strength of a function.

Implied consent: Legal concept that assumes a person would consent to receive emergency care if he or she were physically able or old enough to do so.

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

Infection: A condition caused by disease-producing microorganisms, called pathogens or germs, in the body.

Inhalant: A substance, such as a medication, that a person inhales to counteract or prevent a specific condition; also a substance inhaled to produce mood-altering effects.

Ingested poison: A poison that is swallowed.

Inhaled poison: A poison that is breathed into the lungs.

Injected poison: A poison that enters the body through a bite, sting or syringe.

Injury: Damage that occurs when the body is subjected to an external force, such as a blow, a fall, a collision, an electrical current or temperature extremes.

Insulin: A hormone produced by the pancreas to help glucose move into cells; in persons with diabetes, it may not be produced at all or may not be produced in sufficient amounts.

Insulin shock: A life-threatening condition in which too much insulin is in the bloodstream.

Integumentary system: A group of organs and other structures that protects the body, retains fluids and helps to prevent infection.

Internal bleeding: Bleeding inside the body.

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

Kidney: An organ that filters waste from the blood to form urine.

Labor: The birth process, beginning with the contraction of the uterus and dilation of the cervix and ending with the stabilization and recovery of the mother.

Laceration: A cut, usually from a sharp object, that can have either jagged or smooth edges.

Lay responder: A layperson (someone who does not have special or advanced medical training or skill) who recognizes an emergency and decides to act.

Life-threatening emergency: An illness or injury that impairs a person's ability to circulate oxygenated blood to all the parts of his or her body.

Ligament: A fibrous band that holds bones together at a joint.

Lower extremity: The parts of the body from the hip to the toes.

Lower leg: The part of the lower extremity from the knee to the ankle.

Lyme disease: A disease transmitted by the deer tick and black-legged tick.

Manual stabilization: A technique used to achieve spinal motion restriction by manually supporting the person's head and neck in the position found *without* the use of any equipment.

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

Medical emergency: A sudden illness requiring immediate medical attention.

Medication: A drug given therapeutically to prevent or treat the effects of a disease or condition, or otherwise enhance mental or physical well-being.

Mental (cognitive) function: The brain's capacity to reason and process information.

Metabolism: The process by which cells convert nutrients to energy.

Metacarpals: The bones of the hand.

Metatarsals: The bones of the foot.

Motor function: The ability to move the body or a body part.

Motor impairment: The total or partial inability to move or to use a body part.

Mucous plug: A collection of mucous that blocks the opening of the cervix and is expelled, usually toward the end of the pregnancy when the cervix begins to dilate.

Multiple sclerosis: A progressive disease characterized by nerve degeneration and patches of hardened tissue in the brain or spinal cord.

Muscle: A tissue that contracts and relaxes to create movement.

Muscular dystrophy: A hereditary disease characterized by progressive deterioration of muscles, leading to disability, deformity and loss of strength.

Musculoskeletal system: A group of tissues and other structures that supports the body, protects internal organs, allows movement, stores minerals, manufactures blood cells and creates heat.

Narcotic: A drug derived from opium or opium-like compounds; used to reduce pain and can alter mood and behavior.

Nervous system: A group of organs and other structures that regulates all body functions.

Nitroglycerin: A prescribed medication, often in tablet form, given for the prevention or relief of angina pectoris.

Non-life-threatening emergency: A situation that does not have an immediate impact on a person's ability to circulate oxygenated blood, but still requires medical attention.

Occlusive dressing: A special type of dressing that does not allow air or fluid to pass through.

Open fracture: A type of fracture in which there is an open wound in the skin over the fracture.

Open wound: An injury resulting in a break in the skin's surface.

Organ: A structure of similar tissues acting together to perform specific body functions.

Osteoporosis: The gradual, progressive weakening of bone.

Overdose: The use of an excessive amount of a substance, resulting in adverse reactions ranging from mania (mental and physical hyperactivity) and hysteria to coma and death.

Paralysis: A loss of muscle control; a permanent loss of feeling and movement; the inability to move.

Paramedic: A person with more in-depth training than AEMTs and who can perform all of the duties of an AEMT plus has additional knowledge of more invasive procedures than any other prehospital care provider; formerly referred to as EMT-Paramedic.

Partial seizure: A seizure that affects only part of the brain; may be simple or complex.

Partial-thickness burn: A burn injury involving the epidermis and dermis, characterized by red, wet skin and blisters; also referred to as a second-degree burn.

Patella: The kneecap.

Pathogen: A term used to describe a germ; a disease-causing agent (e.g., bacterium or virus).

Pelvis: The lower part of the trunk, containing the intestines, bladder and internal reproductive organs.

Personal protective equipment: The equipment and supplies that help prevent the responder from directly contacting infected materials; includes gloves, gowns, masks, shields and protective eyewear.

Phalanges: The bones of the fingers and toes.

Physiology: How living organisms function (e.g., movement and reproduction).

Placenta: An organ attached to the uterus and unborn baby through which nutrients are delivered; expelled after the baby is delivered.

Plasma: The liquid part of the blood.

Platelets: Disk-shaped structures in the blood that are made of cell fragments; help stop bleeding by forming blood clots at wound sites.

Poison: Any substance that can cause injury, illness or death when introduced into the body, especially by chemical means.

Poison control center (PCC): A specialized health center that provides information on poisons or suspected poisoning emergencies.

Post-ictal phase: The final phase of a generalized seizure, during which the person becomes extremely fatigued.

Pregnancy: Begins when an egg (ovum) is fertilized by a sperm, forming an embryo.

Prehospital care: Emergency medical care provided before a person arrives at a hospital or medical facility.

Pressure bandage: A bandage applied snugly to create pressure on a wound to help control bleeding.

Prolapsed umbilical cord: A complication of childbirth in which a loop of umbilical cord protrudes through the vagina before delivery of the baby.

Puncture/penetration wound: A type of wound that results when the skin is pierced with a pointed object.

Rabies: An infectious viral disease that affects the nervous system of humans and other mammals; has a high fatality rate if left untreated.

Radius: One of the two bones of the forearm.

Reaching assist: A method of rescuing someone in the water by using an object to extend the rescuer's reach or by reaching with an arm or leg.

Refusal of care: The declining of care by a competent person; a person has the right to refuse the care of anyone who responds to an emergency scene.

Remote: Far away from populated areas or resources.

Reproductive system: A group of organs and other structures that enables sexual reproduction.

Respiratory arrest: A condition in which breathing has stopped.

Respiratory distress: A condition in which a person is having difficulty breathing or requires extra effort to breathe.

Respiratory system: A group of organs and other structures that brings air into the body and removes wastes through a process called breathing, or respiration.

Reye's syndrome: An illness brought on by high fever that affects the brain and other internal organs; can be caused by the use of aspirin in children and infants.

Rib cage: The cage of bones formed by the 12 pairs of ribs, the sternum and the spine.

Risk factors: Conditions or behaviors that increase the chance that a person will develop a disease.

Rocky Mountain spotted fever: A disease caused by the transmission of microscopic bacteria from the wood tick or dog tick host.

Roller bandage: A bandage made of gauze or gauze-like material that is wrapped around a body part, over a dressing, using overlapping turns until the dressing is covered.

Saturated fat: The fat in animal tissue and products.

Scapula: The shoulder blade.

Sensory function: The ability to see, hear, touch, taste and smell.

Shock: A life-threatening emergency that occurs when the circulatory system fails to provide adequate oxygenated blood to all parts of the body.

Simple partial seizure: A seizure in which a specific body part experiences muscle contractions; does not affect memory or awareness.

Skeletal muscles: Muscles that attach to the bones.

Soft tissues: Body structures that include the layers of skin, fat and muscles.

Spinal column: See *spine*.

Spinal cord: A cylindrical structure extending from the base of the skull to the lower back, consisting mainly of nerve cells and protected by the spinal column.

Spine: The series of vertebrae extending from the base of the skull to the tip of the tailbone (coccyx); also referred to as the spinal column or the vertebral column.

Splint: A device used to immobilize body parts.

Sprain: The partial or complete tearing or stretching of ligaments and other soft tissue structures at a joint.

Sternum: The long, flat bone in the middle of the front of the rib cage; also called the breastbone.

Standard precautions: Safety measures taken to prevent exposure to blood and body fluids when giving care to injured or ill persons; assumes that all body fluids, secretions and excretions (except sweat) are potentially infective.

Status epilepticus: An epileptic seizure (or repeated seizures) that lasts longer than 5 minutes without any sign of slowing down; should be considered life-threatening and requires prompt advanced medical care.

Stimulant: A substance that affects the central nervous system and speeds up physical and mental activity.

Stoma: A surgical opening created in the front of the neck following surgery on the trachea to allow the person to breathe.

Strain: The excessive stretching and tearing of muscles or tendons; a pulled or torn muscle.

Stroke: A disruption of blood flow to a part of the brain, which may cause permanent damage to brain tissue; also called a cerebrovascular accident (CVA).

Substance abuse: The deliberate, persistent, excessive use of a substance without regard to health concerns or accepted medical practices.

Substance misuse: The use of a substance for unintended purposes or for intended purposes but in improper amounts or doses.

Sudden illness: A physical condition requiring immediate medical attention.

Sudden infant death syndrome (SIDS): The sudden death of an infant younger than 1 year that remains unexplained after the performance of a complete postmortem investigation.

Superficial burn: A burn injury involving only the top layer of skin, the epidermis, characterized by red, dry skin; also referred to as a first-degree burn.

Syncope: A term used to describe the loss of consciousness; also known as fainting.

Synergistic effect: The outcome created when two or more drugs are combined; the effects of each may enhance those of the other.

Tarsals: The bones of the ankle.

Tendon: A fibrous band that attaches muscle to bone.

Tetanus: An acute infectious disease caused by a bacterium that produces a powerful poison; can occur in puncture wounds, such as human and animal bites; also called lockjaw.

Thigh: The part of the lower extremity from the pelvis to the knee.

Thrombus: A blood clot that forms in a blood vessel and remains there, slowing the flow of blood and depriving tissues of normal blood flow and oxygen.

Throwing assist: A method of rescuing someone in the water by throwing the person a floating object, with or without a line attached.

Tibia: One of the two bones of the lower leg.

Tissue: A collection of similar cells acting together to perform specific body functions.

Tolerance: The condition in which the effects of a substance on the body decrease as the result of continued use.

Tonic Phase: The second phase of a generalized seizure, during which a person becomes unconscious and muscles become rigid.

Tourniquet: A tight, wide band placed around an arm or a leg to constrict blood vessels in order to stop blood flow to a wound.

Transient ischemic attack (TIA): A condition that produces stroke-like symptoms but causes no permanent damage; may be a precursor to stroke; sometimes called a mini-stroke.

Ulna: One of the two bones of the forearm.

Umbilical cord: A flexible structure that attaches the placenta to the fetus, allowing for the passage of blood, nutrients and waste.

Upper arm: The part of the upper extremity from the shoulder to the elbow.

Upper extremity: The parts of the body from the shoulder to the fingers.

Urinary system: A group of organs and other structures that eliminates waste products from the blood.

Uterus: A pear-shaped organ in a woman's pelvis in which an embryo forms and develops into a baby; also called the womb.

Veins: Blood vessels that carry oxygen-poor blood from all parts of the body to the heart, except for the pulmonary veins, which carry oxygen-rich blood to the heart from the lungs.

Ventricular fibrillation (V-fib): A life-threatening heart rhythm in which the heart is in a state of totally disorganized electrical activity, and does not pump blood effectively.

Ventricular tachycardia (V-tach): A life-threatening heart rhythm in which there is very rapid contraction of the ventricles, and the heart does not pump blood at all.

Vertebrae: The 33 bones of the spine.

Vertebral column: See *spine*.

Virus: A common type of pathogen that depends on other organisms to live and reproduce; can be difficult to kill.

Vision loss: Partial or total loss of sight.

Vital organs: Those organs whose functions are essential to life, including the brain, heart and lungs.

Wading assist: A method of rescuing someone in the water by wading out to the person in distress.

Wheezing: A high-pitched whistling sound heard during inhalation but heard most loudly on exhalation; an abnormal breath sound that can often be heard without a stethoscope.

Wilderness: An area that is uninhabited by human beings, is uncultivated and has been left in its natural condition.

Withdrawal: The condition of mental and physical discomfort produced when a person stops using or abusing a substance to which he or she is addicted.

Wound: An injury to the soft tissues.

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