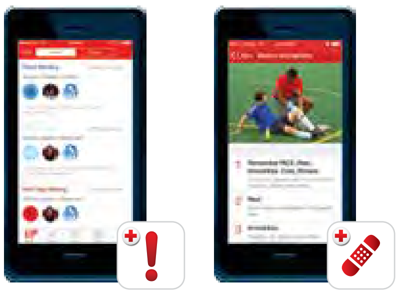
Emergency Medical Response

American Red Cross

Complement your training with the resources you'll need that will keep you knowledgeable, confident, and ready to respond. From our mobile apps to the Red Cross store with best-in-class products, ensure you have the tools to quickly assist during emergency situations.



Help is in your hand with mobile apps

Red Cross apps provide you with the information to help you be prepared—whether it's everyday safety tools, tips and preparedness information or what actions to take during a natural disaster or first aid emergency.

- The Emergency App covers 35 severe weather and emergency alerts.
- The First Aid App gives you instant help for the most common first aid emergencies.

Go to redcross.org/emergencyapps to learn more.

Get equipped at the Red Cross Store

You'll find the products you need to be prepared for any emergency:

- First aid kits and refills
- CPR keychains and lifeguard rescue tubes
- First Aid and other reference guides
- Emergency preparedness kits and products

You'll also find apparel and even gift ideas for the family, friends and neighbors who want to be ready and prepared.

Plus, a portion of proceeds from the sale of all store products helps to fund the lifesaving mission of the American Red Cross.

Shop at redcrossstore.org/classproducts.

Access your digital certificate anytime, anywhere

The American Red Cross makes certification fast, simple and easy. With Red Cross Digital Certificates you get anytime, anywhere access to your certificates; plus print, share, and download wherever and whenever you like. Each certificate includes a unique ID and a QR code which meets employment requirements and allows employers to easily confirm your certificate is valid.

Learn more about how to access your digital certificate at redcross.org/myclasscert.

American Red Cross

Emergency Medical Response

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

Published by The StayWell Company, LLC

Printed in the United States of America

ISBN: 978-1-58480-692-9

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.

The care steps outlined in this textbook are consistent with the:

- 2015 International Consensus on CPR and Emergency Cardiovascular Care (ECC) Science with Treatment Recommendations.
- 2015 American Heart Association Guidelines Update for CPR and ECC.
- 2015 American Heart Association and American Red Cross Guidelines Update for First Aid.

This course meets or exceeds National Emergency Medical Services Education Standards Emergency Medical Responder Instructional Guidelines.

American Red Cross Scientific Advisory Council

Guidance for the Emergency Medical Response program was provided by members of the American Red Cross Scientific Advisory Council.

The Council is a panel of nationally recognized experts drawn from a wide variety of scientific, medical and academic disciplines. The Council provides authoritative guidance on first aid, CPR, emergency treatments, rescue practices, emergency preparedness, aquatics, disaster health, nursing, education and training.

For more information on the Scientific Advisory Council, visit redcross.org/science.

Emergency Medical Response Content Direction

The American Red Cross team for this edition included:

Jonathan Epstein
Senior Director
Science & Content Development

Joshua Rowland
Product Manager
Healthcare Product Management

Table of Contents

Detailed Table of Contents

UNIT 2: ASSESSMENT

UNIT 6: TRAUMA EMERGENCIES

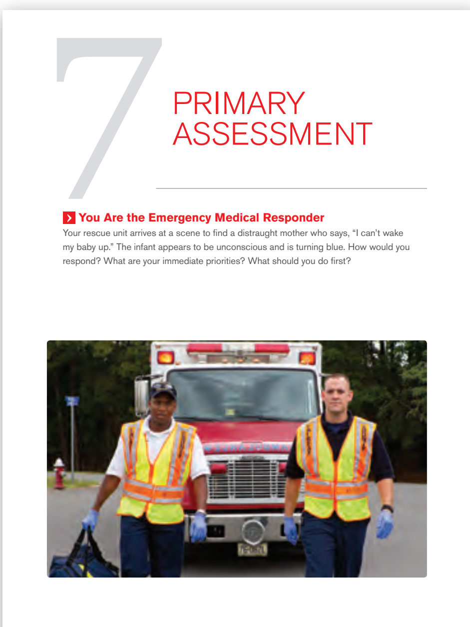
Key Features

The American Red Cross Emergency Medical Response program is designed to be a flexible training solution and is part of a comprehensive suite of high-quality health and safety training programs offered by one of the most respected brands in the world.

This program has been completely revised to reflect the latest science in first aid, CPR and cardiovascular care. The course has also been redesigned to align with updated EMS Educational Standards.

This *Emergency Medical Response* textbook has also been revised with instructors' and participants' needs in mind. The new affordable, user-friendly training materials enrich the learning experience for EMRs at every level. The new course includes:

- An interactive course format featuring rescue scenarios and hands-on exercises.
- Fully updated participant materials, including a textbook and workbook.


7 PRIMARY ASSESSMENT

You Are the Emergency Medical Responder

Your rescue unit arrives at a scene to find a distraught mother who says, "I can't wake my baby up." The infant appears to be unconscious and is turning blue. How would you respond? What are your immediate priorities? What should you do first?

You Are the Emergency Medical Responder

At the start of each chapter, readers will find a unique, real-life scenario description that features an emergency involving different EMRs. Readers are asked to assess the situation and are prompted to think about what should be done. These scenarios help frame what will be discussed in the chapter, and encourage the participant to start thinking about what to do and the proper sequence in a given emergency. A concluding scenario at the end of each chapter builds on the opening scenario and allows readers to apply the knowledge and skills gained to help answer the questions posed.

KEY TERMS

Agonal breaths: Isolated or infrequent gasping in the absence of normal breathing in an unconscious person; can occur after the heart has stopped beating. Agonal breaths are not normal breathing and are considered a sign of cardiac arrest.

Airway: The pathway for air from the mouth and nose through the pharynx, larynx and trachea and into the lungs.

AVPU: Mnemonic describing the four levels of patient response: Alert, Verbal, Painful and Unresponsive.

Brachial artery: The main artery of the upper arm; runs from the shoulder down to the bend of the elbow.

Breathing rate: Term used to describe the number of breaths per minute.

Capillary refill: A technique for estimating how the body is reacting to injury or illness by checking the ability of the capillaries to refill with blood.

Carotid artery: The major artery located on either side of the neck that supplies blood to the brain.

CPR breathing barrier: Device that allows for ventilations without direct mouth-to-mouth contact between the responder and the patient; includes resuscitation masks, face shields and bag-valve-mask (BVM) resuscitators.

Cyanotic: Showing bluish discoloration of the skin, nailbeds and mucous membranes due to insufficient levels of oxygen in the blood.

Glasgow Coma Scale (GCS): A measure of level of consciousness (LOC) based on eye opening, verbal response and motor response.

Head-tilt/chin-lift maneuver: A common method for opening the airway unless the patient is suspected of having an injury to the head, neck or spine.

Hypoxic: Having below-normal concentrations of oxygen in the organs and tissues of the body.

Jaw-thrust (without head extension) maneuver: A maneuver for opening the airway in a patient suspected of having an injury to the head, neck or spine.

Level of consciousness (LOC): A person's state of awareness, ranging from being fully alert to unconscious; also referred to as mental status.

Minute volume: The amount of air breathed in a minute; calculated by multiplying the volume of air inhaled at each breath (in mL) by the number of breaths per minute.

Perfusion: The circulation of blood through the body or through a particular body part for the purpose of exchanging oxygen and nutrients with carbon dioxide and other wastes.

Primary (initial) assessment: A check for conditions that are an immediate threat to a patient's life.

Pulse: The beat felt from each rhythmic contraction of the heart.

Respiratory arrest: A condition in which there is an absence of normal breathing.

Respiratory distress: A condition in which a person is having difficulty breathing or requires extra effort to breathe.

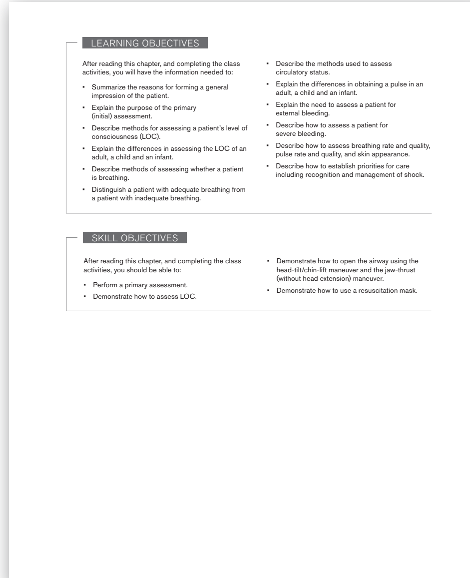
Signs: Term used to describe any observable evidence of injury or illness, such as bleeding or unusual skin color.

Signs of life: A term sometimes used to describe normal breathing and a pulse in an unresponsive patient.

Stoma: A surgical opening in the body; a stoma may be created in the neck following surgery on the trachea to allow the patient to breathe.

Symptoms: What the patient reports experiencing, such as pain, nausea, headache or shortness of breath.

Vital signs: Important information about the patient's condition obtained by checking respiratory rate, pulse and blood pressure.



LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Summarize the reasons for forming a general impression of the patient.
- Explain the purpose of the primary (initial) assessment.
- Describe methods for assessing a patient's level of consciousness (LOC).
- Explain the differences in assessing the LOC of an adult, a child and an infant.
- Describe methods of assessing whether a patient is breathing.
- Distinguish a patient with adequate breathing from a patient with inadequate breathing.
- Describe the methods used to assess circulatory status.
- Explain the differences in obtaining a pulse in an adult, a child and an infant.
- Explain the need to assess a patient for external bleeding.
- Describe how to assess a patient for severe bleeding.
- Describe how to assess breathing rate and quality, pulse rate and quality, and skin appearance.
- Describe how to establish priorities for care including recognition and management of shock.

SKILL OBJECTIVES

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

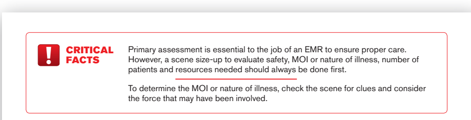
- Perform a primary assessment.
- Demonstrate how to assess LOC.
- Demonstrate how to open the airway using the head-tilt/chin-lift maneuver and the jaw-thrust (without head extension) maneuver.
- Demonstrate how to use a resuscitation mask.

Key Terms and Glossary

A list of the key terms that most EMS personnel should be familiar with appears at the beginning of each chapter. These key terms are in ***boldface italics*** the first time they are explained in the chapter and also appear in the glossary.

Learning Objectives and Skill Objectives

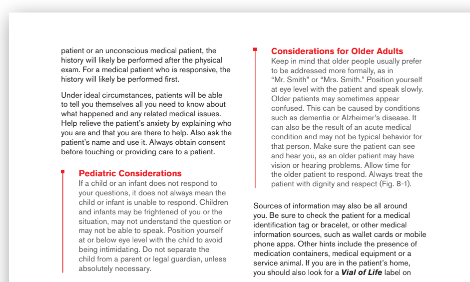
These objectives represent the key material covered in the chapter, as well as the skills in which the participants will be trained.



CRITICAL FACTS

Primary assessment is essential to the job of an EMR to ensure proper care. However, a scene size-up to evaluate safety, MOI or nature of illness, number of patients and resources needed should always be done first.

To determine the MOI or nature of illness, check the scene for clues and consider the force that may have been involved.



patient or an unconscious medical patient, the history will likely be performed after the physical exam. For a medical patient who is responsive, the history will likely be performed first.

Under ideal circumstances, patients will be able to tell you themselves all you need to know about what happened and any related medical issues. Help relieve the patient's anxiety by explaining who you are and that you are there to help. Also ask the patient's name and use it. Always obtain consent before touching or providing care to a patient.

Pediatric Considerations

If a child or an infant does not respond to your questions, it does not always mean the child or infant is unable to respond. Children and infants may be frightened of you or the situation, may not understand the question or may not be able to speak. Position yourself at or below eye level with the child to avoid being intimidating. Do not separate the child from a parent or legal guardian, unless absolutely necessary.

Considerations for Older Adults

Keep in mind that older people usually prefer to be addressed more formally, as in "Mr. Smith" or "Mrs. Smith." Position yourself at eye level with the patient and speak slowly. Older patients may sometimes appear confused. This can be caused by conditions such as dementia or Alzheimer's disease. It can also be the result of an acute medical condition and may not be typical behavior for that person. Make sure the patient can see and hear you, as an older patient may have vision or hearing problems. Allow time for the older patient to respond. Always treat the patient with dignity and respect (Fig. 8-1).

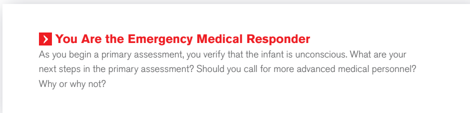
Sources of information may also be all around you. Be sure to check the patient for a medical identification tag or bracelet, or other medical information sources, such as wallet cards or mobile phone apps. Other hints include the presence of medication containers, medical equipment or a service animal. If you are in the patient's home, you should also look for a ***Vial of Life*** label on

Critical Facts

Brief summaries of crucial parts of the chapter are called out for quick and easy reference.

Pediatric Considerations and Considerations for Older Adults

Focus on considerations in the pediatric and older adult populations EMRs should be aware of when responding to an emergency.



You Are the Emergency Medical Responder

As you begin a primary assessment, you verify that the infant is unconscious. What are your next steps in the primary assessment? Should you call for more advanced medical personnel? Why or why not?

Putting It All Together

A wrap-up for each chapter, touching on the key objectives and points covered.

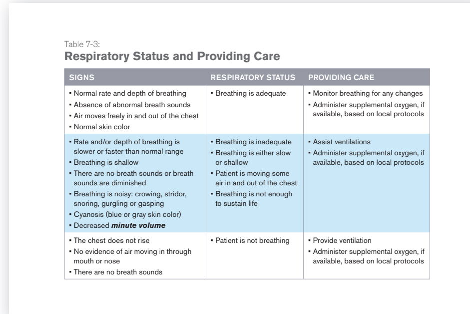
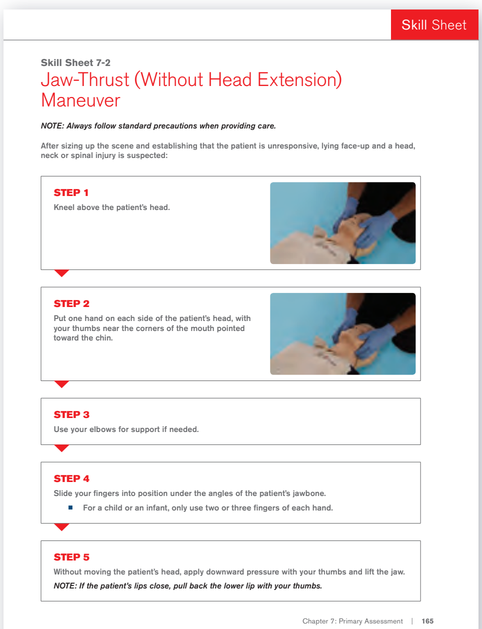


Table 7-3:
Respiratory Status and Providing Care

SIGNS	RESPIRATORY STATUS	PROVIDING CARE
▪ Normal rate and depth of breathing ▪ Absence of abnormal breath sounds ▪ Air moves freely in and out of the chest ▪ Normal skin color	▪ Breathing is adequate	▪ Monitor breathing for any changes ▪ Administer supplemental oxygen, if available, based on local protocols
▪ Rate and/or depth of breathing is slower or faster than normal range ▪ Breathing is shallow ▪ There are no breath sounds or breath sounds are diminished ▪ Breathing is noisy: crowing, stridor, snoring, gurgling or gasping ▪ Cyanosis (blue or gray skin color) ▪ Decreased ***minute volume***	▪ Breathing is inadequate ▪ Breathing is either slow or shallow ▪ Patient is moving some air in and out of the chest ▪ Breathing is not enough to sustain life	▪ Assist ventilations ▪ Administer supplemental oxygen, if available, based on local protocols
▪ The chest does not rise ▪ No evidence of air moving in through mouth or nose ▪ There are no breath sounds	▪ Patient is not breathing	▪ Provide ventilation ▪ Administer supplemental oxygen, if available, based on local protocols

Tables

Clear, visual presentation of certain key information.



Skill Sheet

Skill Sheet 7-2
Jaw-Thrust (Without Head Extension) Maneuver

NOTE: Always follow standard precautions when providing care.

After sizing up the scene and establishing that the patient is unresponsive, lying face-up and a head, neck or spinal injury is suspected:

STEP 1
Kneel above the patient's head.

STEP 2
Put one hand on each side of the patient's head, with your thumbs near the corners of the mouth pointed toward the chin.

STEP 3
Use your elbows for support if needed.

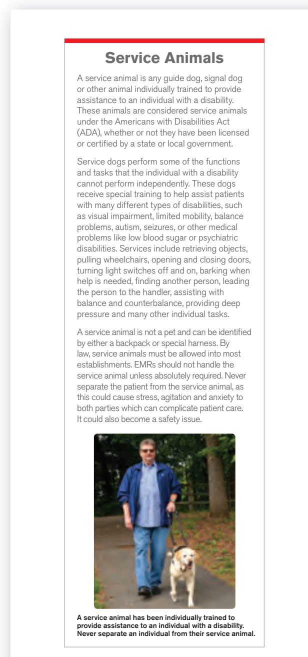
STEP 4
Slide your fingers into position under the angles of the patient's jawbone.
- For a child or an infant, only use two or three fingers of each hand.

STEP 5
Without moving the patient's head, apply downward pressure with your thumbs and lift the jaw.
NOTE: If the patient's lips close, pull back the lower lip with your thumbs.

Chapter 7: Primary Assessment | 165

Skill Sheets

Step-by-step visual directions for performing specific skills that participants will need to know in order to provide appropriate care.



Service Animals

A service animal is any guide dog, signal dog or other animal individually trained to provide assistance to an individual with a disability. These animals are considered service animals under the Americans with Disabilities Act (ADA), whether or not they have been licensed or certified by a state or local government.

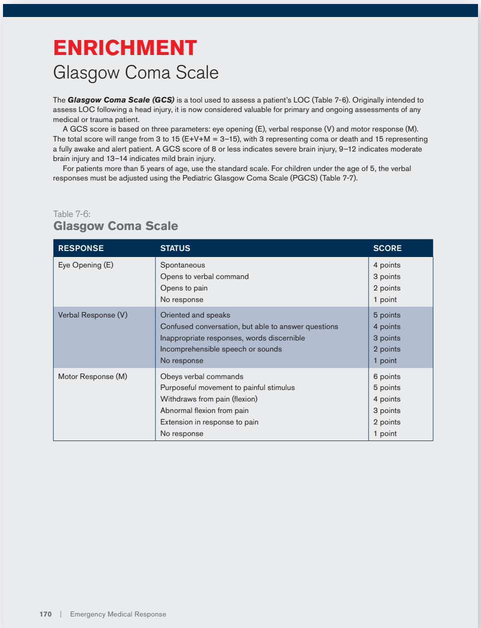
Service dogs perform some of the functions and tasks that the individual with a disability cannot perform independently. These dogs receive special training to help assist patients with many different types of disabilities, such as visual impairment, limited mobility, balance problems, autism, seizures, or other medical problems like low blood sugar or psychiatric disabilities. Services include retrieving objects, pulling wheelchairs, opening and closing doors, turning light switches off and on, barking when help is needed, finding another person, leading the person to the handler, assisting with balance and counterbalance, providing deep pressure and many other individual tasks.

A service animal is not a pet and can be identified by either a backpack or special harness. By law, service animals must be allowed into most establishments. EMRs should not handle the service animal unless absolutely required. Never separate the patient from the service animal, as this could cause stress, agitation and anxiety to both parties which can complicate patient care. It could also become a safety issue.

A service animal has been individually trained to provide assistance to an individual with a disability. Never separate an individual from their service animal.

Sidebars

Supplementary information that enriches participant knowledge and understanding of the chapter material.



ENRICHMENT

Glasgow Coma Scale

The ***Glasgow Coma Scale (GCS)*** is a tool used to assess a patient's LOC (Table 7-6). Originally intended to assess LOC following a head injury, it is now considered valuable for primary and ongoing assessments of any medical or trauma patient.

A GCS score is based on three parameters: eye opening (E), verbal response (V) and motor response (M). The total score will range from 3 to 15 (E+V+M = 3–15), with 3 representing coma or death and 15 representing a fully awake and alert patient. A GCS score of 8 or less indicates severe brain injury, 9–12 indicates moderate brain injury and 13–14 indicates mild brain injury.

For patients more than 5 years of age, use the standard scale. For children under the age of 5, the verbal responses must be adjusted using the Pediatric Glasgow Coma Scale (PGCS) (Table 7-7).

Table 7-6:
Glasgow Coma Scale

RESPONSE	STATUS	SCORE
Eye Opening (E)	Spontaneous Opens to verbal command Opens to pain No response	4 points 3 points 2 points 1 point
Verbal Response (V)	Oriented and speaks Confused conversation, but able to answer questions Inappropriate responses, words discernible Incomprehensible speech or sounds No response	5 points 4 points 3 points 2 points 1 point
Motor Response (M)	Obeys verbal commands Purposeful movement to painful stimulus Withdraws from pain (flexion) Abnormal flexion from pain Extension in response to pain No response	6 points 5 points 4 points 3 points 2 points 1 point

170 | Emergency Medical Response

Enrichment

Areas of additional information and skills participants will find valuable.

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 HIV, the virus that causes many severe infections, including 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, they 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 they can provide one for you. You will not be asked to explain why you made this request. The manikin will not be used by anyone else until it has been cleaned according to the recommended 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 with 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 (1/4 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.

UNIT 1

Preparatory

1

THE EMERGENCY MEDICAL RESPONDER

You Are the Emergency Medical Responder

A terrified mother pulls her child from the bottom of a pool while a neighbor calls 9-1-1 for help. You are the first to arrive at the scene and see the neighbor trying to breathe air into the boy's limp body. The mother looks to you helplessly. How would you respond?

KEY TERMS

Advanced emergency medical technician (AEMT): A person trained to give basic and limited advanced emergency medical care and transportation for critical and emergent patients who access the emergency medical services (EMS) system.

Certification: Certification is achieved by obtaining and maintaining the National EMS Certification (or state certification), taking an approved EMS course and meeting other requirements; this does not grant the right to practice as licensure may in some states.

Direct medical control: A type of medical direction, also called "on-line," "base-station," "immediate" or "concurrent medical control"; under this type of medical direction, the physician speaks directly with emergency care providers at the scene of an emergency.

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

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

Emergency medical technician (EMT): A person who gives basic emergency medical care and transportation for critical and emergent patients who access the EMS system; EMTs are typically authorized to function after completing local and state certification requirements; formerly referred to as EMT-Basic.

Indirect medical control: A type of medical direction, also called "off-line," "retrospective" or "prospective" medical control; this type of medical direction includes education, protocol review and quality improvement for emergency care providers.

Licensure: Required acknowledgment that the bearer has permission to practice in the licensing state; offers the highest level of public protection; may be revoked at the state level should the bearer no longer meet the required standards.

Local credentialing: Local requirements EMRs must meet in order to maintain employment or obtain certain protocols so that they may practice.

Medical direction: The monitoring of care provided by out-of-hospital providers to injured or ill persons, usually by a medical director.

Medical director: A physician who provides oversight and assumes responsibility for the care of injured or ill persons provided in out-of-hospital settings.

Paramedic: An allied health professional whose primary focus is to give advanced emergency medical care for critical and emergent patients who access the EMS system. Paramedics may also give nonemergency, community-based care based on state and local community paramedicine or mobile integrated healthcare programs.

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

Protocols: Standardized procedures to be followed when providing care to injured or ill persons.

Scope of practice: The range of duties and skills that are allowed and expected to be performed when necessary, according to the professional's level of training, while using reasonable care and skill.

Standing orders: Protocols issued by the medical director allowing specific skills to be performed or specific medications to be administered in certain situations.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Summarize the history and origins of the emergency medical services (EMS) system.
- Describe the components of an EMS system, and discuss factors related to "right to practice."
- Explain the different levels of EMS training.
- Discuss the continuity of care and the importance of working with other responders.
- Define who an emergency medical responder (EMR) is.
- List the roles and responsibilities of an EMR.
- Describe the personal characteristics and professional behavior expected of an EMR.
- Discuss medical oversight.
- Discuss factors related to the "right to practice."

INTRODUCTION

The ***emergency medical services (EMS) system***, along with its front-line-trained emergency medical responders (EMRs), plays a vital role in the health and safety of the population. By providing emergency services rapidly and effectively, EMRs save many lives and minimize damage caused by injuries.

The role of the EMR can vary, however, depending on the state and the location of practice. It is important for every EMR to understand the role of practice and any limitations, to be able to provide timely and skillful care.

As an EMR, you provide a link between the first actions of bystanders and more advanced care. An EMR is a person trained in emergency care, paid or volunteer, who is often summoned to provide initial care in an emergency (Fig. 1-1).

As the first trained professional on the scene, your actions are often critical. They may determine whether a seriously injured or ill person survives.

By taking this course, you will gain the knowledge, skills and confidence to provide appropriate care when you are called upon to help a person who has sustained an injury or sudden illness. You will learn how to assess a patient's condition and how to recognize and care for life-threatening emergencies. You will also learn how to minimize a patient's discomfort and prevent further complications until more advanced medical personnel take over.

THE EMS SYSTEM

History and Origins

In the early 1960s in the United States, firefighters in some regions were taught how to perform CPR and basic first aid. There were two reasons for this. First, it prepared them to provide emergency care to colleagues injured in action. Second, because firefighters are based in communities all across the country, they were a practical choice to be available to answer emergency calls.

Fig. 1-1: As the first trained professional on the scene, an EMR's actions are often critical.

CRITICAL FACTS

As the first trained professional on the scene, your actions are often critical. They may determine whether a seriously injured or ill person survives or has a long-term disability.

Although some firefighters received training in CPR and first aid, there was no organized EMS network in the early 1960s. This meant that there was no standardized or regulated training to ensure comparable emergency care education between the different regions.

This patchwork of resources resulted in response times and quality of care that differed between locations. Also, by not having a directed, formal EMS system, educational requirements differed by location.

In 1966, the National Academy of Sciences/National Research Council (NAS/NRC) documented the problem in a white paper that found the quality of emergency care in the United States to be dismal. Entitled "Accidental Death and Disability: The Neglected Disease of Modern Society," the white paper criticized both ambulance services and hospital emergency departments. In response to this white paper, in 1973, the U.S. Congress enacted the Emergency Medical Services Act, which created a multi-tiered, nationwide system of emergency healthcare. Among other things, the legislation called for standardized training within the EMS system.

The EMS System Today

Types of Systems

Today, several types of EMS services operate in the United States:

- Fire-based services: These services are operated directly by a local, county or regional fire-rescue department. Approximately half of all communities in the United States depend on fire departments to provide emergency services.
- Private services: These are for-profit and not-for-profit companies that have been hired (often on a contract basis) by local governmental agencies to perform EMS services in specific geographic areas.
- Hospital-based services: These services are those that are backed up, monitored and run by a local hospital.
- Third services: These are provided by community-based EMS departments that are not a subset of a fire or police department. Many large cities employ the third-service model.
- Other systems: These include other police and private systems that do not fit one of the models above, such as a private corporate response system servicing an industrial complex.

At each of these levels, the delivery of care may be different, but the goal is always the same: to provide care according to community needs and resources.

Regulating Agencies

Working with federal partners, the National Highway Traffic Safety Administration's (NHTSA) Office of EMS advances a national vision for EMS through projects and research, fosters collaboration among federal agencies involved in EMS planning, measures the health of the nation's EMS systems, and delivers the data EMS leaders need to help advance their systems. Its mission is to reduce death and disability by providing leadership and coordination to the EMS community in assessing, planning, developing and promoting comprehensive, evidence-based emergency medical services and 9-1-1 systems.

In addition to NHTSA's oversight of the EMS system, each state and territory has a lead EMS office of its own. These can fall under the individual state health or public safety department. In some states, the EMS office is independent.

State EMS agencies are responsible for the overall planning, coordination and regulation of the EMS system within the state as well as licensing or certifying EMS providers.

Their responsibilities may include leading statewide trauma systems; licensing and certifying EMS services, vehicles and personnel; developing and enforcing statewide protocols for EMS providers in addition to the national requirements; administering or coordinating regional EMS programs; operating or coordinating statewide communications systems; coordinating and distributing federal and state grants; and planning and coordinating disaster and mass casualty responses, as well as homeland security medical initiatives.

CRITICAL FACTS

State EMS agencies are responsible for the overall planning, coordination and regulation of the EMS system within the state as well as licensing or certifying EMS providers.

Components of an EMS System

NHTSA Technical Assistance Program Assessment Standards

As part of its role to oversee the national EMS system, NHTSA has designated 10 components that make up an effective EMS system and has identified a method of assessing those areas. NHTSA's statewide EMS Technical Assistance Program allows states to request a team of outside experts, a Technical Assistance Team (TAT), to conduct a comprehensive assessment of each statewide EMS program. The assessment provides an overview of the current program in comparison to a set of standards. This evaluation outlines the program's strengths and weaknesses, as well as recommendations for improvement. Almost all states and territories have utilized this process, and states may also request a reassessment by making joint requests to their state Highway Safety Office and NHTSA Regional Office. By measuring the progress of EMS systems against the standard set by NHTSA, states can ensure the EMS system is effective nationwide.

NHTSA's 10 components, also known as its Technical Assistance Program Assessment Standards, include:

1. Regulation and policy. State agencies have regulations and policies in place that govern their EMS systems. The regulations and policies regarding the EMS system vary among states. As an EMR, you are responsible for knowing and understanding the applicable regulations and policies in your state of practice.
2. Resource management. To ensure that all patients are able to receive the required care, all states must have central control of EMS resources. State EMS oversight includes ensuring that EMS personnel have adequate training, and providing the equipment necessary to provide emergency care throughout the state. Equipment includes vehicles for transportation as well as tools and supplies necessary to provide care.
3. Human resources and training. All EMS personnel must be trained to adequate levels, with the basic level being that of an EMR. Each state has its own rules and regulations regarding extra training or skills. For this, the agencies have to monitor training programs, and these programs must be re-evaluated on a regular basis.
4. Transportation. Safe and reliable transportation is needed for patients to reach end destinations. This includes adequate and functioning transportation services for the area, which gives all citizens equal access to emergency care.
5. Facilities. EMS systems must have a range of appropriate receiving institutions available to meet the various and acute needs of injured or ill persons. Depending on the patient's age and condition, these can range from the hospital emergency department to specialty centers such as trauma, burn, stroke or pediatric centers.
6. Communications. EMS systems must have a designated communications number to be used by the public to get help and by members of the emergency response team to communicate effectively. Generally, 9-1-1 is used, although there are areas that must use a non-9-1-1 or seven- or 10-digit number.
7. Public information and education. The EMS system should offer information and education to the public on prevention of injury and illness and appropriate use of the EMS system.
8. Medical direction (also known as medical oversight). EMS systems are required to have a physician act as medical director, overseeing their operations.
9. Trauma systems. As part of the EMS system, each state is required to have a system that ensures timely and effective direction of patients to the appropriate receiving facilities, depending on the level of care required.
10. Evaluation. Improvement in care and assessment of the care provided are obtained through evaluation and upgrading of the EMS system, which is governed by each state.

Levels of EMS Training

National EMS Education Agenda for the Future: A Systems Approach

The need for standards in EMS care was identified back in the 1960s. At that time, the National Standard Curricula (NSC) were developed by the U.S. Department of Transportation (DOT) and NHTSA, in response to a mandate by Congress. Between 1966 and 1973, NSC were developed for EMT-Basics, Intermediates and Paramedics. These curricula standardized aspects such as course planning and structure, objectives, lessons, content and hours of instruction.

Access to the EMS System

Mobile 9-1-1: Hundreds of Millions Served

The 9-1-1 service was created in the United States in 1968 as a nationwide telephone number for the public to use to report emergencies and request emergency assistance. It gives the public direct access to an emergency communications center called a public safety answering point (PSAP), which is responsible for taking appropriate action.

The numbers 9-1-1 were chosen because they best fit the needs of the public and the telephone companies. They are easy to remember and dial, and they have never been used as an office, area or service code. Most of the population and geography of the United States is covered by some type of 9-1-1 service. Today, an estimated 240 million calls are made to 9-1-1 each year in the United States. In many areas, 70 percent or more are from a wireless device. People who call 9-1-1 using a mobile phone should remember the following tips, to assist the PSAP in finding their location:

- Callers should tell the call taker the location of the emergency right away.
- They should then give the call taker the mobile phone number so that they can call back if the call gets disconnected. This is especially important if callers do not have a contract for service with a mobile phone service provider, because in these cases dispatch centers will have no way of obtaining the mobile phone number and may be unable to contact them.
- Callers should learn to use the designated number in their state for highway crashes or other non-life-threatening incidents, if there is one. States often reserve specific numbers for these types of incidents. For example, "#77" is the number used for highway crashes in a number of states. The number to call for non-life-threatening incidents in each state may be located in the front of the phone book or found online.
- Callers should not program their mobile phone to automatically dial 9-1-1 when one button, such as the "9" key, is pressed. Mobile 9-1-1 calls often occur when autodial keys are pressed unintentionally. This causes problems for PSAPs.
- Callers should turn off the autodial 9-1-1 feature if the mobile phone came preprogrammed with it already turned on. They can check their user manual to find out how.
- Callers should lock their keypad when they are not using the mobile phone. This action prevents accidental calls to 9-1-1.

The next generation of 9-1-1 systems—NG911—is now being implemented across the nation to create a faster, more flexible, resilient and scalable system that allows 9-1-1 to keep up with communication technology used by the public. NG911 is a system that allows digital information (e.g., audio, photos, video, text messages) to flow seamlessly from the public, through the 9-1-1 network, and on to emergency responders. While many of these new functions are not currently available in most states, progress is being made rapidly.

People who call 9-1-1 with a mobile phone should immediately tell the call taker the emergency location and the mobile phone number in case the call gets disconnected. *Photo: D. Hammonds/Shutterstock.com.*

In 1996, the NHTSA and the Health Resources and Services Administration (HRSA) published a document entitled the *EMS Agenda for the Future* (the *Agenda*). The purpose of this document was to create a common vision for the future of EMS systems. The document was designed to be used by national, state and local governments, as well as by private organizations, in order to guide planning, decision making and policy around EMS care.

One of several areas addressed in the *Agenda* was the EMS education system. NHTSA, along with more than 30 EMS-related organizations, implemented steps to address the education section of the *Agenda*. The plan for this implementation was entitled the *National EMS Education and Practice Blueprint* (known as the *Blueprint*), and represents an important component of the EMS education system. The purpose of this document was to establish nationally recognized levels of EMS providers and scopes of practice, a framework for future curriculum-development projects, and a standardized way for states to handle legal recognition and reciprocity.

In 1998, a group under the NHTSA met to develop procedures to revise the *Blueprint* and developed a document entitled the *EMS Education Agenda for the Future: A Systems Approach* (the *Education Agenda*). The *Education Agenda* proposed an education system with five components:

1. National EMS Core Content
2. National EMS Scope of Practice Model
3. National EMS Education Standards
4. National EMS Education Program Accreditation
5. National EMS Certification

The main benefit of this systematic approach was the resulting consistency of instructional quality it would achieve through the system's three main components: the National EMS Education Standards, the National EMS Education Program Accreditation and the National EMS Certification.

The National EMS Education Standards replaced the NSC and set minimum learning objectives for each level of practice. National EMS Certification now is available for all levels of providers and entails a standardized examination process to ensure entry-level competence of EMS providers.

National Scope of Practice

The ***scope of practice*** of an EMR is defined as the range of duties and skills that the EMR is allowed and expected to perform when necessary, while using reasonable care and skill according to the EMR's level of training. While the scope of practice does not have regulatory authority, it does provide guidance to states. The EMR is governed by legal, ethical and medical standards. Since practices may differ by region, responders must be aware of the variations that exist for their level of training, certification and/or licensure in their region. Whenever the national scope of practice is updated for any level of EMS responder, responder duties and skills will be impacted.

Professional Levels of EMS Certification or Licensure

There are four nationally recognized levels of training for prehospital emergency care, including:

1. ***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—takes over. EMR is the initial training level within the EMS system.
2. ***Emergency medical technician (EMT)***. EMTs have the next highest level of training. An EMT gives basic emergency medical care and transportation for critical and emergent patients who access the EMS system. EMTs are

CRITICAL FACTS

The scope of practice of an EMR is defined as the range of duties and skills that the EMR is allowed and expected to perform when necessary, while using reasonable care and skill according to the EMR's level of training and the terms of certification and/or licensure in the location where they practice.

An EMR's responsibilities are to ensure safety, gain safe access to the patient, determine threats to the patient's life, summon more advanced medical personnel and assist them as needed, and provide needed care for the patient.

typically authorized to function after completing local and state certification requirements; formerly referred to as EMT-Basic.

3. ***Advanced emergency medical technician (AEMT)***. AEMTs receive more training than EMTs, which allows them to give basic and limited advanced emergency medical care and transportation for critical and emergent patients who access the EMS system, such as insertion of IVs, the administration of a limited number of emergency medications and insertion of some advanced airway devices. This level of care used to be called EMT-Intermediate.
4. ***Paramedic***. Paramedics have more in-depth training than AEMTs, including more knowledge about performing physical exams. They may perform more invasive procedures than any other ***prehospital care*** provider. Paramedics are considered allied health professionals whose primary focus is to give advanced emergency medical care for critical and emergent patients. They may also give nonemergency, community-based care based on state and local community paramedicine or mobile integrated healthcare programs. This level of care used to be called EMT-Paramedic.

Working with Other Responders and Continuity of Care

Continuity of care in an emergency situation can be compared to a course of action. As an EMR, you are often the first on the scene and begin the course of action. While providing care, you will collect all the information you require to pass on to the next level of personnel when they arrive or to the receiving facility if you are providing transport. A smooth transition of care depends on the proper and thorough relay of information.

As an EMR, you will be working and communicating with other medical personnel including EMTs, AEMTs and paramedics as well as other public safety personnel, emergency management, home healthcare providers and others.

EMERGENCY MEDICAL RESPONDER

Who Is an EMR?

An EMR is a person trained in emergency care who may be called on to provide such care as a routine part of their job, whether that job is voluntary or paid. EMRs have a duty to respond to the scene of a medical emergency and to provide emergency care to the injured or ill person. They are recognized and certified to provide emergency care to the general public until more advanced medical personnel take over.

Some occupations, such as law enforcement and firefighting, require personnel to respond to and assist at the scene of an emergency. These personnel are dispatched through an emergency number, such as 9-1-1, and often share common communications networks. When someone dials 9-1-1, this will contact police, fire or EMS personnel. These are typically considered public safety personnel. However, EMRs do not necessarily work for public safety agencies. People in many occupations other than public safety are called to help in the event of an injury or sudden illness, such as:

- Athletic trainers.
- Camp leaders.
- Emergency management personnel.
- First aid station members.
- Industrial response teams.
- Lifeguards.
- Ski patrol members.

In an emergency, these people are often required to provide the same minimum standard of care as traditional EMRs. Their duty is to assess the patient's condition and provide necessary care, make sure that any necessary additional help has been summoned, assist other medical personnel at the scene and document their actions.

Responsibilities

To be an EMR means to accept certain responsibilities beyond providing care. Since you will often be the first trained professional to arrive at many emergencies, your primary responsibilities center on safety and early emergency care. Your major responsibilities are to:

- Ensure safety for yourself and any bystanders. Your first responsibility is not to make the situation worse by getting hurt or letting bystanders get hurt. By making sure the scene is safe as you approach it, you can avoid unnecessary injuries.
- Gain safe access to the patient. Carefully approach the patient unless the scene is too dangerous for you to handle without help. Electrical or chemical hazards, unsafe structures and other dangers may make it difficult to reach the patient (Fig. 1-2). Recognize when a rescue requires specially trained emergency personnel.

Fig. 1-2: One of an EMR's major responsibilities is gaining safe access to the patient.

- Determine any threats to the patient's life. Check first for immediate life-threatening conditions, and care for any you find. Next, look for other conditions that could threaten the patient's life or health if not addressed.
- Summon more advanced medical personnel as needed. After you quickly assess the patient, notify more advanced EMS personnel of the situation, if someone has not done so already.
- Provide needed care for the patient. Remain with the patient and provide whatever care you can until more advanced medical personnel take over.
- Assist more advanced medical personnel. Transfer your information about the patient and the emergency to more advanced medical personnel. Tell them what happened, how you found the patient, any problems you found and any care you provided. Assist them as needed within your level of training, and help with care for any other patients. When possible, try to anticipate the needs of those providing care.

In addition to these major responsibilities, you have secondary responsibilities that include:

- Summoning additional help, such as special rescue teams and utility crews, when needed.
- Controlling or directing bystanders or asking them for help.
- Taking additional steps, if necessary, to protect bystanders from dangers, such as traffic or fire.
- Recording what you saw, heard and did at the scene.
- Reassuring the patient's family or friends.

Maintaining Certification

As an EMR, you have an obligation to remain up-to-date on the knowledge, skills and use of equipment needed for you to fulfill your role competently and effectively. Your employer should provide you with the requirements for your area. Some areas require a higher level of knowledge for their EMRs, above and beyond the basic requirements.

CRITICAL FACTS

As an EMR, you have an obligation to remain up-to-date on the knowledge, skills and use of equipment needed for you to fulfill your role competently and effectively.

Continuing Education

The field of healthcare, particularly emergency care, changes quickly as newer and better techniques and methods are discovered. EMRs must keep up-to-date on all of the new developments that affect them and the care they provide. As an EMR, you will be required to participate in various types of continuing education (CE) programs as outlined by the certifying body and your region.

Criminal Implications

The *National EMS Scope of Practice Model* places limitations on your scope of practice to ensure that what you do is in the interest of public protection and safety. Standards for EMR education, certification, licensure and credentialing are all mechanisms that set the parameters of practice. Criminal implications may arise for you if you perform procedures that are outside of what you are trained to do, what you are certified as competent to do, what you are legally licensed to do or what you have been credentialed (authorized by a medical director) to do.

EMRs must not be placed in situations in which they are expected to perform procedures they have not been sufficiently trained to do or for which they have insufficient experience. There are also criminal implications for falsification of care or training records, or for allowing your certification to lapse and continuing to practice.

Fees

One of your areas of responsibility is paying required fees. There is a fee to obtain licensure and recertification, and there may be fees for certain exams. You will also be required to obtain continuing education units (CEUs) to maintain your knowledge and skills. Fees vary widely from state to state and are usually your responsibility, though employers may sometimes assist with them.

Personal Characteristics and Professional Behavior

The responsibilities of EMRs require that they demonstrate certain characteristics. These include:

- Maintaining a caring and professional attitude. Injured or ill people are sometimes difficult to work with. Be compassionate; try to understand their concerns and fears (Fig. 1-3). Realize that anger shown by an injured or ill person often results from fear. A lay responder who helps at the emergency may also be afraid. Try to be reassuring. Even though lay responders may not have done everything perfectly, be sure to thank them for taking action. Recognition and praise help to affirm their willingness to act. Also be careful about what you say. Do *not* volunteer distressing news about the emergency to the patient or to the patient's family or friends.
- Controlling your fears. Try not to reveal your anxieties to the patient or bystanders. The presence of blood, vomit, unpleasant odors, or torn or burned skin is disturbing to most people. You may need to compose yourself before acting. If you must, turn away for a moment and take a few deep breaths before providing care.
- Presenting a professional appearance. This helps ease a patient's fears and inspires confidence.
- Keeping your knowledge and skills up-to-date. Involve yourself in continuing education, professional reading and refresher training.
- Maintaining a safe and healthy lifestyle. Job stresses can adversely affect your health. As an EMR, it is important to maintain a safe and healthy lifestyle both on and off the job. Exercise, diet and common sense safety practices can help you manage physical, mental and emotional stress, and may help you be more effective as an EMR.

CRITICAL FACTS

As an EMR, you have a responsibility to control your fears, present a professional appearance, keep your knowledge and skills up-to-date, and maintain a safe and healthy lifestyle.

Medical direction is the process by which a physician directs the care provided by out-of-hospital providers to injured or ill people. Usually this monitoring is done by a medical director, who assumes responsibility for the care provided.

Fig. 1-3: An EMR should be compassionate and reassuring. *Photo: courtesy of Captain Phil Kleinberg, EMT-P.*

Medical Direction

Medical Director

Medical direction is the process by which a physician directs the care provided by out-of-hospital providers to injured or ill people. Usually this monitoring is done by a ***medical director***, who provides oversight and assumes responsibility for the care provided. The physician also oversees training and the development of ***protocols*** (standardized procedures to be followed when providing care to injured or ill people).

Medical Control

Since it is impossible for the medical director to be present at every incident outside the hospital, the physician directs care through ***standing orders***. Standing orders allow EMS personnel to provide certain types of care or treatment without speaking to the physician. This kind of medical direction is called ***indirect medical control***. Indirect medical control, or "offline" medical direction, includes education, protocol review and quality improvement for emergency care providers.

Other procedures that are not covered by standing orders require EMRs to speak directly with the physician. This contact can be made via mobile phone, radio or telephone following local requirements. This kind of medical direction is called ***direct medical control***, or "online" medical direction (Fig. 1-4).

Right to Practice

Legislation and Scope of Practice

EMRs must follow state regulations that determine what they can and cannot do. Each state has very specific laws and rules governing how EMS personnel may practice in the out-of-hospital setting.

State EMS Office Oversight

EMRs must be licensed or certified through the state EMS office, the licensing or certifying agency, before being allowed to work in that state. EMRs should be familiar with these laws and regulations. Typical legal concerns and issues are addressed in Chapter 3.

Medical Direction

Medical direction is provided by the medical director, who assumes responsibility for care provided.

Levels of Credentialing

There are three aspects to credentialing of EMRs, all with the goal of protecting the public: certification, licensure and local credentialing.

Fig. 1-4: Procedures that are not covered by standing orders require EMRs to speak directly with the physician. This is called direct medical control.

Certification

Certification is achieved by obtaining and maintaining the National EMS Certification (or state certification), taking an approved EMS course and meeting other requirements. This does not grant you the right to practice as licensure may in some states. EMS personnel generally need to recertify every 2 years, to ensure that they maintain a high degree of competency by re-affirming their knowledge, skills and abilities as well as learning any new skills or information.

Licensure

Licensure is an acknowledgement that the bearer has permission to practice in the licensing state. It is the highest level of public protection, which is granted at the state level. It is generally a requirement, with a few exceptions, for work on federal land or in the military. States often have requirements in addition to those required for certification, before they grant licensure. The state is the final authority for public protection; therefore, states can revoke state licensure if appropriate.

Local Credentialing

Often, EMS providers must meet ***local credentialing*** requirements in order to maintain employment or obtain certain protocols so that they may practice. Most employers also have additional requirements as part of an orientation program that would be similar to a local credentialing process.

Administrative Requirements

EMRs must follow any policies and procedures based on national, state, local or employer requirements. For example, the Health Insurance Portability and Accountability Act (HIPAA) is national; protocols can be state or local; and specifics of uniform (e.g., level of training and credentialing recognition) could be employer requirements.

Research

The field of emergency care and emergency medicine is constantly evolving. Quality improvement (QI), or continuous quality improvement (CQI), based on research, allows for continuing assessment and reassessment of all aspects of the EMS system. This includes viewing and evaluating the system internally, from the personnel's and administration's point of view, and also externally, from the public's point of view. It also entails keeping personnel and equipment up-to-date with the latest standards of care, ensuring that personnel are adequately trained and skilled in using new knowledge.

One example is the continuous evaluation of CPR procedures. As new recommendations come about and become the recognized standard through an evidence-based guidelines process, EMS systems across the country must ensure that employees and volunteers are up-to-date and comfortable performing new techniques. The goal of an EMS system is to provide the highest quality of care possible throughout the country, equally accessible to all citizens. Through research, QI programs can assess whether that goal is being met.

PUTTING IT ALL TOGETHER

Since the EMS system was established in the United States, it has undergone significant changes as it has grown and adapted to citizens' needs. However, this growth needs to continue as the field of emergency and prehospital care continues to evolve.

The primary role of an EMR is to provide emergency care at the scene, while working with other services and healthcare personnel. It is important to understand that the role of the EMR does not stop at providing care. EMRs must continue to grow and learn along with the field. They must remain certified and retain their licensure in order to practice in their chosen state and, as such, must maintain the necessary standards as outlined by that state.

To be an effective EMR, you must not only be able to keep up the professional side of your work, but your personal side. EMRs have a responsibility to remain fit and healthy in order to perform their duties accordingly. This means maintaining a healthy lifestyle, and being aware of your choices and how they would and could affect your performance on the job.

The size and scope of the EMS system in each state may vary according to population, needs and resources. However, all systems have some things in common: namely, their need for certification and licensure, and their goal of providing equal access to prehospital care to all citizens.

2 THE WELL-BEING OF THE EMERGENCY MEDICAL RESPONDER

You Are the Emergency Medical Responder

Your police unit responds to a call for a medical emergency involving a man who has collapsed in front of a school building. When you and your partner arrive, you see that the man is bleeding from the mouth and face. Vomit and blood are on the ground around him. “His face hit the ground when he fell,” a bystander says. The man does not appear to be breathing. How would you respond, and what can you do to protect yourself from possible disease transmission?

KEY TERMS

Acute: Having a rapid and severe onset, then quickly subsiding.

Adaptive immunity: The type of protection from disease that the body develops throughout a lifetime as a person is exposed to diseases or immunized against them.

AIDS: A disease of the immune system caused by infection with HIV.

Antibodies: A type of protein found in blood or other bodily fluids; used by the immune system to identify and neutralize pathogens, such as bacteria and viruses.

Bacteria: One-celled organisms that can cause infection; a common type of pathogen.

Biohazard: A biological agent that presents a hazard to the health or well-being of those exposed.

Bloodborne: Used to describe a substance carried in the blood (e.g., bloodborne pathogens are pathogens carried through the blood).

Bloodborne pathogens: Infectious microorganisms that are present in human blood or other potentially infectious materials (OPIM) and can cause disease in humans.

Body substance isolation (BSI) precautions: Protective measures to prevent exposure to communicable diseases; these precautions define all body fluids and substances as infectious.

Chronic: Persistent over a long period of time.

Critical incident stress: Stress triggered by involvement in a serious or traumatic incident.

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

Disease-causing agent: A pathogen or germ that can cause disease or illness (e.g., a bacterium or virus).

Droplet transmission: Mode of transmission of pathogens that occurs when a person inhales droplets from an infected person's cough or sneeze; also known as respiratory droplet transmission.

Engineering controls: Control measures that eliminate, isolate or remove a hazard from the workplace; things used in the workplace to help reduce the risk of an exposure.

Exposure: An instance in which someone is exposed to a pathogen or has contact with blood or OPIM or objects in the environment that contain disease-causing agents.

Exposure control plan: Plan in the workplace that outlines the employer's protective measures to eliminate or minimize employee exposure incidents.

Hepatitis: An inflammation of the liver most commonly caused by viral infection; there are several types including hepatitis A, B, C, D and E.

HIV: A virus that weakens the body's immune system, leading to life-threatening infections; causes AIDS.

Homeostasis: A constant state of balance or well-being of the body's internal systems that is continually and automatically adjusted.

Immune system: The body's complex group of body systems that is responsible for fighting disease.

Indirect contact: Mode of transmission of a disease caused by touching a contaminated object.

Infection: A condition caused by disease-producing microorganisms, called pathogens or germs, in the body.

Infectious disease: Disease caused by the invasion of the body by a pathogen, such as a bacterium, virus, fungus or parasite.

Innate immunity: The type of protection from disease with which humans are born.

Lividity: Purplish color in the lowest-lying parts of a recently dead body, caused by pooling of blood.

Meningitis: An inflammation of the meninges, the thin, protective coverings over the brain and spinal cord; caused by virus or bacteria.

Methicillin-resistant *Staphylococcus aureus* (MRSA): A staph bacterium that can cause infection; difficult to treat because of its resistance to many antibiotics.

Multidrug-resistant tuberculosis (MDR TB): A type of tuberculosis (TB) that is resistant to some of the most effective anti-TB drugs.

Needlestick: A penetrating wound from a needle or other sharp object; may result in exposure to pathogens through contact with blood or OPIM.

(*Continued*)

KEY TERMS continued

Occupational Safety and Health Administration (OSHA): Federal agency whose role is to promote the safety and health of American workers by setting and enforcing standards; providing training, outreach and education; establishing partnerships; and encouraging continual process improvement in workplace safety and health.

Opportunistic infections: Infections that strike people whose immune systems are weakened.

Other potentially infectious materials (OPIM): Materials, other than blood, that can cause illness; these materials include body fluids such as semen and vaginal secretions.

Pandemic influenza: A respiratory illness caused by virulent human influenza A virus; spreads easily and sustainably, and can cause global outbreaks of serious illness in humans.

Passive immunity: The type of immunity gained from external sources such as from a mother's breast milk to an infant.

Pathogen: A term used to describe a germ; a disease-causing agent (e.g., bacterium or virus).

Personal protective equipment (PPE): All specialized clothing, equipment and supplies that keep the user from directly contacting infected materials; includes gloves, gowns, masks, shields and protective eyewear.

Standard precautions: Safety measures, including BSI and universal precautions, taken to prevent occupational-risk exposure to blood and OPIM; these precautions assume that all body fluids, secretions and excretions (except sweat) are potentially infective.

Stress: The body's normal response to any situation that changes a person's existing mental, physical or emotional balance.

Sudden death: An unexpected, natural death; usually used to describe a death from a sudden cardiac event.

Tuberculosis (TB): A bacterial infection that usually attacks the lungs.

Universal precautions: A set of precautions designed to prevent transmission of HIV, hepatitis B virus (HBV) and other bloodborne pathogens when providing care; these precautions consider blood and OPIM of all patients potentially infectious.

Vector-borne transmission: Transmission of a pathogen that occurs when an infectious source, such as an animal or insect bite or sting, penetrates the body's skin.

Virus: A common type of pathogen that depends on other organisms to live and reproduce; can be difficult to kill.

Work practice controls: Control measures that reduce the likelihood of exposure by changing the way a task is carried out.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Describe how the immune system works.
- Identify ways in which diseases are transmitted and give an example of how each transmission can occur.
- Describe diseases that cause concern and how they are transmitted.
- Describe conditions that must be present for disease transmission.
- Explain the importance of standard precautions.
- Identify standard precautions to protect yourself against disease transmission.
- Describe the steps an emergency medical responder (EMR) should take for personal protection from bloodborne pathogens.
- Describe the procedure an EMR would use to disinfect equipment, work surfaces, clothing and leather items.
- Explain the importance of documenting an exposure incident and post-exposure follow-up care.
- Explain how the OSHA standard for bloodborne pathogens influences your actions as an EMR.
- Acknowledge the importance of knowing how various diseases are transmitted.

(*Continued*)

LEARNING OBJECTIVES continued

- Demonstrate the proper techniques for placing and removing personal protective equipment (PPE).
- Use appropriate PPE and properly remove and discard the protective garments, given a scenario in which potential exposure takes place.
- Identify the signs and symptoms of critical incident stress.
- Describe actions an EMR could take to reduce or alleviate stress.
- Describe reactions a person might have when confronted with the dying process or actual death of another individual.
- List possible emotional reactions an EMR may experience when faced with trauma, illness, death and dying.
- Explain the importance of understanding the response to death and dying and communicating effectively with the patient's family.
- Describe the steps an EMR might take when approaching the family of a dead or dying patient.
- Recognize possible reactions of the EMR's family to the responsibilities of an EMR.
- Communicate with empathy to patients and their family members and friends.

INTRODUCTION

The demands on an emergency medical responder (EMR) can be significant and are physical, emotional and mental in nature. To meet these demands, it is essential to take good care of yourself, by making healthy choices that promote your own physical, emotional and mental well-being. These choices will benefit not only you but also the patients and families you assist as you carry out your work each day.

Bloodborne pathogens, such as bacteria and viruses, are present in blood and ***other potentially infectious materials (OPIM)*** and can cause disease when certain conditions are present. Being aware of ***disease-causing agents***, how they are spread, and their signs and symptoms will help you prevent ***exposure*** to these illnesses and recognize them. It is also important for you to keep immunizations up-to-date to protect against vaccine-preventable diseases and wear proper personal protective equipment (PPE) while providing care (Fig. 2-1).

Fig. 2-1: Prevent exposure to bloodborne pathogens by wearing personal protective equipment, such as disposable latex-free gloves.

EMRs must also look after their mental and emotional health. A serious injury, sudden illness or death can have an emotional impact on everyone involved: patients, family, friends, bystanders, EMRs and others. The degree of impact varies from person to person. The way one person responds to a stressful situation can differ substantially from the response of another person in a similar situation.

At times, you may encounter a patient who is experiencing an emotional crisis. Besides providing care for a specific injury or illness, you may also need to provide emotional support. Being able to understand some of what a patient feels when coping with an injury or illness is an important part of what you do as a responder.

PREVENTING DISEASE TRANSMISSION

To help prevent disease transmission, you need to understand how ***infections*** occur, how diseases spread from one person to another and what you as an EMR can do to protect yourself and others. ***Infectious diseases*** can be spread from infected people and from animals, insects or objects that have been in contact with them. EMRs must protect themselves and others from infectious diseases.

How Infection Occurs

Disease-Causing Agents

The disease process begins when a ***pathogen*** (germ) gets into the body. When pathogens enter the body, they sometimes can overpower the body's natural defense systems and cause illness. Bacteria and viruses cause most infectious diseases. Other disease-causing pathogens include fungi, protozoa, rickettsia, parasitic worms, prions and yeasts.

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, such as bacterial meningitis and tetanus.

The body may have difficulty fighting infection caused by bacteria. The body's ability to fight infection depends on its ***immune system***. In people with healthy immune systems, a bacterial infection is often avoided. When an infection is present, healthcare providers may prescribe antibiotic medications that either kill the bacteria or weaken them enough for the body to get rid of them. Commonly used antibiotics include penicillin, erythromycin and tetracycline.

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

Some infections, such as measles, malaria, ***HIV*** and yellow fever, affect the entire body. Others affect only one organ or system of the body—for example, the virus that causes the common cold, which occurs in the upper respiratory tract. Table 2-1 identifies some diseases and conditions caused by each of the types of pathogenic agents.

Table 2-1:

Pathogens and the Diseases and Conditions They Cause

PATHOGEN	DISEASES AND CONDITIONS
Viruses	Hepatitis, measles, mumps, chicken pox, meningitis, rubella, influenza, warts, colds, herpes, HIV (which causes AIDS), genital warts, smallpox, avian flu, Ebola, Zika
Bacteria	Tetanus, meningitis, scarlet fever, strep throat, tuberculosis, gonorrhea, syphilis, chlamydia, toxic shock syndrome, Legionnaires' disease, diphtheria, food poisoning, Lyme disease, anthrax
Fungi	Athlete's foot, ringworm, histoplasmosis
Protozoa	Malaria, dysentery, cyclospora, giardiasis
Rickettsia	Typhus, Rocky Mountain spotted fever
Parasitic worms	Abdominal pain, anemia, lymphatic vessel blockage, lowered antibody response, respiratory and circulatory complications
Prions	Creutzfeldt-Jakob disease (CJD) or bovine spongiform encephalopathy (mad cow disease)
Yeasts	Candidiasis (also known as "thrush")

The Body's Natural Defenses

The body has a series of natural defenses that prevent infectious microorganisms from entering. The body depends on intact skin and mucous membranes in the mouth, nose and eyes to keep infectious microorganisms out. When the skin is damaged, infectious microorganisms can enter through openings, such as cuts or sores. Mucous membranes in the mouth, nose and eyes also work to protect the body from intruding infectious microorganisms, often by trapping them and forcing them out through a cough or sneeze. However, mucous membranes are less effective than skin at keeping bloodborne pathogens out of the body. If these barriers fail and a germ enters the body, the body's immune system begins working to fight the disease.

The immune system's basic tools are ***antibodies*** and white blood cells. Special white blood cells travel around the body and identify invading pathogens. Once they detect a pathogen, white blood cells gather around it and release antibodies that fight infection.

These antibodies attack the pathogens and weaken or destroy them. Antibodies usually can rid the body of pathogens. However, once inside the body, some pathogens can thrive and, under ideal conditions, multiply and overwhelm the immune system.

This combination of preventing pathogens from entering the body and destroying them once they enter is necessary for good health (***homeostasis***). Sometimes, however, the body cannot fight off infection. When this occurs, an invading pathogen can become established in the body, causing infection, which may range from mild to serious and brief (***acute***) to long-lasting (***chronic***). Fever and exhaustion are often a sign and symptom that the body is fighting off an infection. Other common signs and symptoms include headache, nausea and vomiting.

There are three different types of human immunity: innate, adaptive and passive.

- ***Innate immunity*** is the type of protection with which we are born. The term "innate immunity" also refers to the natural barriers our bodies have, such as the skin and mucous membranes in the nose, throat and gastrointestinal tract that prevent most diseases from entering our bodies.
- ***Adaptive immunity*** develops throughout our lives as we are exposed to diseases or are immunized against them.
- ***Passive immunity*** is immunity we gain from external sources such as from a mother's breast milk to an infant.

How Diseases Spread

Exposure to blood and OPIM occurs across a wide variety of occupations. Healthcare workers, emergency response personnel, public safety personnel and other workers can be exposed to blood and OPIM through injuries from needles and other sharps devices, as well as by ***direct*** and ***indirect contact*** with skin and mucous membranes.

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

1. A pathogen must be present.
2. A sufficient quantity of the pathogen to cause disease must be present.
3. A person must be susceptible to the pathogen.
4. The pathogen must pass through the correct entry site (e.g., eyes, mouth and other mucous membranes or skin pierced or broken by ***needlesticks***, bites, cuts, abrasions and other means).

To understand how infections occur, think of these four conditions as pieces of a puzzle (Fig. 2-2). All of the pieces must be in place for the picture to be complete. If any one of the conditions is missing, an infection cannot occur.

Bloodborne pathogens, such as hepatitis B, hepatitis C and HIV, spread primarily through direct or indirect contact with infected blood or OPIM (see Table 2-2). While these diseases can be spread by sexual contact through infected body fluids, such as vaginal secretions and semen, these body fluids are not usually involved in occupational transmission. Hepatitis B, hepatitis C and HIV are not spread by food or water or by casual contact

CRITICAL FACTS

Intact skin, as well as mucous membranes in the mouth, nose and eyes, are part of the body's natural defenses to help keep infectious microorganisms out.

For any disease to spread, pathogens must be present in sufficient quantity and pass through the broken skin or mucous membrane of a susceptible person.

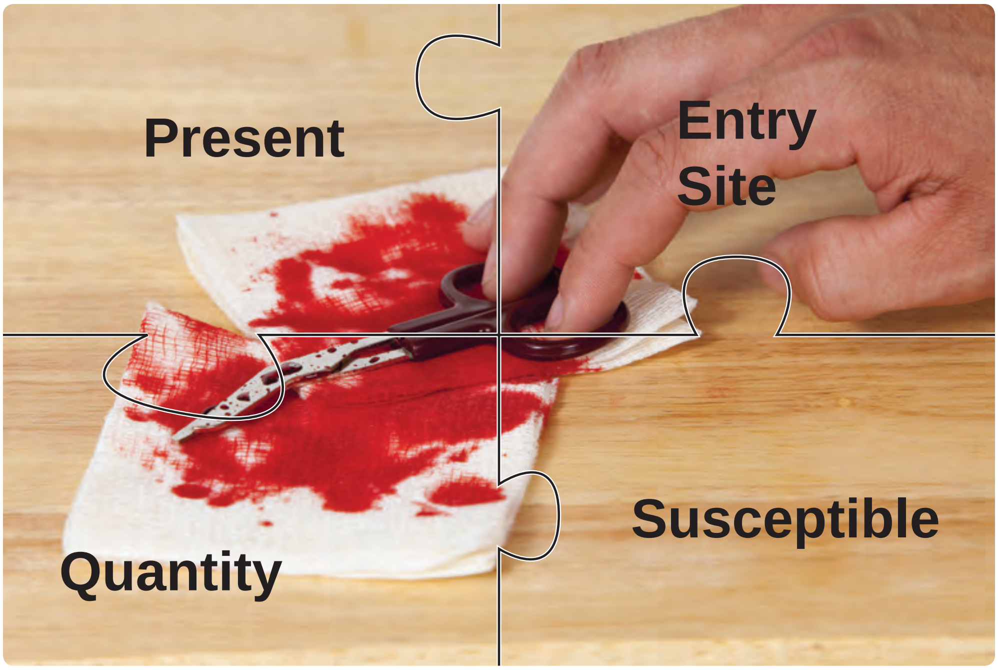


Fig. 2-2: To understand how infections occur, think of the four necessary conditions as pieces of a puzzle.

Table 2-2:
How Bloodborne Pathogens Are Transmitted

DISEASE	SIGNS AND SYMPTOMS	MODE OF TRANSMISSION	INFECTIVE MATERIAL
Hepatitis B	Jaundice, fever, dark urine, clay-colored bowel movements, fatigue, abdominal pain, loss of appetite, nausea, vomiting, joint pain	Direct and indirect contact	Blood, semen
Hepatitis C	Jaundice, fever, fatigue, dark urine, clay-colored stool, abdominal pain, loss of appetite, nausea, vomiting, joint pain	Direct and indirect contact	Blood, semen
HIV	May or may not be signs and symptoms in early stage; late-contact stage symptoms may include fever, headache, fatigue, diarrhea, skin rashes, night sweats, loss of appetite, swollen lymph glands, significant weight loss, white spots in the mouth or vaginal discharge (signs of yeast infection) and memory or movement problems	Direct and possibly indirect contact	Blood, semen, vaginal fluid

such as hugging or shaking hands. The highest risk of occupational transmission is unprotected direct or indirect contact with infected blood.

Disease-causing germs can also cause infection through contaminated food or water. In this way, germs can spread to many people through a single source, such as sometimes occurs with *Escherichia coli (E. coli)*; this type of infection is referred to as food poisoning.

Direct Contact

Direct contact transmission occurs when infected blood or OPIM from one person enters another person's body at a correct entry site (Fig. 2-3). For example, direct contact transmission can occur through infected blood splashing in the eye or from directly touching the OPIM of an infected person. The infected blood or OPIM then enters the body through a correct entry site.

Fig. 2-3: Bloodborne pathogens can be transmitted by direct contact when an uninfected person directly touches the blood or OPIM of an infected person.

Fig. 2-4: Bloodborne pathogens can be transmitted by indirect contact when an uninfected person touches an object that contains the blood or OPIM of an infected person.

Indirect Contact

Some bloodborne pathogens are also transmitted by indirect contact (Fig. 2-4). Indirect contact transmission can occur when a person touches an object that contains the blood or OPIM of an infected person, and that infected blood or OPIM enters the body through a correct entry site. These objects include soiled dressings or equipment and work surfaces contaminated with an infected person's blood or OPIM. For example, indirect contact can occur when a person picks up blood-soaked bandages with a bare hand and the pathogens enter through a break in the skin on the hand.

Respiratory Droplet and Vector-Borne Transmission

Other pathogens, such as the flu virus, can enter the body through ***droplet transmission*** (Fig. 2-5). This occurs when a person inhales droplets propelled from an infected person's cough or sneeze from within a few feet. A person can also become infected by touching a surface recently contaminated by infected droplets and then touching the eyes, mouth or nose with contaminated hands. ***Vector-borne transmission*** of diseases, such as malaria, rabies and West Nile virus, occurs when an infectious source, such as an animal or insect bite or a sting, penetrates the body's skin (Fig. 2-6).

Risk of Transmission

Infectious diseases have widely varying levels of risk of transmission. Hepatitis B, hepatitis C and HIV share a common mode of transmission—direct or indirect contact with infected blood or OPIM—but they differ in the risk of transmission. Workers who have received the hepatitis B vaccine and have developed immunity to the virus are at virtually

Fig. 2-5: Some pathogens enter the body through droplet transmission, when a person inhales droplets propelled from an infected person's cough or sneeze. *Photo: courtesy of Michelle Lala Clark.*

Fig. 2-6: Vector-borne transmission occurs when an insect bite or sting penetrates the body's skin. *Photo: © Shutterstock.com/ Dmitrijs Bindemanis.*

no risk for infection by the hepatitis B virus (HBV). For an unvaccinated person, the risk for infection from a needlestick or cut exposure to hepatitis B-infected blood can be as high as 30 percent, depending on several factors. In contrast, the risk for infection after a needlestick or cut exposure to hepatitis C-infected blood is about 2 percent, and the risk of infection after a needlestick or cut exposure to HIV-infected blood is less than 1 percent.

Diseases That Cause Concern

Hepatitis A, B, C, D and E

Hepatitis is a type of liver disease. Hepatitis A is caused by the hepatitis A virus (HAV). This disease is spread primarily through food or water that has been contaminated by stool from an infected person.

HAV is transmissible by:

- Eating food prepared by someone with HAV who did not wash hands after using the bathroom.
- Engaging in certain sexual activities, such as oral-anal contact with someone who has HAV.
- Changing a diaper and then not washing hands.
- Drinking water that has been contaminated.

HAV causes inflammation and swelling of the liver. The patient may feel ill, with flu-like symptoms, or may experience no symptoms at all. Symptoms of HAV usually disappear after several weeks. This disease rarely causes permanent damage or chronic illness.

HAV can be prevented with the hepatitis A vaccine, which is a series of two injections administered at least 6 months apart. The most effective prevention, though, is healthy habits. Always wash your hands thoroughly before preparing food, after using the toilet and after changing a diaper. International travelers should be careful about drinking tap water.

Hepatitis B is a liver infection caused by HBV. Hepatitis B may be severe or even fatal and it can be in the body for up to 6 months before symptoms appear. These may include flu-like symptoms such as fever, fatigue, abdominal pain, loss of appetite, nausea, vomiting and joint pain, as well as dark urine and clay-colored bowel movements. Later-stage symptoms include jaundice, which causes a yellowing of the skin and eyes (Fig. 2-7).

Medications are available to treat chronic hepatitis B infection, but they do not work for everyone. The most effective means of prevention

Fig. 2-7: Later-stage symptoms of hepatitis B include jaundice, which causes a yellowing of the skin and eyes. *Photo: courtesy of CDC/Dr. Thomas F. Sellers, Emory University.*

is the hepatitis B vaccine. This vaccine, given in a series of three doses, provides immunity to the disease. Scientific data show that hepatitis B vaccines are safe for adults, children and infants. There is no confirmed evidence indicating that the hepatitis B vaccine causes chronic illnesses.

The hepatitis B vaccination series must be made available to all employees who have occupational exposure, usually within 10 working days of initial assignment, after completing appropriate training. However, employees may decide not to have the vaccination. If an employee decides not to be vaccinated, the person must sign a form affirming this decision. However, if an employee who initially declines hepatitis B vaccination decides to accept the vaccination at a later date, the employer must make the hepatitis B vaccination available at that time, so long as the standard still covers the employee.

Hepatitis C is a liver disease caused by the hepatitis C virus (HCV). It is the most common chronic bloodborne infection in the United States. Its symptoms are similar to those of hepatitis B infection, including fever, fatigue, abdominal pain, loss of appetite, nausea, vomiting, dark urine, clay-colored stool, joint pain and jaundice. There is no vaccine against hepatitis C and no treatment available to prevent infection after exposure. For these reasons, hepatitis C is more serious than hepatitis B. Hepatitis C is the leading cause of liver transplants.

Hepatitis D is a serious liver disease caused by the hepatitis D virus (HDV) and relies on HBV to replicate. It is uncommon in the United States. It is transmitted through contact with infectious blood, similar to how HBV is spread. There is no vaccine for hepatitis D.

Hepatitis E is caused by the hepatitis E virus (HEV). It is commonly transmitted via the fecal-oral route and is associated with ingestion of drinking water contaminated with fecal material in countries with poor sanitation. It occurs primarily in adults. The potential for HEV transmission from contaminated food is still under investigation, and there is no evidence of transmission by percutaneous (through the skin) or sexual exposures. There is currently no FDA-approved vaccine for hepatitis E.

HIV/AIDS

HIV is the virus that causes ***AIDS***. HIV attacks white blood cells and destroys the body's ability to fight infection. This weakens the body's immune system. Infections that strike people with weakened immune systems are called ***opportunistic infections***. Some opportunistic infections that occur in patients with AIDS include severe pneumonia, tuberculosis, Kaposi's sarcoma and other unusual cancers.

People infected with HIV may not feel or appear sick. A blood test, however, can detect the HIV antibody. When an infected person has a significant drop in a certain type of white blood cell or shows signs of having certain infections or cancers, the patient may be diagnosed as having AIDS. These infections can cause fever, fatigue, diarrhea, skin rashes, night sweats, loss of appetite, swollen lymph glands and significant weight loss. In the advanced stages, AIDS is a very serious condition. Patients with AIDS eventually develop life-threatening infections from which they can die. Currently, there is no vaccine against HIV.

Tuberculosis

Tuberculosis (TB) is an infection caused by a bacterium called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs, but they may also damage other parts of the body such as the brain, kidneys or spine. TB is spread through the air when an infected person coughs, sneezes or talks. Anyone exposed to TB should be tested. People with a weakened immune system are more likely to get TB.

Symptoms of TB in the lungs may include:

- A bad cough lasting 3 weeks or longer.
- A pain in the chest.
- Weight loss.
- Loss of appetite.
- Coughing up blood or bloody sputum (phlegm from inside the lungs).
- Weakness and/or fatigue.
- Fever and chills.
- Night sweats.

TB must be treated properly or it can lead to death. It can usually be cured with several medications over a long period of time. Patients with latent (asymptomatic) TB can take medicine to prevent development of active TB.

Multidrug-Resistant Tuberculosis

Multidrug-resistant tuberculosis (MDR TB) is TB that is resistant to at least two of the most effective anti-TB drugs, isoniazid and rifampicin. These drugs are the ones most widely used to treat TB. MDR TB is more likely to occur in patients who:

- Do not take their TB medicine regularly or who do not take all of the prescribed medication.
- Get active TB, after having taken medication to treat it in the past.
- Come from areas of the world where MDR TB is prevalent.
- Spend time with someone known to have MDR TB.

Meningitis

Meningitis is a contagious meningococcal infection that attacks the meninges, the protective coverings that surround the brain and spinal cord. Several different bacteria can cause meningitis, but a virus can also cause it. The bacteria are transmitted from person to person through droplets. Close and prolonged contact (e.g., kissing, sneezing or coughing on someone) and living in close quarters or dormitories (e.g., military or student housing) facilitates the spread of the disease. Meningitis can infect anyone but is more commonly found in those who have compromised immune systems and have trouble fighting infections.

The most common symptoms are stiff neck, high fever, light sensitivity, confusion, headache, nausea, sleepiness and vomiting. Bacterial meningitis is a serious infection; even when diagnosed early and properly treated, 5 to 10 percent of patients die, typically within 24 to 48 hours of the onset of symptoms. Bacterial meningitis may result in brain damage, hearing loss or learning disability in 10 to 20 percent of patients and sometimes death. Viral meningitis is less severe and usually resolves without specific treatment.

Bacterial meningitis is potentially fatal and is a medical emergency. Admission to a hospital or health center is necessary. There are vaccines available to prevent meningitis and antibiotics with which to treat it.

Community-Associated MRSA

Methicillin-resistant Staphylococcus aureus (MRSA) is a type of bacterium. As one of the staph bacteria, like other kinds of bacteria, it frequently lives on the skin and in the nose without causing any health problems. It only becomes a problem when it is a source of infection. These bacteria can be spread from one person to another through casual contact or contaminated objects. Infections with MRSA are more difficult to treat than ordinary staph infections because they are resistant to many types of antibiotics, the medications used to treat bacterial infections. Infections can occur in wounds, burns and sites where tubes have been inserted into the body.

When MRSA occurs in groups of people who have not been recently hospitalized or have not had a medical procedure, this type of MRSA is referred to as community-associated MRSA (CA-MRSA). For example, it can occur among young people who have cuts or wounds and who are in close contact with one another, such as members of a sports team.

Influenza

Seasonal influenza is a respiratory illness caused by both human influenza A and human influenza B viruses, which can be transmitted from person to person. Most people have some immunity to influenza and there is a vaccine available.

Seasonal influenza usually has a sudden onset, with symptoms of fever (usually high), headache, extreme tiredness, dry cough, sore throat, runny or stuffy nose and muscle aches. Abdominal symptoms such as nausea, vomiting and diarrhea may also be present, but these symptoms occur more often in children than in adults.

Influenza is transmitted from person to person via large virus-laden droplets from coughing or sneezing. These large droplets settle on the mucosal surfaces of the upper respiratory tracts of susceptible persons who are within 3 feet of infected people. Transmission can also occur through direct contact or indirect contact with respiratory secretions—for example, when touching surfaces contaminated with influenza virus and then touching the mouth, nose or eyes.

Pandemic influenza (or pandemic flu) is a virulent human influenza A virus. The term "pandemic" refers to a worldwide epidemic occurring over a wide geographic area that affects a large number of people. Pandemic flu causes a global outbreak, or pandemic, of serious illness in humans. Because there is little natural immunity, the disease spreads easily from person to person.

Although we do not know for sure when the next pandemic influenza will strike or that it would present in the same way as seasonal influenza, it is helpful to be aware of the symptoms of seasonal influenza in order to plan for a pandemic flu. The best defense is to take steps to prevent disease transmission, such as frequent hand washing.

Protecting Yourself from Disease Transmission

An EMR may be exposed to many other illnesses, viruses and infections. Keep immunizations current, have regular physical checkups and be knowledgeable about other pathogens. For more information on infectious diseases and illnesses of concern, contact the Centers for Disease Control and Prevention (CDC) at (800) 232-4636 (800-CDC-INFO) or visit the website at cdc.gov. You may also refer to your organization's exposure control officer.

Exposure Control Plan

Federal ***Occupational Safety and Health Administration (OSHA)*** regulations require employers to have an ***exposure control plan***. The exposure control plan is a written plan outlining the protective measures the employer will take to eliminate or minimize employee exposure incidents. The exposure control plan should include exposure determination, methods for implementing other parts of the OSHA standard (e.g., ways of meeting the requirements and recordkeeping) and

CRITICAL FACTS

Exposure control plans, as required by OSHA, contain policies and procedures that help employers eliminate, minimize and properly report employee exposure incidents.

procedures for evaluating details of an exposure incident. The exposure control plan guidelines should be available to employees and should specifically explain what they need to do to prevent the spread of infectious diseases.

Immunizations

Before working as an EMR, you should have a physical examination to determine your baseline health status. Your immunizations should be current while practicing in healthcare and should include protection against:

- Tetanus, diphtheria, pertussis.
- Hepatitis B.
- Measles/mumps/rubella (German measles).
- Chicken pox (*varicella*).
- Influenza.
- Meningococcal (meningitis).

In addition to immunizations, it is recommended that you be screened for TB and have an annual tuberculin test.

Standard Precautions

Standard precautions are safety measures taken to prevent occupational-risk exposure to blood and OPIM such as body fluids containing visible blood. Standard precautions combine body substance isolation (BSI) precautions and universal precautions and assume that all body fluids may be infective.

Universal precautions are OSHA-required practices of control to protect employees from exposure to blood and OPIM. These precautions require that all human blood and OPIM be treated as if known to be infectious for hepatitis B, hepatitis C, HIV or other bloodborne pathogens.

Body substance isolation (BSI) precautions are a group of measures to prevent exposure to pathogens. This approach to infection control can be applied through the use of:

- PPE.
- Proper hand hygiene.
- Engineering controls.
- Work practice controls.
- Proper equipment cleaning.
- Spill cleanup procedures.

Personal Protective Equipment

Personal protective equipment (PPE) is equipment that is appropriate for your job duties and should be available in your workplace and identified in the exposure control plan. PPE includes all specialized clothing, equipment and supplies that keep you from directly contacting infected materials. These include, but are not limited to, CPR breathing barriers, disposable (single-use) latex-free gloves, gowns, masks, shields and protective eyewear (Fig. 2-8).

Disposable Latex-Free Gloves

Wear disposable, latex-free nitrile gloves for all patient contact when providing care to injured or ill people. There are powder-free gloves available as well as disposable latex-free gloves made of vinyl. However, nitrile gloves are preferred and offer the greatest protection from bloodborne pathogens. For information on glove removal, refer to Skill Sheet 2-1.

Eye Protection

Safety glasses with side shields may be worn for eye protection. Use goggles or a full-face shield if there is a risk of splash or spray of body fluids. These reduce the risk of contamination of the mouth, nose or eyes. Examples of when these are necessary are when a patient is bleeding profusely, when delivering a baby, when suctioning and when providing ventilatory support (e.g., bag-valve-mask [BVM] resuscitator or resuscitation mask).

CPR Breathing Barriers

CPR breathing barriers include resuscitation masks (pocket masks), shields and BVMs. CPR breathing barriers help protect you against disease transmission when performing CPR or giving ventilations to a patient.

CRITICAL FACTS

Standard precautions are safety measures to prevent occupational-risk exposure to blood and OPIM. These assume that all body fluids may be infective.

Fig. 2-8: Personal protective equipment.

The History of Isolation Precautions

Isolation precautions have evolved over the last few decades, in response to the expansion of healthcare delivery from a mostly primary care hospital setting to a wide range of settings, as well as our understanding of new pathogens and how they spread.

While isolation precautions were already in place in the early 1980s, new guidelines, called universal precautions, were developed in the mid-1980s in response to the HIV/AIDS epidemic. These precautions dictated the application of blood and OPIM precautions to all patients, whether or not they were known to be infected. These precautions included such measures as hand washing immediately following glove removal, handling of needles and other sharps devices, and PPE to protect healthcare personnel from mucous membrane exposures.

In 1987, new precautions were developed, called BSI precautions, which shared some features with universal precautions but emphasized the need to avoid contact with all moist and potentially infectious body substances, even if blood was not present. Another difference from universal precautions was that BSI precautions did not specify hand washing after glove removal unless there was visible soiling.

In 1996, the Healthcare Infection Control Practices Advisory Committee (HICPAC) blended the major features of universal and BSI precautions in a broader guideline referred to as standard precautions, directing healthcare workers to apply these precautions to all patients at all times. Standard precautions address some gaps in the earlier guidelines, by including three transmission-based categories of precautions: airborne, droplet and contact.

Today, standard precautions constitute the primary strategy to prevent healthcare-associated infection among patients and healthcare personnel.

Masks

A mask is a personal protective device worn on the face that covers at least the nose and mouth, and reduces the wearer's risk of inhaling hazardous airborne particles (including dust particles and infectious agents such as TB), gases or vapors. A high-efficiency particulate air (HEPA) or N95 mask filters out at least 95 percent of airborne particles, and is therefore given a "95" rating. Respirators that filter out at least 99 percent receive a "99" rating. Those that filter at least 99.97 percent (essentially 100 percent) receive a "100" rating. Remember that masks must be fit-tested to be effective. Place a surgical mask on the patient if you suspect an airborne disease.

Gowns

Wear a disposable gown in situations with large amounts of blood or OPIM. If your clothing becomes contaminated, remove it and shower as soon as possible. Wash the clothes in a separate load, preferably at work.

Hand Hygiene

Hand washing is the most effective measure to prevent the spread of infection (Fig. 2-9). By washing your hands often, you physically remove disease-causing germs you may have picked up from other people, animals or contaminated surfaces. In addition, jewelry, including rings, should not be worn where the potential for risk of exposure exists.

Wash your hands frequently. When practical, wash your hands before providing care and always after providing care—whether or not gloves are worn. Local protocols may vary and should be followed.

Fig. 2-9: Hand washing is the most effective way to prevent the spread of infection.

Wash your hands with soap and running water, and dry your hands thoroughly. Wash your hands and other exposed skin immediately if exposed to contaminants, such as blood and OPIM. Always wash hands after using the restroom and before and after handling food. Use alcohol-based hand sanitizers when soap and running water are not available, but wash your hands with soap and water as soon as it is practical.

Hand-Washing Tips

To ensure you wash your hands correctly, follow these steps:

- Wet hands with warm water.
- Apply soap to hands.
- Rub hands vigorously for at least 20 seconds, covering all surfaces of the hands and fingers. Use soap and warm running water. Scrub nails by rubbing them against the palms.
- Rinse hands with water.
- Dry hands thoroughly with a paper towel.
- Turn off the faucet using the paper towel.

In addition to washing your hands frequently, keep your fingernails less than one-quarter of an inch long and avoid wearing artificial nails.

Hand Sanitizer and Hand-Washing Stations

At some outdoor events or workplaces, for example on a farm or at a fair, the only source of clean water may be a portable hand-wash station. These stations consist of a supply of soap and potable water, and a bucket, cooler or other container with a turn-spout that allows the water to run over your hands to rinse soap away. The stations also include a catch bucket to catch the wastewater, and an ample supply of paper towels.

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

- 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 soap and water as soon as they are available.

Engineering and Work Practice Controls

Engineering controls are control measures that isolate or remove a hazard from the workplace. In other words, engineering controls are objects used in the workplace to help reduce the risk of an exposure incident. Examples of engineering controls include:

- Sharps disposal containers (Fig. 2-10).
- Self-sheathing needles.
- Safer medical devices, such as sharps with engineered sharps injury protections or needleless systems.
- Use of ***biohazard*** containers and labels, and posting of signs at entrances to areas where infectious materials may be present.
- PPE.

Biohazard containers are marked with a biohazard symbol—typically, a three-sided design in bright, fluorescent orange or orange-red, with lettering or symbols in a contrasting color. This symbol warns of potential infection hazards. The origin of the biohazard symbol dates back to the 1960s. It was created out of a need for a standardized, unique symbol to use as a warning symbol in response to accidental infections that occurred as a result of biomedical research. These unfortunate incidents were viewed as preventable. The symbol's development was spearheaded by Charles Baldwin, an environmental health engineer at Dow Chemical Corporation. The symbol that was eventually chosen best met the criteria that were tested in development of the symbol. It is easy to recognize, has three sides so it can be identified from any angle, and can be easily stenciled for labeling purposes. The symbol was soon adopted by the National Institutes of Health, the CDC and OSHA.

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

Fig. 2-10: Biohazard containers, such as those used for sharps disposal, are one type of engineering control.

- Placing sharps items (e.g., needles, scalpel blades) in puncture-resistant, leak-proof and labeled containers, and having the containers at the point of use.
- Avoiding splashing, spraying and splattering droplets of blood or OPIM when performing all procedures.
- Removing and disposing of soiled protective clothing as soon as possible.
- Cleaning and disinfecting all equipment and work surfaces possibly soiled by blood or OPIM.
- Washing your hands thoroughly with soap and water immediately after providing care, using a utility or restroom sink (not one in a food preparation area).
- Not eating, drinking, smoking, applying cosmetics or lip balm, handling contact lenses, or touching your mouth, nose or eyes when you are in an area where you may be exposed to infectious materials.
- Using alcohol-based sanitizers where hand-washing facilities are not available.

Vehicle and Equipment Cleaning and Disinfecting

After providing care, the equipment and surfaces you used should always be cleaned and disinfected or properly disposed of (Fig. 2-11). Handle all soiled equipment, supplies and other materials with care

CRITICAL FACTS

Engineering controls, such as biohazard containers and PPE, are control measures that isolate or remove a hazard from the workplace.

Work practice controls reduce the likelihood of exposure by changing the way tasks, such as disposal of sharps items or soiled clothing, are carried out.

Fig. 2-11: Always clean and disinfect the equipment you use after providing care. *Photo: courtesy of Terry Georgia.*

until it is properly cleaned and disinfected. Place all used disposable or single-use items in labeled biohazard containers. Place all soiled clothing in marked plastic bags for disposal or washing.

Take the following steps to clean up spills:

- Wear disposable latex-free gloves and other PPE when cleaning spills.
- Clean up spills immediately or as soon as possible after the spill occurs.
- If the spill is mixed with sharp objects, such as broken glass and needles, do not pick these up with your hands. Use tongs, a broom and dustpan or other similar items.
- Dispose of the absorbent material used to collect the spill in a labeled biohazard container.
- Flood the area with a fresh disinfectant solution. Use a commonly accepted disinfectant of approximately 1½ cups of liquid chlorine bleach to 1 gallon of water (1 part bleach per 9 parts water, or about a 10 percent solution), and allow it to stand for at least 10 minutes. Other commercial disinfectant/antimicrobial solutions are available and may have different set times. Follow local protocols and manufacturer's instructions.
- Use appropriate material to absorb the solution, and dispose of it in a labeled biohazard container.
- Scrub soiled boots, leather shoes and other leather goods such as belts with soap, a brush and hot water. If you wear a uniform to work, wash and dry it according to the manufacturer's instructions.

Clean and disinfect the vehicle according to standard procedures. Wear appropriate PPE (disposable gown and gloves) during the cleaning process and discard after use. Thoroughly clean and disinfect all surfaces that may have come in contact with the patient or materials that may have become contaminated while providing care for the patient (e.g., stretcher, rails, control panels, floors, walls, work surfaces). Use an Environmental Protection Agency (EPA)-registered hospital disinfectant and follow manufacturer's recommendations.

If an Exposure Occurs

Exposure incidents involve contact with blood or OPIM—for example, a patient's blood gets into a cut on your hand, you are stuck with a needle used on a patient, or bloody saliva splashes into your mouth or eyes. You may also be exposed when in unprotected, close contact with someone who has an airborne disease involving exposure to aerosolized, respiratory droplets (e.g., coughing, sneezing), such as with a patient infected with influenza (including pandemic flu), TB or MDR TB.

What to Do If You Are Exposed

If you are exposed, take the following steps immediately:

- Clean the contaminated area thoroughly with soap and water. Wash needlestick injuries, cuts and exposed skin with soap and water.
- Flush splashes of blood and OPIM to the mouth and nose with water.

CRITICAL FACTS

If you are exposed to blood or OPIM, immediately take the appropriate steps, such as cleaning contaminated areas, as part of a proper exposure control plan.

- If the eyes are involved, irrigate with clean water, saline or sterile irrigants for 20 minutes.
- Seek immediate follow-up care as identified in your department exposure control plan.

Reporting Exposures

Following any exposure incident:

- Report the exposure incident to the appropriate person identified in your employer's exposure control plan (often the infection control officer) immediately and to the emergency medical services (EMS) providers who take over care of the patient. This step can be critical to the success of post-exposure treatment.
- Write down what happened. Include the time and date of the exposure as well as the circumstances of the exposure, any actions taken after the exposure and any other information required by your employer.

OSHA Regulations

OSHA has issued regulations about on-the-job exposure to bloodborne pathogens. OSHA determined that employees are at risk when exposed to blood or OPIM. OSHA therefore requires employers to reduce or remove hazards from the workplace that may place employees in contact with infectious materials.

OSHA regulations and guidelines apply to employees who may come into contact with blood and OPIM that could cause an infection. These regulations apply to you as an EMR because you are expected to provide emergency care as part of your job. In 2001, in response to passage of the federal Needlestick Safety and Prevention Act, OSHA revised the Bloodborne Pathogens Standard 29 CFR 1910.1030. These guidelines may help you and your employer meet the OSHA bloodborne pathogens standard to prevent transmission of serious diseases. (For additional information on the Bloodborne Pathogens Standard 29 CFR 1910.1030, visit OSHA's website at www.osha.gov/SLTC/bloodbornepathogens/standards.html.)

OSHA regulations regarding bloodborne pathogens have placed specific responsibilities on employers for protection of employees, including:

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

Needlestick Safety and Prevention Act

Blood and OPIM have long been recognized as potential threats to the health of employees who are exposed to these materials through penetration of the skin. Injuries from contaminated

CRITICAL FACTS

Per OSHA regulations, employers are required to remove items that might put employees in contact with infectious materials.

OSHA regulations regarding bloodborne pathogens have placed specific responsibilities on employers for protection of employees. These include creating exposure control plans, scheduling decontamination and cleaning of the workplace, training on OSHA regulations and free hepatitis B vaccinations.

needles and other sharps have been associated with an increased risk of disease from more than 20 infectious agents. The most serious pathogens are hepatitis B, hepatitis C and HIV. Needlestick and other sharps injuries resulting in exposure to blood or OPIM are a concern because they happen frequently and can have serious health effects.

In 2001, OSHA revised the Bloodborne Pathogens Standard 29 CFR 1910.1030. The revised standard clarifies the need for employers to select safer needle devices and to involve employees in identifying and choosing these devices. Needleless systems are one option to reduce the possibility of accidental needlestick injuries and possible infection. The updated standard also requires employers to maintain a log of injuries from contaminated sharps. (For additional information on the Needlestick Safety and Prevention Act, visit OSHA's website at www.osha.gov/SLTC/bloodbornepathogens/standards.html.)

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

EMOTIONAL ASPECTS OF EMERGENCY CARE

Stressful Situations

EMRs experience an extraordinary number of stressful situations beyond what others may encounter. Some of the more powerful situations include:

- Dangerous situations. Fires, scenes of violent crime, agricultural accidents and other emergency scenes all involve a certain measure of danger.
- Physical and psychological demands. Some rescues, such as extrications, may place substantial physical burdens on the EMR; others, such as rescuing an abused child, may involve extraordinary psychological demands.
- Critically injured or ill people. Responding to a call to help someone who is critically injured or ill can be highly stressful because of the possibility of not being able to save the patient.
- Death and dying patients. Death is disturbing to most people, but the feelings of powerlessness at not being able to save someone's life may also bring about tremendous guilt and grief.
- Overpowering sights, smells and sounds. Disturbing sights, strong smells and sounds that are upsetting to the EMR may accompany scenes of illness and accidents, especially those that are severe.
- Multiple-patient situations. All of the above situations can occur when a single person is injured or ill, but the effects are magnified in a multiple-casualty incident, which can be truly overwhelming.
- Angry or upset patients, family and bystanders. In an emotionally charged situation, tempers may flare, adding to the intensity of the situation.

During stressful situations, cooperate with other personnel responding to the situation. It is important that you handle the situation in a professional manner when dealing with public safety responders, other EMS providers, the patient and the family.

Death and Dying

Experiencing the dying process is difficult for most people. The following measures may help the patient and family deal with the dying process:

- Recognize that the patient's and the family's needs include dignity, respect, sharing, communication, privacy and control.
- Allow the patient and the family to express rage, anger and despair.
- Listen empathetically and remain calm and nonjudgmental.
- Do not falsely reassure.
- Use a gentle tone of voice.
- Let the patient and the family know that everything that can be done to help will be done.
- Use a reassuring touch, if it is appropriate.
- Comfort the patient and the family.

CRITICAL FACTS

Measures such as listening empathetically, speaking gently, and allowing anger or despair to be expressed may help the patient and family cope with the dying process.

Resuscitation

You may be summoned to an emergency in which one or more people have died or are dying. The cause could be natural, accidental or intentional. Though your responses will vary according to the situation, you must recognize that death will have an emotional impact on you, as well as on others involved.

You may be in a situation in which you think a person has been dead for a while and you are unsure whether you should attempt to resuscitate that person. The general rule is to always attempt to resuscitate a patient without a pulse or normal breathing except in the following situations:

- A valid do not resuscitate (DNR) order or a Physician Orders for Life-Sustaining Treatment (POLST) form that meets local guidelines is present at the scene and directs not to attempt resuscitation.
- Obvious signs of death are present in the patient. These signs include tissue decay (putrefaction); rigor mortis (stiffening of joints that occurs after death; assess two or more joints, such as the fingers and jaw, to verify); obvious mortal wounds (injuries clearly not compatible with life, such as decapitation); or dependent ***lividity*** (purplish color in the lowest-lying parts of a recently dead body, due to pooling of blood).
- The situation is so dangerous (such as a gunman on the scene) that attempting to resuscitate the patient would endanger your life.

To determine that a person is dead, the patient is often placed on a heart monitor and vital signs are assessed by more advanced EMS personnel. When it is determined that the patient has no electrical activity of the heart and no respirations and blood pressure, the person may be declared dead. This may occur after prolonged resuscitation attempts, or it may occur immediately if one of the above conditions is present.

Some patients may have advance directives, POLST forms or DNR orders, which are written legal documents saying that they do not wish to be resuscitated or kept alive by mechanical means. In most instances, you should honor the wishes of the patient if they are expressed in writing. However, since state and local laws about these situations vary, you should summon more advanced medical personnel immediately to provide care. If you are in doubt about the validity of the advance directives, attempt to resuscitate the patient. (For more information on advance directives, POLST forms and DNR orders, refer to Chapter 3.)

Individual Responses to Death

Dying is part of the living process. Death affects everyone, and the way we respond varies widely. Be prepared to handle your feelings and the feelings of others. Remember that reactions to death and dying range from anxiety to acceptance. How well you and others handle the situation will depend on both personal feelings about death and the nature of the incident.

One of the most disturbing emergency situations is sudden death. ***Sudden death*** generally refers to an unexpected, natural death. It is commonly used to describe death resulting from an abrupt cardiac event, but it also describes a death that occurs within a few hours after an abrupt onset of symptoms in an otherwise healthy person. Sudden death of an infant can be especially disturbing to new parents, though it is difficult for anyone involved. EMRs can never fully prepare themselves for an emergency involving sudden death.

Stages of Grief

There will be times you are called to assist grieving patients or family members. There are some predictable responses to grief, though people do not always experience them in any particular order. Keep in mind that everyone's reaction to death and dying is unique and not everyone will experience every stage of grief, nor will everyone experience grief in the same order.

Remain nonjudgmental throughout the grieving process. The stages of grieving include:

- Denial. The patient or family member denies the seriousness of the situation in order to buffer the pain of the event.
- Anger. The patient or family member projects feelings of anger toward other people, especially those closest to the individual. Do not take anger personally, even though it may seem to be directed toward you. Be alert to anger that may become physical and endanger you or others.

CRITICAL FACTS

Denial, anger, bargaining, depression and acceptance are the five stages of grief.

- Bargaining. The patient or family member may attempt to negotiate with a spiritual higher being or even with EMS providers in an effort to extend life.
- Depression. The patient or family member exhibits sadness and grief, is usually withdrawn and may cry continually. Allow the affected person to express these feelings, and help the patient or family member to understand that these are normal feelings associated with death.
- Acceptance. The patient or family member ultimately accepts the situation and incorporates the experience into the activities of daily living, in an effort to survive or to support a loved one. Use good listening skills in this phase.

Helping the Patient and the Family

The care EMRs provide to patients often focuses on the patient's physical needs, but care must also include supporting patients and their families through the emotions they may experience when someone is injured or ill. In these situations, be calm, supportive and nonjudgmental. Allow the patient or family member to safely vent feelings.

STRESS MANAGEMENT

What Is Stress?

Stress is the body's normal response to any situation that changes a person's existing mental, physical or emotional balance. Stress can result from positive experiences, such as a wedding, or more difficult situations, such as responding to a life-threatening emergency.

Stress can arise from any situation or thought that brings about feelings of frustration, anger or anxiety. Stress is unique to the individual; what is stressful to one person may not be so to another. Stress is a normal part of life. In small quantities, it can be positive, motivating people and helping them to be more productive. Too much stress or a strong response to stress, however, can be harmful, contributing to illnesses such as heart disease or depression.

An event like a serious injury, illness or death may produce great stress in patients, family members and EMRs. By learning how stress builds up, how to identify its signs and symptoms, and how to manage stress, you can help yourself and others cope with the stressful impact of an emergency situation.

While providing care, you may encounter angry, scared or violent patients and family members, especially when the patient is seriously injured or ill. Personal feelings triggered by these situations can affect you. Learn what to expect and how to assist patients, their families, yourself and others in dealing with this stress.

Those involved in a serious injury, sudden illness or death may face an emotional crisis. Their reactions to the crisis will depend on a number of factors and will differ from person to person. Often, reactions will come during or immediately following the event, but in some cases they may be delayed for hours, days or even longer.

Warning Signs and Symptoms of Personal Stress

As an EMR, be sure to note if you or those around you are exhibiting any signs or symptoms of personal stress during or following a response. When interacting with patients and their families during an emergency, you may hear them talk about or exhibit certain signs or symptoms of stress. Warning signs and symptoms of stress include:

- Difficulty sleeping and nightmares.
- Irritability with co-workers, family and friends.
- Feelings of sadness, anxiety or guilt.
- Indecisiveness.
- Loss of appetite.
- Loss of interest in sexual activity.
- Isolation.
- Loss of interest in work.
- Feelings of hopelessness.
- Alcohol or drug misuse or abuse.
- Inability to concentrate.

CRITICAL FACTS

When interacting with patients and their families, watch carefully for signs of stress, which can include sleep disorders, loss of appetite, emotional and behavioral changes, and drug abuse.

INCIDENT STRESS MANAGEMENT

An EMR's job can be highly stressful, often involving "critical incidents." These emergencies involve a serious injury or death. Critical incidents are especially stressful if you feel you did something wrong or failed to do something even after responding exactly as you were trained. A particular type of stress, called ***critical incident stress***, can result from such a situation. It is important to understand the powerful impact this stress can have on you.

The stress of the emergency can cause distress or disruption in a person's mental or emotional balance. It can cause sleeplessness, anxiety, depression, exhaustion, restlessness, nausea, nightmares and other problems. Some effects may appear right away and others only after days, weeks or even months have passed. People suffering from critical incident stress might not be able to do their job well.

Closely monitor your performance and watch for the following signs and symptoms of critical incident stress reactions:

- Confusion
- Shortened attention span
- Poor concentration
- Denial
- Guilt
- Depression
- Anger
- Change in interactions with others
- Increased or decreased eating
- Uncharacteristic, excessive humor or silence
- Any other unusual behavior

EMS Incidents Likely to Produce Stress

Events that trigger critical incident stress are often powerful and traumatic, and are usually outside of the range of what we consider normal human experiences on the job. This might include the death or serious injury of a co-worker, the death of a child or a multiple-casualty event.

Pre-Incident Education

To help EMRs cope with job-related stress before it occurs, employers sometimes offer stress-management classes and crisis-mitigation training. This preparation helps responders set expectations and improve their ability to cope with stress.

It is also a good idea to create a self-care plan that lays out how you will take care of your own well-being while involved in emergency work. This should include mental health considerations. For example, your employer may offer prearranged professional counseling to help you cope with work-related stress.

Finally, an EMR's job often requires long hours, including weekends and evenings. To lower your stress level, it is a good idea to arrange in advance for personal responsibilities such as care for children and older parents.

Stress Management During an Emergency

Pay attention to your own stress responses during an emergency, through continual self-monitoring. In monitoring your stress, consider factors such as stamina, expectations, prior traumatic experiences and eating habits. Partner with a colleague so that you can help monitor each other's stress levels to determine when relief is necessary. If you feel your stress level rising to a concerning level, you may need a second to step back from a situation, recollect your thoughts and then continue with care.

Post-Incident Stress Management

To relieve stress, the following steps can help:

- Use quick relaxation techniques, such as deep, slow breathing.
- Eat a good meal and avoid beverages with caffeine.
- Avoid alcohol or drugs.
- Review the event and clear up any uncertainties.
- Get enough rest.
- Get involved in some type of physical exercise or activity, either alone or in a group.

CRITICAL FACTS

The stress of critical incidents can be powerful for EMRs, and the effects may be latent or immediate. Watch for signs, including guilt, poor concentration, depression, or any uncharacteristic or unusual behavior.

Follow-Up

EMRs sometimes do not recognize how much the stress of what they do can affect their family and friends. They sometimes complain that their loved ones show a lack of understanding for what they do. Family members can experience frustration because of an EMR's unwillingness to share information and feelings about an incident. EMRs do not always realize that family members and friends suffer fear of separation and are afraid of being ignored for something "more exciting." An EMS career can be cut short by the invisible dangers of unmanaged stress. By taking a serious look at your life and making necessary adjustments, you can ensure a healthy balance in all the things you choose to do.

If you begin to exhibit signs and symptoms of critical incident stress that do not seem to be going away after an emergency, work with your supervisor to arrange for professional counseling by a licensed mental health professional.

When to Access Professional Help

If you or a colleague show signs of critical incident stress, work with your employer as soon as possible to arrange for professional counseling by a licensed mental health professional. Do not wait until after an emergency to figure out where you should go if you begin to exhibit signs and symptoms of critical incident stress.

Incidents that could lead to a necessity to access professional counseling by a licensed mental health professional include:

- Line-of-duty death or serious injury.
- Multiple-casualty incidents.
- Suicide of an emergency worker.
- Serious injury or death of children.
- Events with excessive media attention.
- Victims known to EMS personnel.
- Events that have unusual impact on EMS personnel.
- Any disaster.

Activation protocols vary from area to area. Your employer should be able to supply you with information on how to access this service in your community.

Some people think that participating in counseling is an admission of weakness. Quite the contrary is true. Counseling should be—and in many areas is—a routine part of any overwhelming incident, such as an airline disaster. Counseling can help in any situation, regardless of how minor you may think the event was. The most important thing you can do to minimize the effects of any emergency is to express your feelings and thoughts after the incident.

PUTTING IT ALL TOGETHER

In order to provide emergency care to others, it is important first to look after yourself. This includes physical, emotional and mental health concerns.

One of the ways EMRs must look after themselves is by preventing illness. Bloodborne pathogens—most commonly bacteria and viruses—are present in blood and OPIM and can cause disease in humans. The bloodborne pathogens of primary concern to EMRs are hepatitis B, hepatitis C and HIV. These pathogens spread primarily through direct or indirect contact with infected blood or OPIM.

To prevent the spread of bloodborne pathogens and other diseases, EMRs should follow standard precautions. These precautions require that all blood and OPIM be treated as if known to be infectious. Apply these precautions by using PPE, frequently washing your hands, using engineering controls, following work practice controls, properly cleaning and disinfecting equipment, cleaning up after spills, and properly disposing of used disposable or single-use equipment.

If exposed to blood or OPIM, you should immediately wash, flush or irrigate the exposed area of your body and report the incident to your supervisor.

It is equally important that you attend to mental and emotional health concerns in yourself and the patients and families you are helping. An emotional crisis often results from an unexpected, shocking and undesired event, such as the sudden loss of a loved one. Although people react differently in different situations, everyone experiences some or all of the stages of grief. By considering the nature of the incident, you can begin to prepare yourself to deal with its emotional aspects.

Regardless of the nature of the event, the care you provide to patients in any emotional crisis is very similar. Your care involves both verbal and nonverbal communication. It also requires you to understand that in some cases death is inevitable. In some situations, you may be overcome by emotion. Remember that self-help involves sharing your feelings with others.

You Are the Emergency Medical Responder

After EMS personnel assumed the care of your patient, you note that, in addition to the blood and vomit on the ground, there is some blood on your disposable gloves and the mask of your BVM. What steps would you follow to avoid coming in contact with the blood and OPIM? How should the area be decontaminated?

Skill Sheet 2-1

Removing Disposable Latex-Free Gloves

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

STEP 1

Pinch the palm side of one glove on the outside near your wrist.

STEP 2

Pull the glove toward your fingertips, turning it inside out as you pull it off your hand.

STEP 3

Hold the glove in the palm of your other (still-gloved) hand.

(*Continued*)

Skill Sheet 2-1

Removing Disposable Latex-Free Gloves *Continued*

STEP 4

Carefully slip two fingers under the wrist of the other glove. Avoid touching the outside of the glove.

STEP 5

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

STEP 6

Dispose of the gloves (and any other PPE) properly in a biohazard container.

Wash your hands thoroughly with soap and running water, if available. Otherwise, rub your hands thoroughly with an alcohol-based hand sanitizer if they are not visibly soiled and then wash your hands as soon as it is practical.

ENRICHMENT

Health of the Emergency Medical Responder

Being an EMR is a rewarding experience, but it also can be physically, emotionally and mentally challenging. Making healthy lifestyle choices benefits not only yourself, but also the patients who will rely on you in their moments of need.

Physical Well-Being

Taking care of your body is a must for an EMR. There are situations you may face where physical strength and stamina will be key components in successfully caring for patients or assisting other responders. There are many factors to obtaining good physical well-being, and you should consider it your responsibility to address all of them as part of a healthy lifestyle. Physical activity not only helps you keep fit but also is an effective way to reduce stress.

Physical Fitness

Your physical well-being is one of the most important assets you hold to ensure that you are able to effectively perform your job as an EMR (Fig. 2-12). Maintaining your own physical fitness is necessary for having the stamina and strength to respond at the level required.

One of the key aspects of physical fitness is cardiovascular endurance. Be sure to get regular cardiovascular training. According to the American College of Sports Medicine, approximately 30 minutes of physical activity per day can help lower blood pressure and cholesterol and help you maintain a healthy weight. The more you exercise, the better your endurance—resulting in better health, strength and stamina.

Muscle strength and flexibility are also important assets for EMRs to assist in day-to-day tasks. Strength training develops strong bones, increases bone density and controls body fat. Strength training will also reduce your risk of injury, as muscle protects your joints and helps you maintain flexibility and balance.

Fig. 2-12: Strength training develops strong bones, increases bone density and controls body fat.

ENRICHMENT

Health of the Emergency Medical Responder *CONTINUED*

Stretching on a regular basis is the best way to maintain flexibility. Therefore, in tandem with your aerobic and strength training, make sure to incorporate stretching as part of your daily workout routine.

Nutrition

Following basic nutrition strategies will help keep you fit, reduce stress and assist in maintaining your stamina throughout the day. Choose an eating style that is low in saturated fat, sodium and added sugars and follow the USDA MyPlate recommendations for a healthy diet (at choosemyplate.gov).

Sleep

Sleep deprivation is one of the most potentially dangerous challenges EMRs may face, as it affects your ability to think clearly and can decrease your hand-eye coordination. This means you are less productive and may make mistakes that can lead to injury or negatively affect the patients you treat. If you find yourself consistently feeling drowsy, adjust your sleep schedule to ensure you are getting enough rest. Speak to your healthcare provider if you are experiencing sleeplessness.

Disease Prevention

Emergency care personnel must take precautions against disease transmission by potentially infectious substances. Make sure to protect yourself against disease transmission by following standard precautions and using recommended PPE. Remember, hand washing is the most important way to prevent the spread of infection, even if you were wearing gloves when possibly exposed.

Controlling risk factors for heart disease is the best way to minimize your chance of cardiovascular disease. Taking steps to maintain a healthy lifestyle by not smoking, becoming more active, lowering stress in your life and eating a healthy diet will dramatically reduce your risks.

Injury Prevention

As mentioned, strength training is a good start to helping prevent injury on the job. As an EMR, it is challenging to keep your own safety in mind, especially when your patient is in a life-threatening situation. Trying to remain aware of your surroundings, using proper lifting techniques, and following proper procedures and protocols will help ensure your safety and that of your patient.

Sun Safety

According to the American Academy of Dermatology, 1 in 5 Americans will develop some form of skin cancer during their lifetime. Remember when exposed to the sun to drink plenty of fluids and dress appropriately, such as in long-sleeved shirts, pants, hats and sunglasses. Apply a broad-spectrum sunscreen that has a sun protection factor (SPF) of 15 or higher and that is water resistant for at least 40 minutes. Broad-spectrum sunscreens protect the skin from ultraviolet A (UVA) and ultraviolet B (UVB) rays, both of which cause cancer. Reapply sunscreen every 2 hours, even on cloudy days, and especially when sweating or swimming. One ounce of sunscreen is considered the amount needed to cover exposed areas of the body.

Mental Well-Being

There is no doubt that being an EMR is stressful (Fig. 2-13). The sense of responsibility for other people's lives can be overwhelming. Mental well-being, like physical well-being, is important to allow you to stay focused and be prepared to deal with the day-to-day stress of your job.

Continued on next page

ENRICHMENT

Health of the Emergency Medical Responder *CONTINUED*

Reducing Stress

If you find yourself feeling overwhelmed or indifferent toward your job, irritable, angry, sarcastic or quick to argue, chances are you are not coping well with the stress in your life. It is important to find ways to help relieve your feelings of stress before they begin to affect your job performance.

Three types of stress reactions are common to EMRs: acute, delayed and cumulative. Recognizing the warning signs of stress is imperative, as the earlier they are identified, the easier they are to address. The warning signs and symptoms include:

- Irritability.
- Lack of concentration.
- Difficulty sleeping and nightmares.
- Anxiety.
- Indecisiveness.
- Guilt or shame.
- Loss of appetite and sexual desire.
- Isolation.
- Loss of interest in work.

If you feel stress affecting your life, it is important to get it under control. These stress management techniques may be helpful:

- Reprioritize work goals and tasks.
- Perform physical activity every day.
- Make sure you eat at every meal and avoid fast food.
- Share household chores with family members.
- Practice relaxed breathing or muscle relaxation.
- Put a positive spin on negative thoughts.

Fig. 2-13: Being an EMR can be overwhelming. Mental well-being is important to help you prepare for the everyday stress of the job.

Personal Relationships

Finding work-life balance is always challenging and must be managed properly so you can enjoy a rewarding personal life. Too much focus on work can place stress on your relationships. Often, when faced with difficulties in your personal life, concentrating on your job can be difficult. This can lead to mistakes or injuries. Some people throw themselves into work as a way to avoid dealing with relationship problems at home, which can lead to burnout.

Discovering you are having difficulty coping with problems at home can be overwhelming. Counseling can help you cope with conflict in your personal relationships and be better prepared to focus while on the job. Family therapy and marriage counseling can help mend strained relationships, teach new coping skills, and improve how you interact with family and partners. Counseling gives families the tools to communicate better, negotiate differences, problem solve and even argue in a healthier way.

ENRICHMENT

Health of the Emergency Medical Responder *CONTINUED*

Alcohol and Drug Problems

High levels of stress, anxiety or emotional pain can lead some people to drink alcohol to excess or use drugs. In actuality, this increases stress.

Addiction is a complex problem, including both psychological and physical aspects. If you are addicted to a drug, you will experience intense cravings for it, sometimes many times throughout the day. Your cravings for the substance will persist in spite of the physical, psychological and social consequences it brings. You may find yourself repeatedly trying to stop taking the drug, but being unable to do so because of the unpleasant reactions to stopping, such as insomnia, anxiety and tremors. You may also find yourself rationalizing the need to do things you would not normally do, such as stealing or lying, to continue drug use. Or, you may try to convince yourself that you need the drug in order to cope with your problems. If you show any of the signs of addiction, seek help immediately through addiction services in your community.

If you are a smoker, deciding to quit smoking will be one of the best and most responsible decisions you make in your life. It will also be one of the most challenging. Speak to your healthcare provider for advice on quitting, and remember the health benefits as a way to stay focused on your goal.

Health Risks and Assessments

Your employer may offer wellness tools, such as online health profiles, to help you identify health risks and develop wellness goals through personalized health assessments. Take advantage of these and other tools that may be offered to you in an effort to lead a healthier lifestyle.

3

MEDICAL, LEGAL AND ETHICAL ISSUES

You Are the Emergency Medical Responder

A 20-year-old cyclist on a mountain bike team was temporarily unconscious after falling off his bike during practice. As the athletic trainer for the team, you respond to the incident. The injured cyclist is awake but complaining of dizziness and nausea. After assessing and taking a history and baseline vital signs, you tell the cyclist to go home and rest. Was this an appropriate response? Why or why not?

KEY TERMS

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

Advance directive: A written instruction, signed by the patient and a physician, that documents a patient's wishes if the patient is unable to communicate their wishes.

Applied ethics: The use of ethics in decision making; applying ethical values.

Assault: A crime that occurs when a person tries to physically harm another in a way that makes the person under attack feel immediately threatened.

Battery: A crime that occurs when there is unlawful touching of a person without the person's consent.

Competence: The patient's ability to understand the emergency medical responder's (EMR's) questions and the implications of decisions made.

Confidentiality: Protection of a patient's privacy and personal information.

Consent: Permission to provide care; given by an injured or ill person to a responder.

Do no harm: The principle that people who intervene to help others must do their best to ensure their actions will do no harm to the patient.

Do not resuscitate (DNR) order: A type of advance directive that protects a patient's right to refuse efforts for resuscitation; also known as a "do not attempt resuscitation (DNAR) order."

Durable power of attorney for healthcare: A legal document that expresses a patient's specific wishes regarding their healthcare; also empowers an individual, usually a relative or friend, to speak on behalf of the patient should they become seriously injured or ill and unable to speak for themselves.

Duty to act: A legal responsibility of some individuals to provide a reasonable standard of emergency care.

Ethics: A branch of philosophy concerned with the set of moral principles a person holds about what is right and wrong.

Expressed consent: Permission to receive emergency care granted by a competent adult verbally, nonverbally or through gestures.

Good Samaritan laws: Laws that protect people against claims of negligence when they give emergency care in good faith without accepting anything in return.

Healthcare proxy: A person named in a healthcare directive, or durable power of attorney for healthcare, who can make medical decisions on someone else's behalf.

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

In good faith: Acting in such a way that the goal is only to help the patient and that all actions are for that purpose.

Legal obligation: Obligation to act in a particular way in accordance with the law.

Living will: A type of advance directive that outlines the patient's wishes about certain kinds of medical treatments and procedures that prolong life.

Malpractice: A situation in which a professional fails to provide a reasonable quality of care, resulting in harm to a patient.

Medical futility: A situation in which a patient has a medical or traumatic condition that is scientifically accepted to be futile should resuscitation be attempted and, therefore, the patient should be considered dead on arrival.

Moral obligation: Obligation to act in a particular way in accordance with what is considered morally right.

Morals: Principles relating to issues of right and wrong and how individual people should behave.

Negligence: The failure to provide the level of care a person of similar training would provide, thereby causing injury or damage to another.

Next of kin: The closest relatives, as defined by state law, of a deceased person; usually the spouse and nearest blood relatives.

Patient's best interest: A fundamental ethical principle that refers to the provision of competent care, with compassion and respect for human dignity.

Physician Orders for Life-Sustaining Treatment (POLST) form: Medical orders concerning end-of-life care to be honored by healthcare workers during a medical crisis.

Refusal of care: The declining of care by a competent patient; a patient has the right to refuse the care of anyone who responds to an emergency scene, either before or after care is initiated.

Standard of care: The criteria established for the extent and quality of an EMR's care.

Surrogate decision maker: A third party with the legal right to make decisions for another person regarding medical and health issues through a durable power of attorney for healthcare.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Define the legal duties of an emergency medical responder (EMR), including scope of practice and the standard of care.
- Define and discuss the ethical responsibilities of an EMR.
- Describe the various forms of consent and explain the methods of obtaining consent.
- Explain the difference between expressed consent and implied consent.
- Have a basic understanding of Good Samaritan laws.
- Discuss the implications of and steps to follow if a patient refuses care.
- Discuss advance directives, do not resuscitate (DNR) orders and Physician Orders for Life-Sustaining Treatment (POLST) forms, and explain their implications on emergency medical care.
- Explain other legal issues including assault and battery, abandonment and negligence.
- Explain the importance, necessity and legality of maintaining confidentiality about the condition, circumstances and care of the patient.
- Discuss the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule, including instances where disclosure of information is permitted.
- Describe the signs of obvious death.
- Understand the importance of and need for crime scene/evidence preservation.
- Understand the circumstances and general requirements of mandated reporting.

INTRODUCTION

This chapter addresses, in general terms, some of the medical, legal and ethical principles that relate to emergency care. As an emergency medical responder, it is your responsibility to keep yourself up-to-date on laws and regulations that affect your duties. If you are unclear about any aspect of these laws and regulations, speak with your employer, regulatory agency or a legal professional. You should also follow any rules and guidelines established by your employer or organization with which you are affiliated when you are acting as an emergency medical responder.

LEGAL DUTIES

Scope of Practice

The emergency medical responder's (EMR's) scope of practice is defined as the range of duties and skills an EMR is allowed and expected to perform as appropriate. The scope of practice also defines boundaries and distinctions within the healthcare system, ensuring that each level of provider operates within a legally accepted range of duties and skills. Scope of practice also draws a distinction between these professionals and the layperson.

The EMR, like other out-of-hospital care providers, is governed by legal, ethical and medical guidelines. Since practice may differ from state to state or in regions of the same state, you must be aware of variations existing for your level of training in your state or area. The term "scope of practice" also refers to the authority to practice, given by the state to individuals licensed or certified to practice in that state.

Standard of Care

The public expects a certain ***standard of care*** from personnel summoned to provide emergency care. The standard of care is the criteria established for the extent and quality of EMR care.

When providing emergency care, EMRs are expected to perform to at least the minimum standard set forth by their training and protocols. State laws and other authorities, such as national organizations, may govern the actions of EMRs. If your actions do not meet the set standards, and harm another person, you may be liable for negligence or ***malpractice***.

Duty to Act

While on duty, an EMR has an obligation to respond to an emergency and provide care at the scene. This obligation is called a ***duty to act*** (Fig. 3-1). It applies to public safety officers, certain government employees, licensed and certified professionals, and medical paraprofessionals while on duty. For instance, members of a volunteer fire department have a duty to act based on participation in the fire department. An athletic trainer has a duty to provide care to an injured athlete. Failure to fulfill these duties could result in legal action.

CRITICAL FACTS

The EMR's scope of practice is defined as the range of duties and skills an EMR is allowed and expected to perform as appropriate.

The public expects a certain standard of care from personnel summoned to provide emergency care. The standard of care is the criteria established for the extent and quality of EMR care.

While on duty, an EMR has an obligation to respond to an emergency and provide care at the scene. This obligation is called a duty to act.

Fig. 3-1: While on duty, an EMR has a legal duty to act.

As an EMR, if you see a motor-vehicle crash while you are off duty, in most states you do not have a ***legal obligation*** to stop (although you may have a ***moral obligation***). However, if you stop and begin to provide care, you are legally obligated to continue until the patient is turned over to someone with an equal or a higher level of training.

Competence

Competence refers to the patient's ability to understand the EMR's questions and the implications of decisions made. EMRs must obtain permission from competent patients before beginning any care. To receive consent or refusal of care, the EMR should determine competence. In certain cases, such as those involving intoxication, drug abuse or cognitive impairment such as dementia or Alzheimer's disease, the patient is not considered competent. Some individuals, such as minors, are not competent to make decisions about their care as a matter of law.

Good Samaritan Laws

The vast majority of states and the District of Columbia have ***Good Samaritan laws*** that protect people against claims of negligence when they provide emergency care in good faith without accepting anything in return. These laws, which differ from state to state, may apply when an EMR volunteers to assist in an emergency when not on duty.

Although professional responders such as EMRs are not usually considered Good Samaritans when on the job, many states have other laws that protect EMRs from negligence claims arising out of job activities in some situations.

When a responder's actions are willful or reckless, however, these liability protections most likely will not apply.

Along with the lay public, Good Samaritan laws may protect off-duty EMRs who are providing emergency care in good faith. The laws do not protect an individual from a claim that an act was grossly negligent.

Good Samaritan laws vary from state to state. For more information, check your local and state laws or consult with a legal professional to see if, and when, Good Samaritan laws protect you.

Ethical Responsibilities

As an EMR, you have an ethical obligation to carry out your duties and responsibilities in a professional manner. This includes showing compassion when dealing with a patient's physical and emotional needs, and communicating sensitively and willingly at all times. Try to avoid becoming satisfied with

CRITICAL FACTS

If an EMR acts in a reasonable and prudent way consistent with the standard of care, a negligence claim against the EMR will likely fail.

meeting minimum training requirements and instead strive to develop your professional skills and knowledge. Doing so includes not only practicing and mastering the skills taught in this course, but seeking out further training and information, such as through workshops, conferences, and supplemental or continuing advanced medical educational programs. Your instructor may be able to provide ideas and information about opportunities in your area for further education and professional development.

In addition to being the best you can be in providing care, be honest in reporting your actions and the events that occurred when you respond to an emergency. Make it a personal goal to be a person whom others trust and can depend on to give accurate reports and provide effective care.

Address your responsibilities to the patient at every emergency. Periodically, carry out a self-review of your performance (e.g., patient care, communication, documentation) to help improve any areas of potential weakness or opportunities for professional growth.

Ethical responsibilities include the following concepts:

- ***Morals:*** Morals are a set of principles relating to issues of right and wrong and how individual people should behave. To understand the morals of a society, you have to know what that society believes.
- ***Ethics:*** Ethics is a branch of philosophy that deals with the set of moral principles a person holds about what is right and wrong.
- ***Applied ethics:*** The term "applied ethics" refers to the application of ethical values in decision making.

Decision-Making Models

A decision-making model is a tool or technique to assist you in making decisions. The term can also refer to a set of principles which, when applied, lead to the desired decision. Some of those principles include the following:

- ***Do no harm:*** The phrase "do no harm" is attributed to Hippocrates and first appeared in his treatise, *Of the Epidemics*. The treatise states, "Practice two things in your dealings with disease: either help or do not harm the patient." "Do no harm" has been brought into several trained and professional healthcare practices. In essence, it means that people who intervene to help others must do their best to ensure their actions will do no harm to the patient or patients. (For more information on the National Association of Emergency Medical Technicians' Code of Ethics and EMT Oath, see naemt.org/about_ems/emtoath.aspx.)
- Act ***in good faith:*** To act in good faith means to act in such a way that the goal is only to help the patient and that all actions are for that purpose.
- ***Patient's best interest:*** To act in the patient's best interest is a fundamental ethical principle that refers to providing competent care with compassion and respect for human dignity. This implies that the care one provides serves the integrity of the patient's physical well-being while at the same time respecting the patient's choices and self-determination.

PATIENT CONSENT AND REFUSAL OF CARE

Individuals have a basic right to decide what can and cannot be done to their bodies; they have the legal right to accept or refuse care. Therefore, to provide care to an injured or ill person, you must first obtain the patient's ***consent***. Usually, the patient needs to tell you clearly that you have permission to provide care.

To obtain consent, you must:

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

Forms of Consent

Consent may be either directly expressed or implied. There are also some special situations in which exceptions or alternate means of providing consent may apply.

CRITICAL FACTS

Ethical responsibilities include morals, ethics and applied ethics.

Individuals have the legal right to refuse or accept care. To obtain consent, you must identify yourself, give your level of training, ask the patient whether you may help, and explain what you observe and what you plan to do.

Expressed Consent

After you have provided the required information, the patient can give ***expressed consent*** either verbally or through a gesture. If the patient is a minor, the law requires that an EMR obtain consent from a parent or legal guardian, if one is available. The patient has the right to withdraw consent for care at any time. If this should occur, step back and call for more advanced medical personnel. In some circumstances, you may be asked to explain why the person needs your care.

To give expressed consent, a patient must be competent. This means the patient must be able to understand the EMR's questions as well as the implications of accepting or refusing any care that the EMR has proposed. The EMR should ensure that the patient understands the condition and both the risks and benefits of the proposed treatment.

Implied Consent

Certain patients may not be able to give expressed consent. This includes patients who are unconscious, have an altered level of consciousness, such as confusion, or who are mentally impaired. In these cases, the law assumes that the patient would give informed consent for emergency care if they were able to do so. This legal concept is called ***implied consent***.

Implied Consent and Minors

Remember, when the patient is a minor, an EMR is required by law to obtain permission to provide care from a parent or legal guardian, if one is available. However, if the condition is life threatening and a parent or legal guardian is not present, consent is implied. A minor is usually considered anyone under the age of 18, unless the person is an ***emancipated minor***, but this varies by state.

If you encounter a parent or legal guardian who refuses to allow you to provide care, try to explain the consequences of not caring for the patient. Use terms the parent or legal guardian will understand. If a law enforcement officer or more advanced medical personnel are not present, have someone call. If necessary, call them yourself. Do not argue with the parent or legal guardian. Doing so can create a potentially unsafe situation.

Emancipated minors are minors who have been granted the legal rights to make their own decisions, such as consent for emergency or medical care. Examples include a minor who is married, pregnant, a parent, a member of the armed forces or financially independent and living away from home.

Special Situations

In certain cases, such as those involving intoxication and drug abuse, patients may not be considered competent and therefore are unable to make rational decisions or give expressed consent. In such cases, call more advanced medical personnel and law enforcement personnel or have someone call them. If possible, attempt to provide care, but do not endanger your personal safety. Always maintain a safe distance from potentially violent or hostile patients.

If a patient appears to be mentally incompetent, the EMR should verify if there is a guardian present with the legal right to consent to treatment. A mentally incompetent patient who is seriously injured or ill falls under implied consent when a parent or legal guardian is not present.

If an adult is legally incompetent—that is, determined by a court to be unable to handle personal or financial affairs, and under a legal guardian's care—you must also get that legal guardian's consent to provide care. Summon a law enforcement officer if necessary.

Refusal of Care

Some injured or ill people may refuse care, even those who may desperately need it. Even though patients may be seriously injured or ill, you should honor their ***refusal of care***. Patients 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 is able to make rational, informed decisions.

Refusal of care does not have to be all or nothing. Patients can agree to receive part of the care that an EMR has suggested, but refuse another part. For example, a patient could choose to be assessed at the scene but refuse transport to the hospital, or agree to be transported to the hospital but not to be treated at the scene. They can also decline care after it has been initiated.

If a patient refuses care, be sure to:

- Follow local policies related to refusal of care.
- Tell the patient what treatment is needed and why. Explain the benefits of receiving treatment as well as the risks of refusing treatment, and mention any reasonable alternative treatments that fall within the parameters of care.

- Try again to convince the patient that the care is needed or that the patient should consider going to the hospital instead, but do not argue. If possible, have a witness listen to and document the refusal, to make it clear that you did not abandon the patient.
- Remind injured or ill persons that they can call 9-1-1 or the designated emergency number to summon emergency medical services (EMS) personnel again if the situation changes or if they change their mind and decide to accept care before you leave the scene.
- Notify more advanced EMS personnel about the situation.
- Notify medical direction, if required by your local protocols.
- Document the patient's refusal, according to local policy. If the patient continues to refuse care, document any assessment you performed and have the patient sign the refusal documentation (Fig. 3-2). If the patient refuses to sign the form, have a family member, police officer or bystander sign the form, verifying that the patient refused to sign. Also, have a family member, police officer or bystander sign the form as a witness. A law enforcement officer is preferable, if available.
- Try one more time to persuade the patient to go to a hospital before leaving the scene.

Advance Directives

An ***advance directive*** is a set of written instructions that describes a person's wishes about medical care. These instructions, signed by the patient and a physician, make a person's intentions known while they are still capable of doing so and are used when the patient can no longer make their own healthcare decisions. The most common types of advance directives are do not resuscitate (DNR) orders, living wills and Physician Orders for Life-Sustaining Treatment (POLST) forms.

Many states have strict requirements for advance directives and the circumstances in which they should be followed. You must be aware of your state and local laws governing advance directives. Your state EMS office is a good source of this information. If you are providing emergency medical responder services as part of your employment or affiliation with an organization, you should also seek guidance from them.

Do Not Resuscitate Orders and Medical Futility

One type of advance directive, a ***do not resuscitate (DNR) order***, also called a "do not attempt resuscitation (DNAR) order," protects a patient's right to refuse efforts for resuscitation (Fig. 3-3). These orders, which differ from state to state, are usually written for people who have a terminal illness.

There must be written proof of a DNR order unless your state is one of the few that accepts verbal verification. If there is no proof of a DNR order, or if you are not certain that it is valid or applicable in the current situation, you must act and provide care as you would in any similar situation where a DNR order does not exist. The exception to this is in cases of medical futility or obvious death.

The term ***medical futility*** is used to describe situations where emergency medical interventions, such as CPR, would not provide any likely benefit to the patient. Be familiar with and follow local protocols and medical control for these situations. If there is any doubt as to whether medical futility exists, treatment should be provided.

Living Wills

A ***living will***, another kind of advance directive, is a legal document that outlines a patient's wishes about certain kinds of medical treatments and procedures that prolong life. In the event that the patient cannot communicate healthcare decisions, this document may take effect.

As an EMR, you should follow a living will only if you are sure that it is valid and applicable to the current emergency. If in doubt, or if the situation is urgent and you do not have the time to assess the living will, you must provide care until the matter has been clarified. More general than a DNR order, which refers only to the act of resuscitation, living wills can go further into dictating what may and may not be done to a patient.

Physician Orders for Life-Sustaining Treatment Forms

A ***Physician Orders for Life-Sustaining Treatment (POLST) form***, while not currently available in all states, is a tool that complements an advance directive. Its primary purpose is to document the types of treatments a patient wants or does not want in the case of a medical emergency. POLST forms are signed by the

Lake-Sumter Emergency Medical Services
INFORMED REFUSAL RELEASE FORM
FORMA INFORMADA DEL LANZAMIENTO DE LA DENEGACIÓN

Date (Fecha): ______________________ **RUN #:** ______________________

Name (Nombre): ______________________ **Street Address** (Direccion de Calle): ______________________

City (Ciudad): ______________________ **State** (Estado): ________ **Zip:** __________ **Age** (Edad): ______ **Sex** (Sexo): **M** **F**

Phone # (Numero de Telefono): ( ) ______________________ **Date of Birth** (Fecha de Nacimiento): ______________________

Refusal of Care (Negación del cuidado)

I (the patient or patient's guardian) have been informed of:
Yo (el paciente o guardian del paciente) he estado informado de:

The reason I (the patient) should go to a hospital for further medical care; and
La razon qua yo (el paciente) debo de ir al hospital para mas tratamiento; y

The evaluation and/or treatment that will/may occur when I (the patient) arrive(s) at the hospital; and
De la evaluacion y/o tratamiento que va/o puede ocurrir quando yo (el paciente) llegue al hospital; y

The potential consequences and/or complications that may result in my (or patient guardian's) refusal to go to the hospital for further emergency care; and
De las consecuencias potenciales y/o complicaciones qua pueden resultar de mi (o guardian del paciente) rechazamiento de ir al hospital para tratamiento de emergencia; y

As a competent adult, I understand the above and I am responsible for making a rational decision on my (the patient's) behalf, and have been advised that emergency medical care is necessary, and that refusal of recommended care and transport to a hospital may result in death or imperil my (the patient's) health by increasing the opportunity for morbidity. Understanding the above, I (patient guardian) refuse to accept emergency medical care and/or transport to a hospital facility, assume all risks and consequences resulting from my (patient guardian's) decision, and release Lake-Sumter EMS from any and all liability resulting from my (patient guardian's) refusal. The patient(s) was/were advised that Lake-Sumter EMS stands ready to return at any time and can be reached by dialing 911.

Como un adulto competente, yo comprendo antedicho y estoy capaz de hacer una decision racional en mi (el paciente) enteres, y estoy avisado que el tratamiento de emergencia as necesario, y que mi rachazamlento para cuidame y transportaclon al hospital puede resultar en muerte o poner an pellgro mi (el paciente) salud para aumentar la oportunidad de morbosidad. Comprendiendo lo antedicho, yo (guardian del paciente) me niego a aceptar tratamiento de emergencia o transporte al hospital, asumi todos los peligros y consecuencias que resultan de mi (guardian del paciente) decision, y suelto a Lake-Sumter EMS de algunas y todas obligaciones resultando de mi (guardian del paciente) rechazamiento. El paciente eralfue avisado que Lake-Sumter EMS esta listo para volver al cualquier hora y puede alcanzarlos marcando 911.

Notice of Privacy Practices(Aviso de las prácticas de la aislamiento)

I hereby acknowledge that I have received a copy of the LSEMS Notice of Privacy Practices as required by Federal Law.
Reconozco por este medio que he recibido una copia del aviso de LSEMS de las prácticas de la aislamiento según los requisitos de ley federal.

Patient Initials(Iniciales):_________(required)

A copy of the LSEMS Notice of Privacy Practices was given to: ☐ Patient ☐ Authorized Representative

Patient Signature
(Firma del Paciente): X ______________________ Date(Fecha):______________________

Print Name (Imprenta su Nombre): ______________________

Print Patient(s) under care of Guardian(Imprenta el paciente que esta al cuidado del guardian)

Name (Nombre): ______________ **Age** (Edad): ______ **Name** (Nombre): ______________ **Age** (Edad): ______

Name (Nombre): ______________ **Age** (Edad): ______ **Name** (Nombre): ______________ **Age** (Edad): ______

Signature of Guardian (Firma del Guardian): X ______________________

Print Guardian's Name (Imprenta el nombre del guardian del paciente): ______________________

WITNESS
(TESTIFICAR)

Signature (Firma): ______________ **Print Name** (Imprenta Nombre): ______________ **ID:** ______

Signature (Firma): ______________ **Print Name** (Imprenta Nombre): ______________ **ID:** ______

Effective: June 2003

Fig. 3-2: Refusal of care form. *Form: courtesy of Lake-Sumter EMS.*

FLORIDA DEPARTMENT OF
HEALTH

State of Florida
DO NOT RESUSCITATE ORDER

(please use ink)

Patient's Full Legal Name: ____Date:__________________
(Print or Type Name)

PATIENT'S STATEMENT

Based upon informed consent, I, the undersigned, hereby direct that CPR be withheld or withdrawn.
(If not signed by patient, check applicable box):

❑ Surrogate ❑ Proxy (both as defined in Chapter 765, F.S.)
❑ Court appointed guardian ❑ Durable power of attorney (pursuant to Chapter 709, F.S.)

____
(Applicable Signature) (Print or Type Name)

PHYSICIAN'S STATEMENT

I, the undersigned, a physician licensed pursuant to Chapter 458 or 459, F.S., am the physician of the patient named above. I hereby direct the withholding or withdrawing of cardiopulmonary resuscitation (artificial ventilation, cardiac compression, endotracheal intubation and defibrillation) from the patient in the event of the patient's cardiac or respiratory arrest.

____
(Signature of Physician) (Date) Telephone Number (Emergency)

____
(Print or Type Name) (Physician's Medical License Number)

DH Form 1896, Revised December 2002

PHYSICIAN'S STATEMENT

I, the undersigned, a physician licensed pursuant to Chapter 458 or 459, F.S., am the physician of the patient named above.
I hereby direct the withholding or withdrawing of cardiopulmonary resuscitation (artificial ventilation, cardiac compression, endotracheal intubation and defibrillation) from the patient in the event of the patient's cardiac or respiratory arrest.

____
(Signature of Physician) (Date) Telephone Number (Emergency)

____
(Print or Type Name) (Physician's Medical License Number)

DH Form 1896,Revised December 2002

HEALTH

State of Florida
DO NOT RESUSCITATE ORDER

____
Patient's Full Legal Name (Print or Type) (Date)

PATIENT'S STATEMENT
Based upon informed consent, I, the undersigned, hereby direct that CPR be withheld or withdrawn. **(If not signed by patient, check applicable box):**
❑ Surrogate
❑ Proxy (both as defined in Chapter 765, F.S.)
❑ Court appointed guardian
❑ Durable power of attorney (pursuant to Chapter 709, F.S.)

____
(Applicable Signature) (Print or Type Name)

Fig. 3-3: DNRs are usually written for people with a terminal illness. *DNR: courtesy of Lake-Sumter EMS.*

CRITICAL FACTS

Always honor a patient's refusal of care. In cases of refusal, follow local policies; tell the patient what treatment is needed and why; try to convince them, but do not argue; remind the person that they can call EMS if the situation changes or they change their mind; and notify more advanced EMS personnel as well as medical direction, based on local protocols.

An advance directive is a set of written instructions that describes a person's wishes about medical care.

A DNR order protects a patient's right to refuse efforts for resuscitation. It is usually written for those who have a terminal illness. You must be aware of state and local legislation and protocol in regard to DNR orders.

patient's physician or other approved healthcare provider such as a physician's assistant or nurse practitioner, based on state rules or protocols. As an EMR, it is important to understand how POLST forms are used in your area and which sections apply to prehospital care.

When assessing an advance directive, check for written physician's instructions that most often accompany the directive. The phrasing must be clear and understandable, with no room for interpretation. It is vital that you review your particular state's laws to see if advance directives, DNRs, POLST forms and/or living wills are permitted in your area of practice. Also, clarify whether they require more than one healthcare provider to verify the patient's condition, which is the case in some states.

What Is a Do Not Resuscitate Order?

DNR orders are intended to direct the care of a patient in the specific setting of either respiratory or cardiac arrest. DNR orders are very specific orders that express a patient's denial of consent for specific interventions limited to CPR for either respiratory or cardiac arrest. As such, they only apply to the following specific interventions in the setting of respiratory or cardiac arrest:

- Airway—positioning, adjuncts and intubations
- Breathing—assisted ventilations
- Circulation—cardiac compressions, defibrillation and cardiac arrest medications

Up to the point of either respiratory or cardiac arrest, the DNR order would not apply and responders should provide the normal care for any conditions that they identify.

In most states, a DNR order is a physician's order not to resuscitate if a patient goes into cardiac or pulmonary (respiratory) arrest. It is part of the prescribed medical treatment plan and must have a physician's signature. Issues surrounding DNR orders are complex, and the laws and regulations regarding them vary from state to state. For these reasons, the American Red Cross advises all professional and certified trained lay responders to receive specific training from their employer, agency or medical director. In addition, responders are encouraged to check local laws and regulations. However, there are some general principles that all responders should be aware of and can use to guide their practice.

End-of-life care legislation is in place across the country and serves as a mechanism to address two equally valid, competing interests. Specifically, it allows patients to be involved in their own healthcare decision making and it protects healthcare personnel from liability for honoring patients' wishes. Ethical principles require that responders respect a person's right to make decisions regarding their own healthcare. This usually involves obtaining the patient's consent. However, sometimes a patient is either

(*Continued*)

What Is a Do Not Resuscitate Order? continued

unconscious or otherwise incapacitated. In these cases, advance directives, such as healthcare proxies, living wills, DNR orders and POLST forms, provide mechanisms by which individuals can make their wishes known when they are unable to speak for themselves. In addition, advance directives allow those responsible for the care of others—such as a minor or an adult lacking the capacity for decisions—to make end-of-life decisions prior to the time when the decision is necessary. Of course, in the absence of an applicable advance directive, consent for emergency treatment is implied.

How Do You Know If There Is a DNR Order?

In most cases, the family, a caretaker or healthcare provider will inform you that a DNR order is in place.

A DNR order is written on a form developed, in most states, by the individual state's Department of Health or state EMS office to identify patients who do not wish to be resuscitated in the event of respiratory or cardiac arrest. In the case of inpatient admissions at hospitals and long-term care facilities, the DNR order may be on a form that complies with state laws and regulations but has been designed by the facility. In some states there are both hospital and inpatient forms. The properly completed form is signed by the competent patient or by the patient's representative, and then signed by a licensed physician on a specific form developed and approved by the respective state.

Unless provided with clear written documentation that meets legal requirements or unless your state laws and regulations allow acceptance of oral verification (which most states' laws do not), you must perform all procedures as you would in the absence of a DNR order.

In some states, there is a patient ID device in the form of a bracelet or a smaller version of the form that can be worn on a chain around the neck or clipped to a key chain or to clothing/bed so it can travel with the patient. It is equally as valid as a traditional DNR form and can be presented to EMS personnel when they arrive on scene; it is designed to allow the patient to move between settings with one document.

Can a DNR Order Be Revoked?

Review of individual state laws for specific criteria is necessary. Generally, the DNR order can be revoked at any time orally or in writing, by physical destruction, by failure to present it, or by the oral expression of a contrary intent by the patient or the patient's healthcare proxy. In the out-of-hospital setting, it may be difficult to determine who the actual surrogate is and, likely, the question has arisen because the patient is in cardiac or respiratory arrest and cannot express their own wishes. If there is any doubt regarding revocation of the DNR order or someone verbally requests revocation, begin normal care procedures.

In What Healthcare Settings Is the DNR Order Honored?

The DNR order is honored in most healthcare settings, including hospices, adult family care homes, assisted living facilities, emergency departments, nursing homes, home health agencies and hospitals. State laws further provide that healthcare providers employed in these healthcare settings may withhold or withdraw CPR if presented with a valid DNR order and be immune from criminal prosecution or civil liability. In addition, most state laws and regulations allow DNR orders to be honored by prehospital providers. In those instances where the DNR order is presented to a prehospital emergency medical provider in a setting other than a healthcare facility, the form may be honored.

Review of individual state and local laws as well as local protocols is essential for compliance. Direct questions regarding DNR orders to the state regulating agency or state EMS office.

In the out-of-hospital setting, if there is any doubt as to whether a DNR order is valid or may have been revoked, care should proceed as it would

(*Continued*)

What Is a Do Not Resuscitate Order? continued

in the absence of a DNR order; this includes activation of the EMS system and transport to a hospital. Usually, the hospital is better equipped and has additional resources to determine the validity and applicability of a DNR order than the resources that are available in the out-of-hospital setting.

Professional and workplace providers should receive specific training from their employer, agency or medical director regarding DNR orders.

Do EMRs Fail to Provide the Standard of Care If They Follow a DNR Order?

A professional responder who follows a valid DNR order is actually complying with the standard of care by respecting the patient's wishes, respecting the patient's denial of consent for CPR in the setting of either respiratory or cardiac arrest, and complying with the physician's order for DNR. Follow local protocols and medical direction when presented with a DNR order.

Surrogate Decision Making

A ***surrogate decision maker*** is a third party who has been given the legal right to make decisions regarding medical and health issues on another person's behalf through a ***durable power of attorney for healthcare***. A person may be given this role for an older parent, an incapacitated spouse or an ill child, for example. You must be able to see the legal document, and the writing should be understandable, leaving no room for interpretation.

A ***healthcare proxy*** is the person named in a durable power of attorney for healthcare to make medical decisions on the patient's behalf. This person may also be known as an attorney-in-fact, an agent or a patient advocate. The healthcare proxy may be a friend, family member or other person designated at an earlier time by the patient or by the courts to be responsible for making health and medical decisions for the patient.

Next of kin refers to the closest relatives, as defined by state law, of a patient or deceased person. Most states recognize the spouse and the nearest blood relatives as next of kin, and these individuals may have certain legal authority regarding medical decisions for an incapacitated patient or the affairs of a deceased person.

OTHER LEGAL ISSUES

Assault

Assault is a threat or an attempt to inflict harm on someone. Assault can be physical, sexual or both. It may result in injury, and often results in emotional distress to the patient. If the patient feels threatened with bodily harm and the other person has the capability of inflicting harm, the act may be considered assault.

Battery

Battery is the legal term used to describe the unlawful touching of a person without that person's consent. The EMR must obtain consent before providing care to a patient. Every patient has a legal right to determine what happens to and who touches that patient's body.

Abandonment

Just as you must obtain the patient's consent before beginning care, you must also continue to provide 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 patient refuses care (Fig. 3-4). 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 patient in need.

Negligence

Negligence refers to a failure to follow a reasonable standard of care, thereby causing or contributing to injury or damage to another. A person could be considered negligent by either

Fig. 3-4: 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 patient refuses care.

acting wrongly or failing to act at all. There are four elements of a negligence claim:

1. The EMR had a duty to act. When an EMR is on duty, the duty to act is the obligation to respond to emergency calls and provide emergency care according to the expected level of knowledge and skills. Once care has begun, the duty is to continue providing care until the patient can be handed over to someone of equal or higher training.
2. The EMR breached that duty. Breach of duty refers to deviation from the standards of care expected for the responder's level of knowledge and skill.
3. The patient was injured because the EMR breached their duty. In legal terms, this is known as proximate cause. If injuries occurred to a patient due to breach of duty or negligence by the EMR, the patient must prove that these injuries were the direct result of the EMR's action or non-action.
4. Harm or injury occurred.

CONFIDENTIALITY AND PRIVACY

While providing care to a patient, you may learn details about the patient that are private and confidential. Information such as medical issues, physical and mental conditions, and any medications the patient is taking are personal to the patient and considered confidential. Respect the patient's privacy and obey the law by maintaining ***confidentiality***. Exceptions to this rule include providing this information to the medical personnel who will take over care of the patient from you and any mandatory reporting requirements, public health issues or legal requirements.

Health Insurance Portability and Accountability Act

Description

The Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule was the first comprehensive federal protection for the privacy of protected health information (PHI). It makes

CRITICAL FACTS

Personal information, such as the patient's medical issues, physical and mental conditions, and medications they take, is considered confidential. You should treat patient information with respect and not share it with unauthorized individuals.

provisions for aspects such as patient control over health information, the use and release of health records, appropriate disclosure of health information, and civil and criminal penalties for violation of patients' privacy rights. Some states have their own medical privacy laws.

Protected Health Information

Depending on the nature of your role as an EMR (including whether you are providing EMR services as part of your employment or affiliation with an organization), you may have obligations under HIPAA or state medical privacy laws. Regardless of whether a privacy law applies, however, you should treat patient information as confidential. You must not share the patient's health information with others, such as the media, employers, colleagues or friends, unless the patient consents. You must continue to maintain confidentiality even after your role with the patient has finished. However, you may release information if you have written consent from the patient, or a parent or legal guardian if the patient is a minor.

Permitted Disclosures of Health Information Without Written Patient Consent

In some circumstances, disclosure of health information is appropriate without patient consent. It is important to note that in most situations you may share information with other healthcare providers who are involved in caring for the patient, and you may share a child's information with their parent or legal guardian. In addition, in some situations, such as when a patient is transported to a hospital or medical center, information must be disclosed to facilitate payment for services. Your employer or other organization with which you are affiliated to provide emergency medical services should give you guidance on documentation for payment purposes.

Other situations where disclosure without consent is permissible include cases of mandatory reporting of abuse or neglect, situations involving public health issues and some law enforcement situations. For example, you must provide requested information if you have received a subpoena.

SPECIAL SITUATIONS

Medical Identification

Medical identification tags are designed to provide healthcare providers and EMS personnel with pertinent health information about a patient who may be unable to communicate in an emergency (Fig. 3-5, A). The tag may be included on a bracelet, necklace or sports band. Others may carry this information on a wallet card. More and more people are carrying their medical identification information on mobile phone apps that responders can access even when the phone is locked by a password (Fig. 3-5, B). These identifiers indicate special medical situations

Fig. 3-5, A–B: A medical identification tag **(A)** or an app on your phone **(B)** can give responders important information about the patient. You must look for them whenever you assess a patient. *Photos: N-StyleID.com.*

CRITICAL FACTS

Medical identification tags alert you to the patient's pertinent health information, such as allergies, diabetes and epilepsy, when the patient cannot communicate. Look for medical identification bracelets, necklaces, sports bands, wallet cards or mobile phone apps whenever you examine a patient.

Although it is a physician's job to declare a patient dead, death is obvious in situations such as decapitation, rigor mortis, decomposition of the body, dependent lividity, and transection or incineration of the body.

pertinent to a medical emergency. It is imperative that you look for them whenever you examine a patient. Examples of conditions you may be alerted to include allergies, diabetes and epilepsy. Some medical identification information lists a phone number to call to obtain further information. Some people also list their emergency contact(s) in their mobile phone under the heading ICE, which stands for in case of an emergency.

Obvious Death

Although it is ultimately a physician's job to declare a patient dead, you will often be faced with situations in which death is obvious. In these situations, resuscitative efforts may not be required. These situations include:

- Decapitation.
- Rigor mortis.
- Decomposition of the body.
- Dependent lividity (discoloration in the skin caused by the pooling of blood).
- Transection of the body.
- Incineration of the body.

Organ Donors

Organs may only be donated when there is a signed, legal document that gives permission for the patient's organs to be harvested in the case of death. Often this documentation is an organ donor card or a sticker on the patient's driver's license (Fig. 3-6). Treat these patients as you would any

Fig. 3-6: Documentation about organ donation is often found on a patient's driver's license. *Photo: courtesy of Donate Life Pennsylvania.*

other patient and provide the same lifesaving emergency care.

Evidence Preservation

Emergency medical care of the patient is the EMR's top priority. However, when faced with a crime scene, there are some precautions you must take to ensure the integrity of the scene is not disturbed. Do not disturb any item at the scene unless emergency medical care requires it. Observe and document anything unusual at the scene. Do not cut through bullet or knife holes in clothing, as they are part of the evidence collected during the investigation. Work closely with appropriate law enforcement authorities and obtain permission to do anything that may interfere with the

CRITICAL FACTS

Most state laws require that EMRs report suspected child abuse, and some states also require that they report other types of abuse and violence. In some circumstances, an EMR may be mandated to report infectious diseases such as hepatitis B or HIV/AIDS. Know your state's requirements to ensure that you make the necessary reports and do not make unauthorized disclosures.

investigation, including using the phone at the emergency scene.

Special Reporting Requirements

Mandated reporting usually refers to the practice of reporting situations in which a patient's injuries may have been caused through battery, abuse or other forms of violence. The requirements for reporting vary from state to state, and it is the EMR's responsibility to learn and follow specific state requirements for reporting incidents in which abuse is suspected.

In most states, EMRs are required to report suspected child abuse. Some states also require the reporting of abuse of older adults, patients in domestic violence situations, injuries that may be the result of a crime and suspected sexual assaults. Mandatory reporting can also apply to some infectious diseases such as tuberculosis, hepatitis B, HIV and AIDS.

You should check your state's laws on mandatory reporting to learn what is covered, or check with your employer or the organization with which you are affiliated when you provide emergency medical services. You should fully document your observations when you deem it necessary to report a situation. You should act in good faith, report only what you know to be factual, and avoid any speculation as to what you believe may have occurred or reporting how you feel.

PUTTING IT ALL TOGETHER

In your role as an EMR, you are guided by certain legal parameters, such as the duty to act and professional standards of care. Injured or ill persons have a right to expect competent initial care by an EMR. They also have a right to expect that you have a thorough understanding of the ethical and legal issues involved.

As a trained EMR, you have minimum standards for your performance, but it is important that you do not let your training stay at that minimum level. Practice your skills and increase your knowledge, taking the opportunity to learn as much as you can within your scope of practice. Most areas require that EMRs participate in a minimum number of continuing education or refresher courses to remain certified.

As an EMR, you can provide the best service to your patients and adhere to the standard of care if you continually examine your role and skill level. You should explain all of your actions, as appropriate, receive consent before performing any procedure and carry out those procedures to the best of your ability within your scope of practice. You must also be aware of the types of exceptional circumstances you may encounter, such as refusal of care and providing care for patients who may not be competent. Stay current on your state's laws that relate to EMR services to ensure that you are providing care in a high-quality and legally compliant manner.

You Are the Emergency Medical Responder

You advised the cyclist to go home and rest. At home, the cyclist loses consciousness and his roommate calls for an ambulance. Later, at the hospital, he is diagnosed as having a severe head injury that could have been minimized if medical care had been provided earlier. Do you believe there are any grounds for legal action against you? Why or why not?

4

THE HUMAN BODY

You Are the Emergency Medical Responder

Your fire rescue unit responds to the scene of a motor-vehicle collision involving a car with two people and a minivan driven by a woman who has two small children in car seats. As you size up the scene, three of the five people appear to be injured. The first person, a woman who was driving the car, is going in and out of consciousness. You suspect her injuries may include possible fractured ribs. The second person, a passenger in the same vehicle, has injuries on the right side of the body. The third person, the driver of the minivan, appears to have chest and abdominal injuries, but she is awake and alert and able to speak with you. She is distraught because her children are in the back of the minivan and she is concerned about them. What would you do? How would you respond? How would you describe the injuries and the body systems involved to more advanced medical personnel?

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 works 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 carries oxygen-rich blood and other nutrients throughout the body and removes waste.

Digestive system: A group of organs and other structures that digests food and eliminates wastes.

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.

Genitourinary system: A group of organs and other structures that eliminates waste and enables reproduction.

Integumentary system: A group of organs and other structures that protects the body, retains fluids and helps to prevent infection.

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.

Nervous system: A group of organs and other structures that regulates 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 brings air into the body and removes wastes 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.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Identify various anatomical terms commonly used to refer to the body.
- Describe various body positions.
- Describe the major body cavities.
- Understand the basics of medical terminology and their application to emergency medical care.
- Identify and describe the fundamental anatomy and physiology of the major body systems.
- Give examples of how body systems interrelate.
- Describe the anatomical and physiological differences of children and infants and the resulting considerations for emergency care.

INTRODUCTION

As an emergency medical responder (EMR), you require a basic understanding of normal human structure and function. Knowing what the body's structures are and how they work will help you more easily recognize and understand injuries and illnesses. ***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 patient's condition and provide the best care.

To remember the location of body structures, it is important 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. For example, to locate the pulse on either side of the neck, you can use the middle of the throat as a reference point. 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, terminology and the functions of eight of the body systems. It also focuses on body structure (***anatomy***) and body function (***physiology***).

MEDICAL TERMINOLOGY

In order to have a common language with which healthcare providers can accurately communicate about patients, it is important to have a basic understanding of medical terminology. One of the key elements to understanding medical terminology is to break down the terms into their parts.

Medical terms often are constructed using a combining form (root word plus a combining vowel) that contains the meaning, plus a suffix (word ending) that has its own meaning and/or a prefix (word beginning).

For example, the medical term "endotracheal" is made up of the combining form "trache," which means trachea; the prefix "endo," which means within; and the suffix "al," which means pertaining to. By understanding the parts of the word, we understand the term endotracheal to mean "pertaining to something within the trachea." This term might be used with the word "tube," to describe a type of tube used within the trachea. The easiest way to learn medical combining forms (Table 4-1), their prefixes and their suffixes is to memorize them. A few of the more common prefixes are: hypo- (below normal), hyper- (above normal), a- (without, no), tachy- (fast) and brady- (slow) (Table 4-2). A few of the more common suffixes are: -emic (pertaining to the blood), -emia (condition of the blood) and -a or -ia (condition).

Table 4-1:
Common Combining Forms

COMBINING FORM	WHAT DOES IT MEAN?
Cardi/o-	Heart, cardiac
Neur/o-	Nerve, neural
Oro-	Mouth
Arteri/o-	Artery, arterial
Hem/o-	Blood
Therm/o-	Heat
Vas/o-	Duct, vessel, vascular

Table 4-2:
Common Prefixes

COMBINING FORM	WHAT DOES IT MEAN?
Hyper-	Excessive, above, over, beyond
Hypo-	Less than normal, under
Tachy-	Fast, swift, rapid, accelerated
Brady-	Slow, dull

CRITICAL FACTS

Medical terms are often constructed from a root word and combining vowel, plus a suffix and/or a prefix. The easiest way to learn these medical combining forms, suffixes and prefixes is to memorize them.

ANATOMICAL TERMS

Directions and Locations

By knowing a few key locations of structures and how to describe them, you can more accurately recognize a serious injury or illness and communicate with other emergency medical services (EMS) personnel about a patient's condition (Fig. 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 patient's head; inferior describes any part toward the patient's feet.
- Frontal or coronal plane: That which divides the body vertically into two planes, anterior (the patient's front) and posterior (the patient'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.

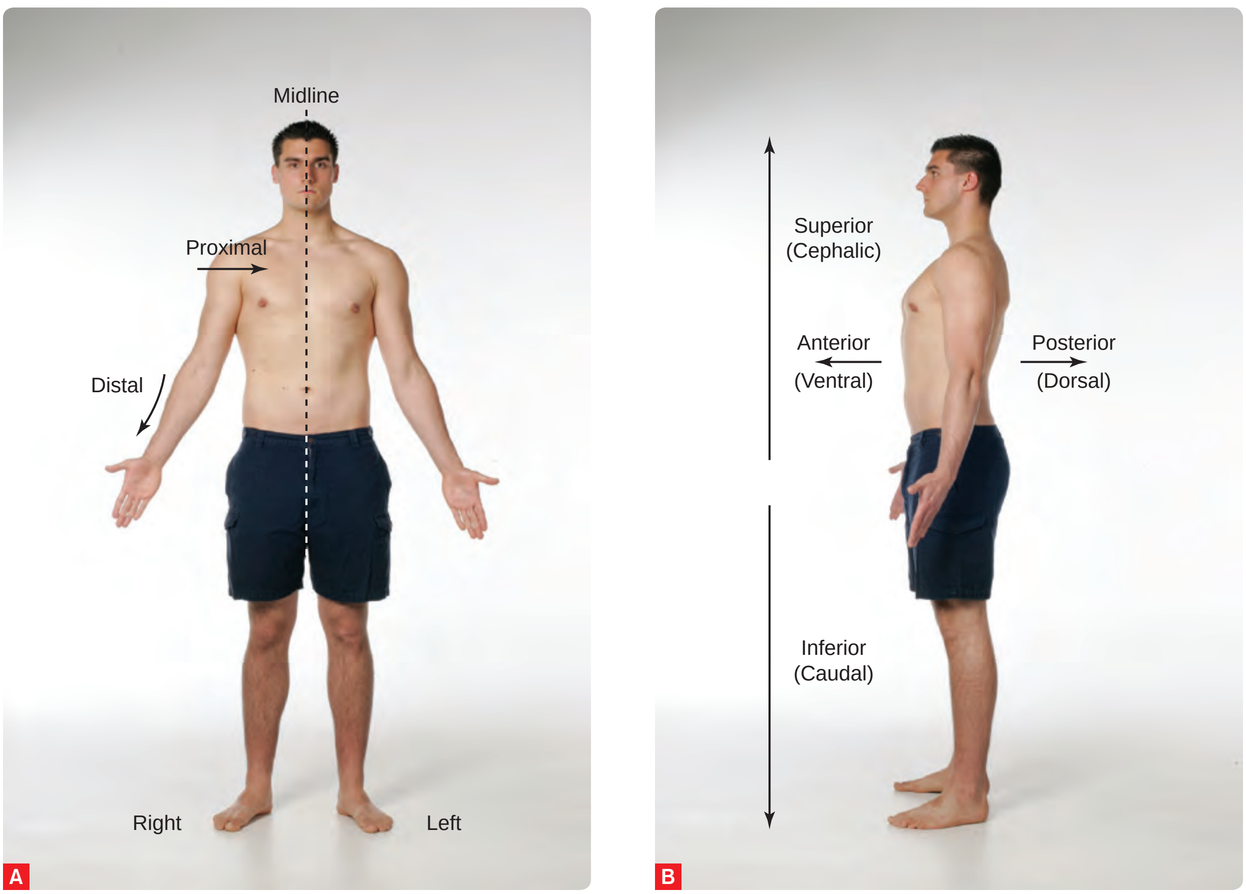


Fig. 4-1, A–B: (A) Any part of the body toward the midline is medial; any part away from the midline is lateral. Any part close to the trunk is proximal; any part away from the trunk is distal. **(B)** Anterior refers to the front part of the body; posterior refers to the back of the body. Superior refers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

CRITICAL FACTS

Knowing locations of anatomical structures and how to describe them will help you recognize a serious injury or illness and help you better communicate with other EMS personnel.

- 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).
- 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 patient'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 (Fig. 4-2). The prefix "hyper" used with either term describes movement beyond the normal position.

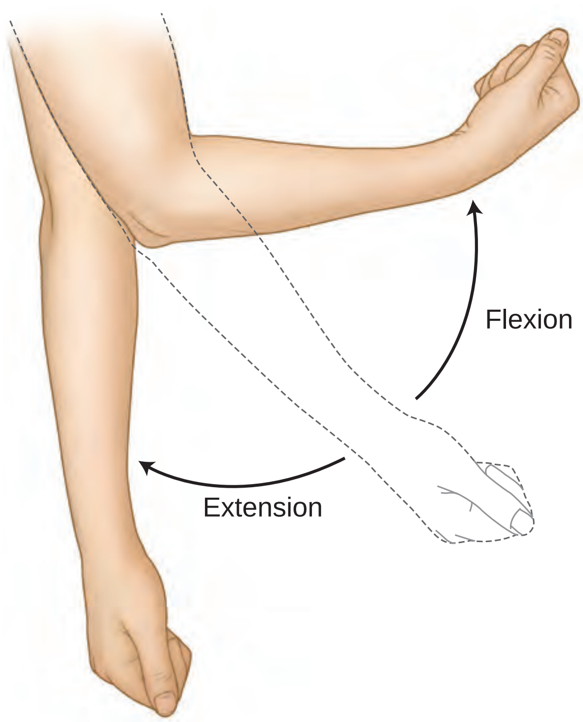


Fig. 4-2: Flexion and extension.

Positions

As a responder, you will often have to describe a patient's position to other EMS personnel and healthcare providers. Using correct terms will help you communicate the extent of a patient's injury quickly and accurately.

Terms used to describe body positions include:

- Anatomical position. This position, where the patient 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 patient is lying face-up on their back (Fig. 4-3, A).
- Prone position. The patient is lying face-down on their stomach (Fig. 4-3, B).
- Right and left lateral recumbent position. The patient is lying on their left or right side (Fig. 4-3, C).
- Fowler's position. The patient is lying on their back, with the upper body elevated at a 45° to 60° angle (Fig. 4-3, D).

Body Cavities

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

- Cranial cavity. Located in the head and is protected by the skull. It contains the brain.
- 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 (Fig. 4-5).

CRITICAL FACTS

Flexion is the term used to describe a bending movement. Extension describes a straightening movement.

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

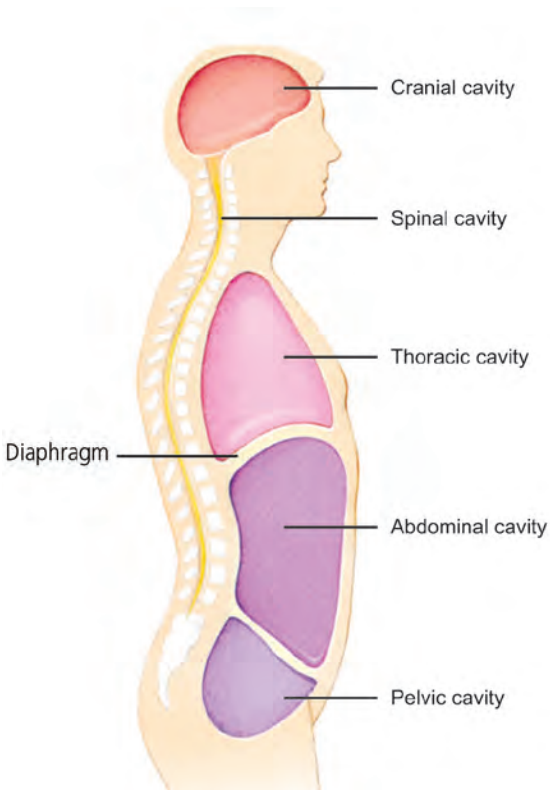


Fig. 4-4: The five major body cavities.

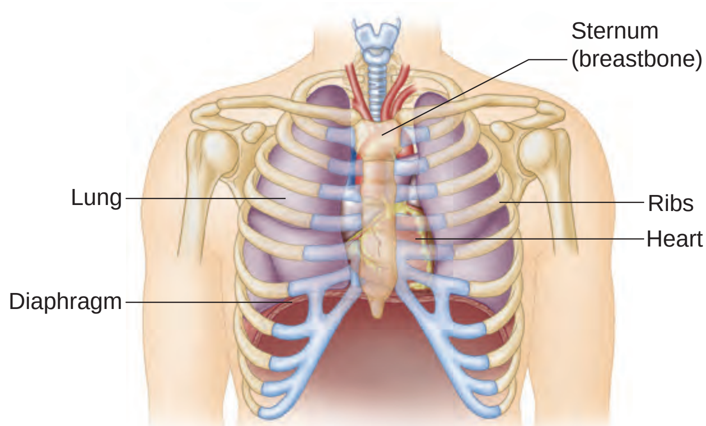


Fig. 4-5: The thoracic cavity is located in the trunk between the diaphragm and the neck.

- 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 (Fig. 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.

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 especially adapted to perform specific body functions needed for life (Table 4-3).

For example, the ***circulatory system*** consists of the heart, blood and blood vessels. This system keeps all parts of the body supplied

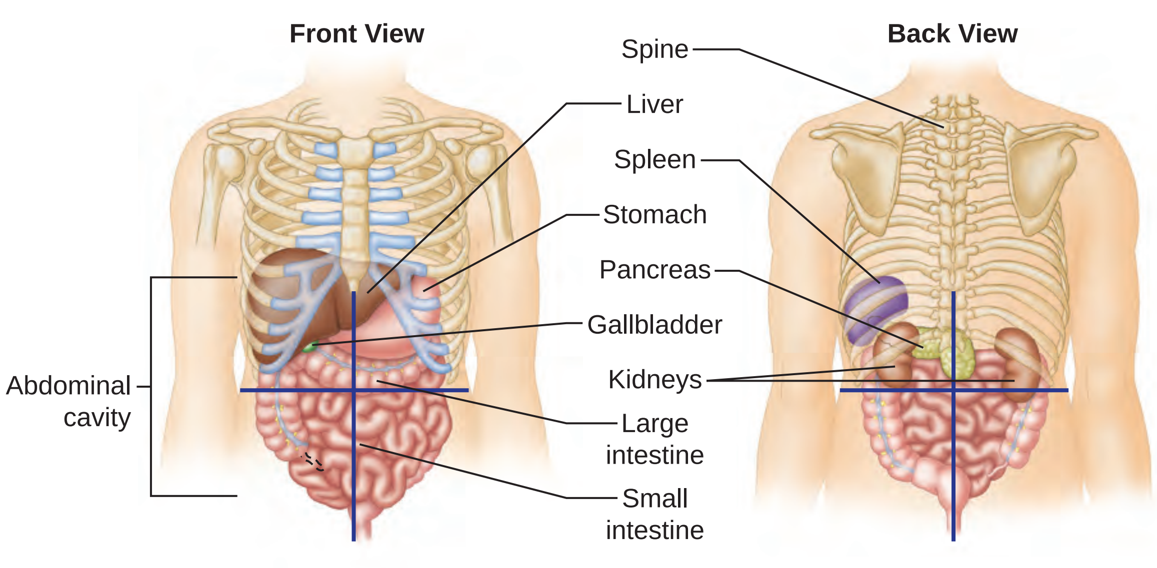


Fig. 4-6: The abdominal cavity contains the organs of digestion and excretion.

CRITICAL FACTS

The organs of the body are located within hollow spaces in the body referred to as body cavities. The five major cavities include the cranial, spinal, thoracic (chest), abdominal and pelvic cavity.

Table 4-3:
Body Systems

SYSTEMS	MAJOR STRUCTURES	PRIMARY FUNCTIONS	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 the 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 protect the body from disease-producing organisms; together with the circulatory system, helps 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 the 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

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

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.

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 (Fig. 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.

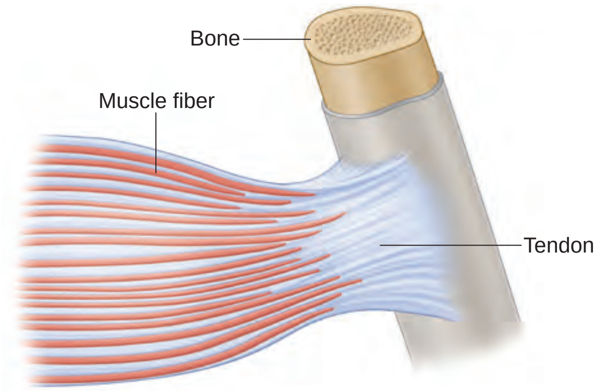


Fig. 4-7: Most of the body's muscles are attached to bones by tendons. Muscle cells, called fibers, are long and threadlike.

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 (Fig. 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.

CRITICAL FACTS

The three types of muscles are skeletal (voluntary), smooth (involuntary) and cardiac.

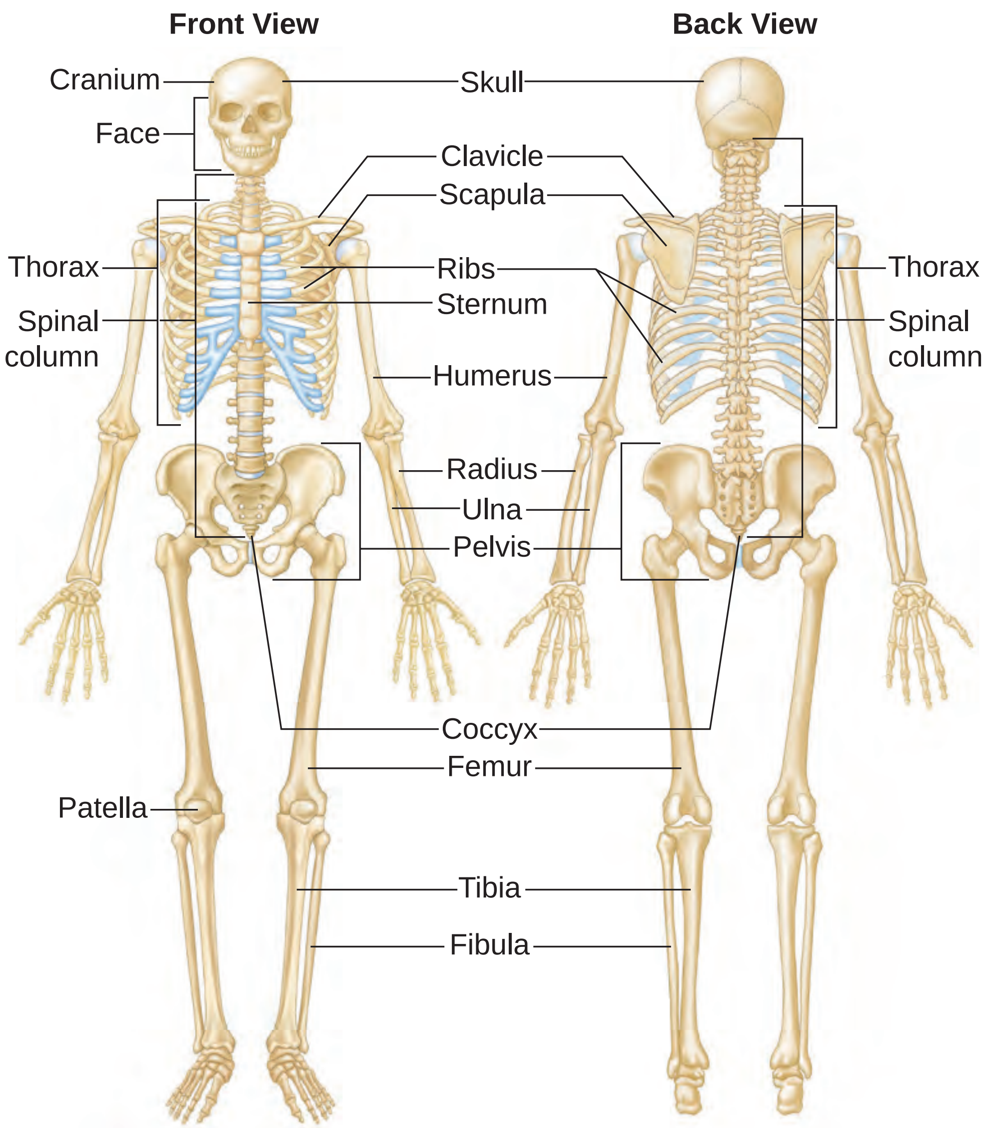


Fig. 4-8: The six parts of the skeleton are the skull, the spinal column, the thorax, the pelvis, and the upper and lower extremities.

- The 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) (Fig. 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. Ten pairs of ribs are attached to the thoracic vertebrae and sternum with cartilage, while the bottom two pairs of ribs, known as the floating ribs, are attached only to the thoracic vertebrae. 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).

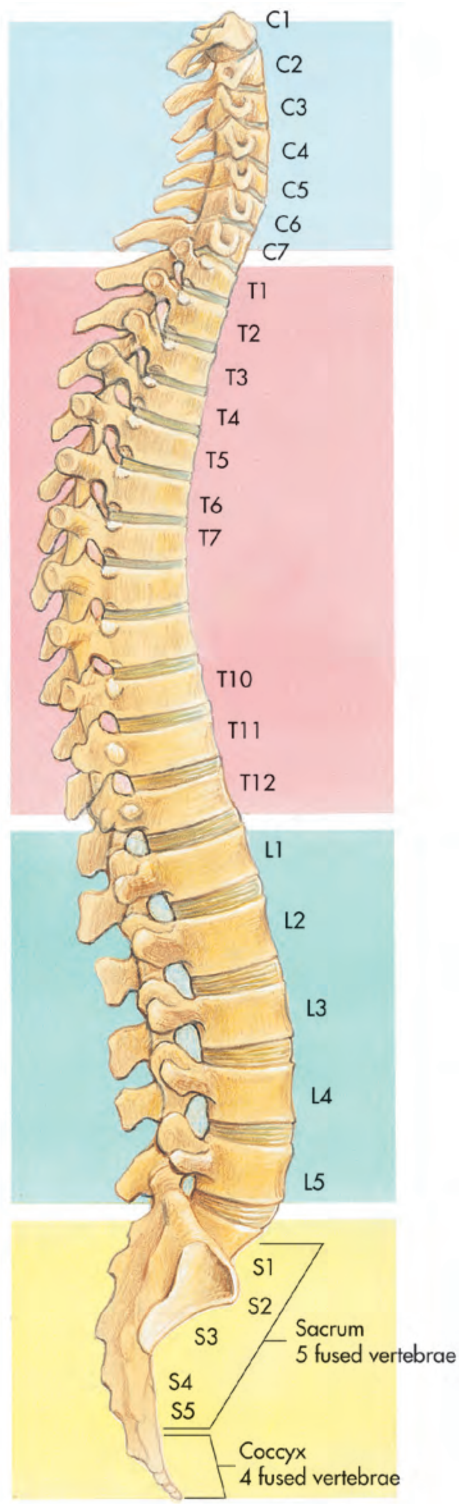


Fig. 4-9: The spinal column is divided into five sections: cervical, thoracic, lumbar, sacral and coccyx.

- 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 (Fig. 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.

The most common types of moveable 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) (Fig. 4-11).

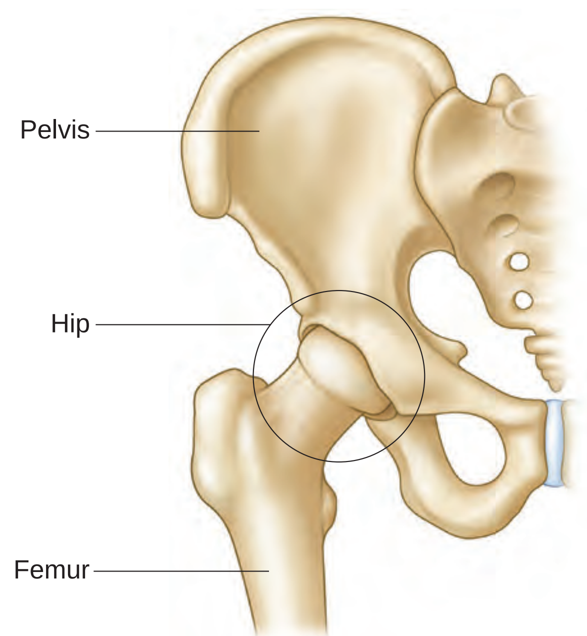


Fig. 4-10: Joints are the places where bones connect to each other.

CRITICAL FACTS

The skeleton is made up of six sections: the skull, spinal column, thorax, pelvis, and upper and lower extremities.

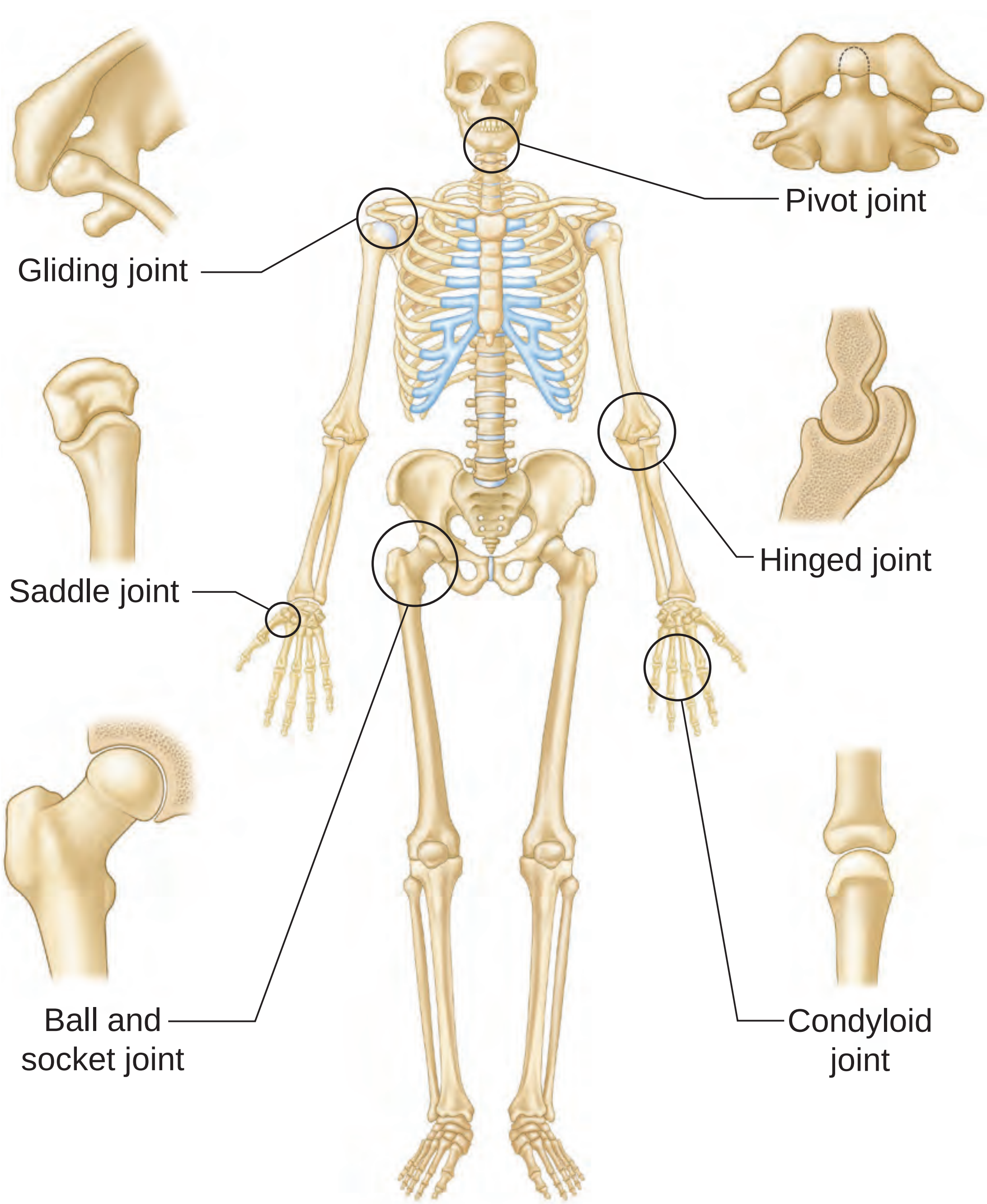


Fig. 4-11: Common types of moveable joints.

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, with certain permanent brain damage occurring after 10 minutes. The ***respiratory system*** delivers oxygen to the body, and removes carbon dioxide from it, in a process called respiration.

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 (Fig. 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

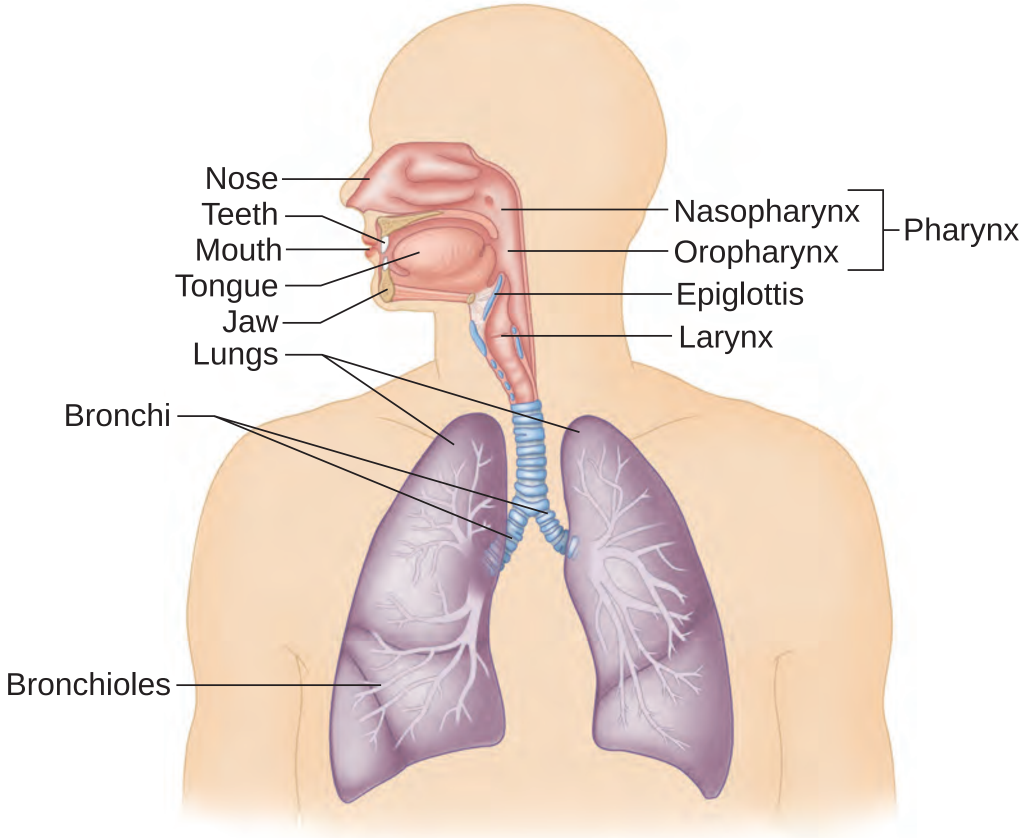


Fig. 4-12: The upper and lower airways.

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 (Fig. 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.

Pediatric Considerations

The structures involved in respiration in children and infants differ from those of adults (Table 4-4). They are usually smaller or less developed in children and infants. Some of these differences are important when providing 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 primarily influenced by changes in pressure inside the chest that cause air to flow into or out of the lungs.

CRITICAL FACTS

Bones connect to each other at joints and are held together by ligaments. All joints have a normal range of motion, but some are immovable or allow only slight movement.

In a healthy person, respiration delivers oxygen the body needs. If that oxygen supply is cut off, brain cells will begin to die in about 4 to 6 minutes.

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 primarily influenced by changes in pressure inside the chest that cause air to flow into or out of the lungs.

Table 4-4:
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

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 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 only used 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.

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 vessels and blood. 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 (Fig. 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 (Fig. 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.

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.

CRITICAL FACTS

The circulatory system consists of the heart, blood vessels and blood. 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.

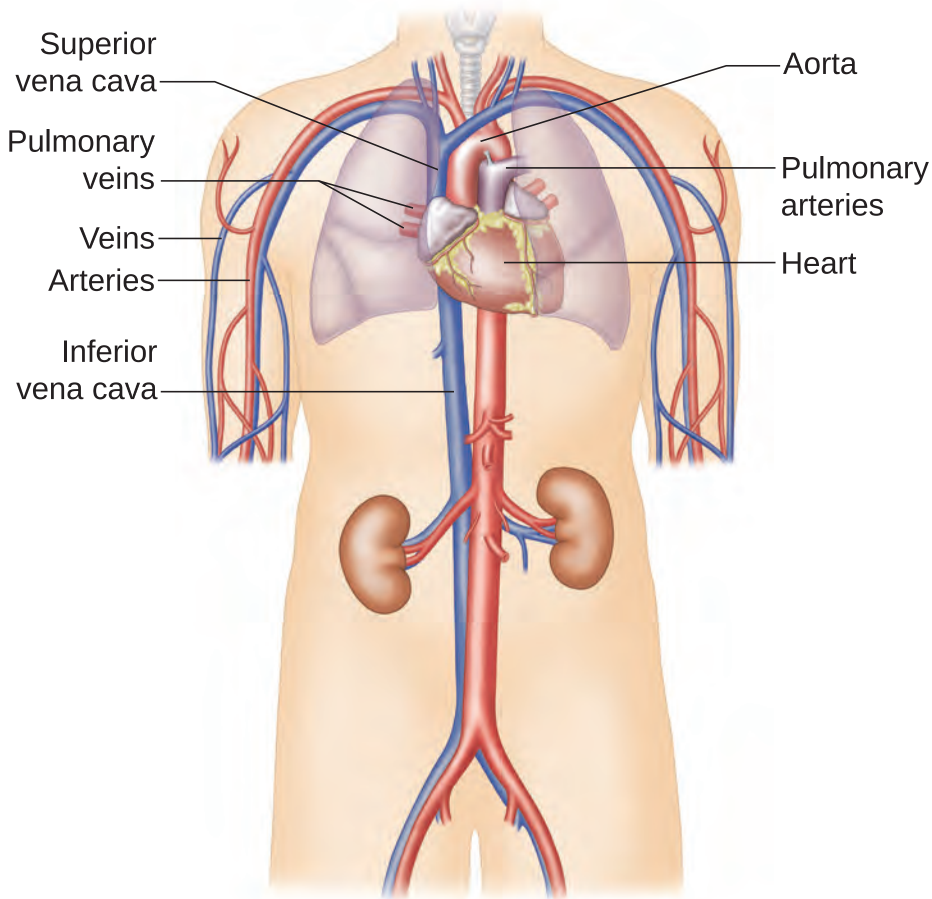


Fig. 4-13: The circulatory system consists of the heart, blood vessels and blood.

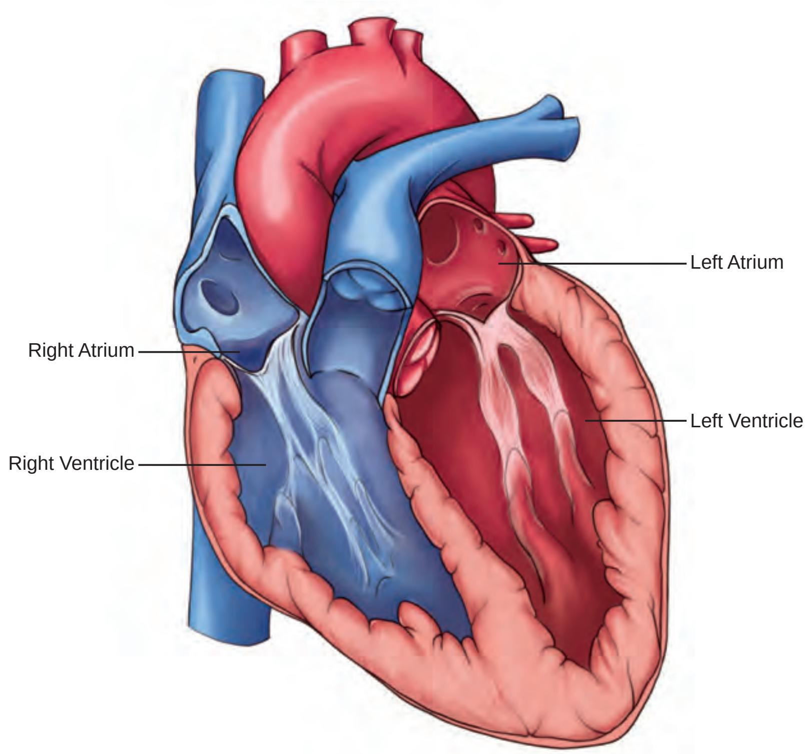


Fig. 4-14: The heart's four chambers.

CRITICAL FACTS

There are three different types of blood vessels: arteries, veins and capillaries. Arteries carry mostly oxygenated blood away from the heart. Veins carry deoxygenated blood back to the heart. Capillaries are the tiny blood vessels that connect the systems of arteries and veins.

There are different types of blood vessels that serve different purposes: arteries, veins and capillaries. 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 further from the heart, they branch into increasingly smaller vessels called arterioles. These narrow vessels carry blood from the arteries into capillaries (Fig. 4-15).

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 further 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.

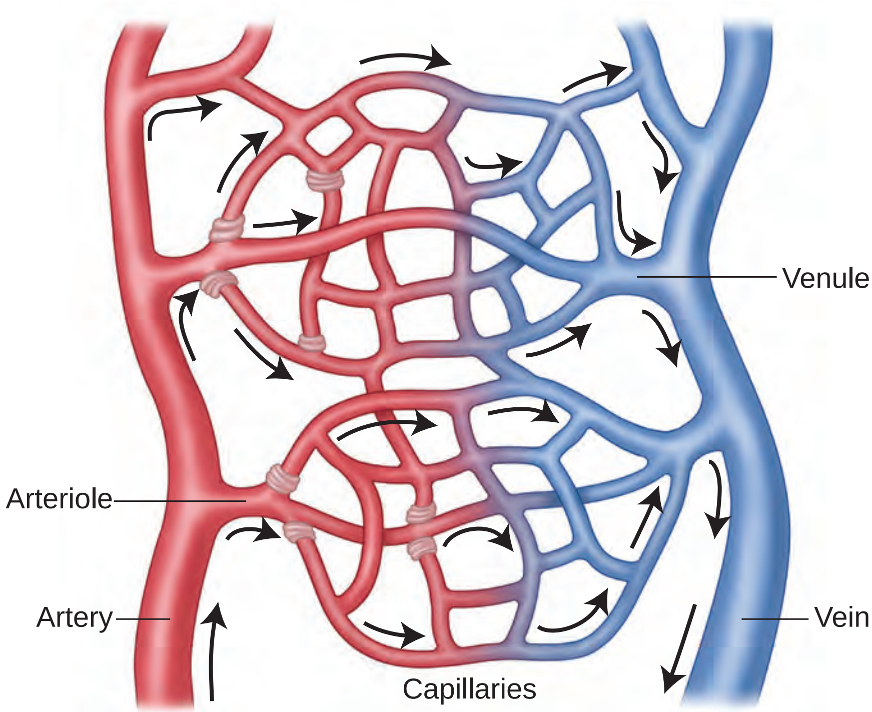


Fig. 4-15: As blood flows through the body, it moves through arteries, arterioles, capillaries, venules and veins.

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, and over a bone (e.g., carotid pulse point in the neck, 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.

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 use of 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 (Fig. 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.

Blood Clotting

One of blood's characteristics is its ability to clot. Normally, blood flows freely though the blood vessels but if there is any trauma, blood must be capable of clotting so that bleeding will stop.

The clotting mechanism is made up of platelets and the thrombin system. Platelets are small cell fragments made in the bone marrow that become sticky when bleeding occurs. They adhere to the blood vessel wall at the site of bleeding. The thrombin system is made up of several proteins that use chemical reactions to create fibrin. The fibrin clumps and, together with the platelets, forms the clot.

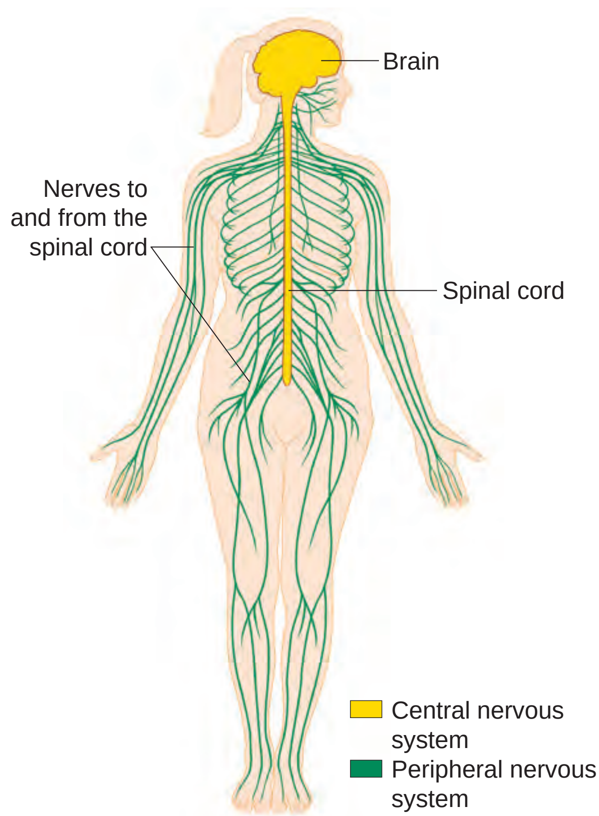


Fig. 4-16: The nervous system.

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 (Fig. 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.

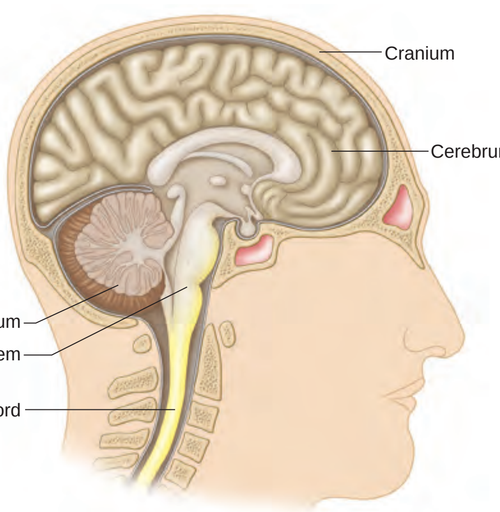


Fig. 4-17: The brain.

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 (Fig. 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.

CRITICAL FACTS

The primary functions of the brain are the sensory functions, the motor functions and the integrated functions of consciousness, memory, emotions and use of language.

The nervous system is divided into two functional systems. The voluntary system controls movement of the muscles and sensation from the sensory organs. The autonomic system controls the involuntary muscles of the organs and glands.

The skin is the largest organ in the human body. It protects against injury and pathogens, regulates fluid balance and body temperature, produces vitamin D and stores minerals.

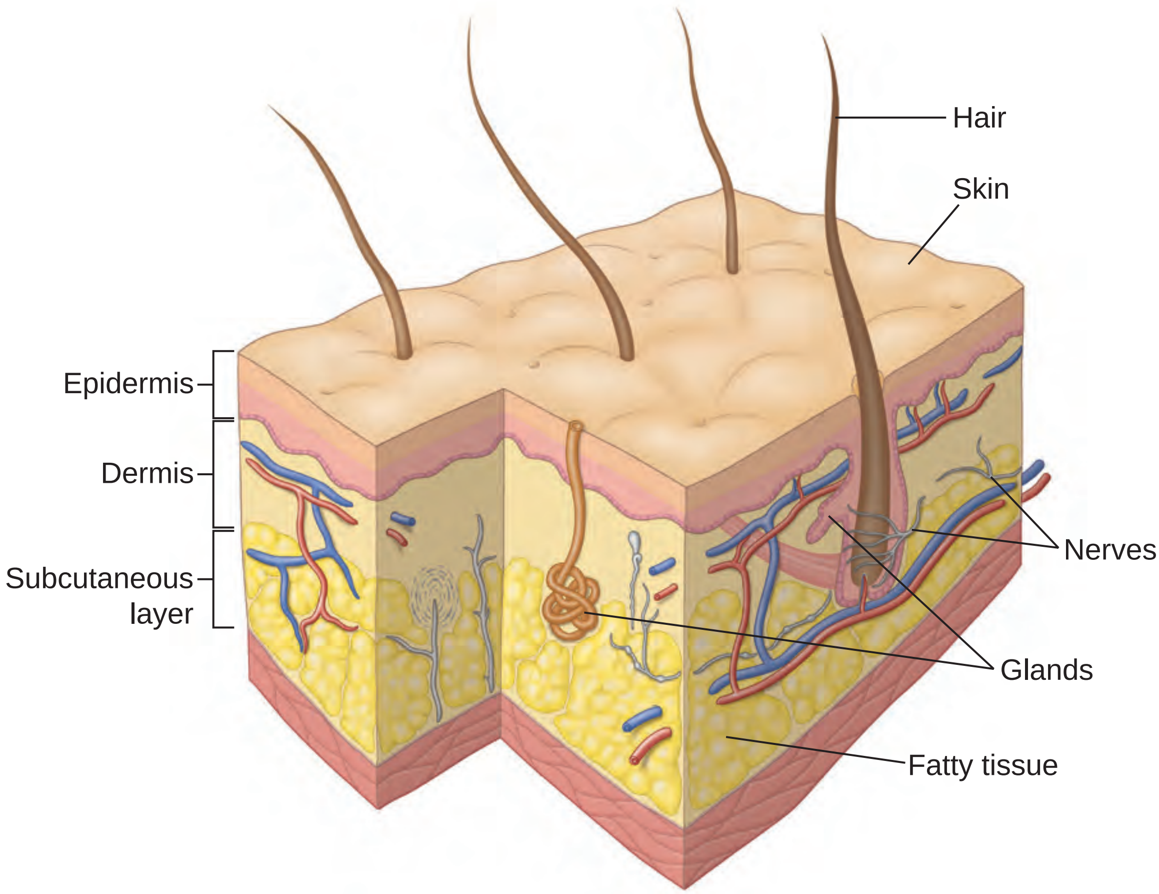


Fig. 4-18: The skin's major layers are the epidermis, the dermis and the subcutaneous layer.

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 tones. 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 people with darker skin tones.

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 (Fig. 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.

CRITICAL FACTS

One of the critical functions controlled by the body's endocrine system is the control of blood glucose levels. The sympathetic nervous system is also regulated through the endocrine system.

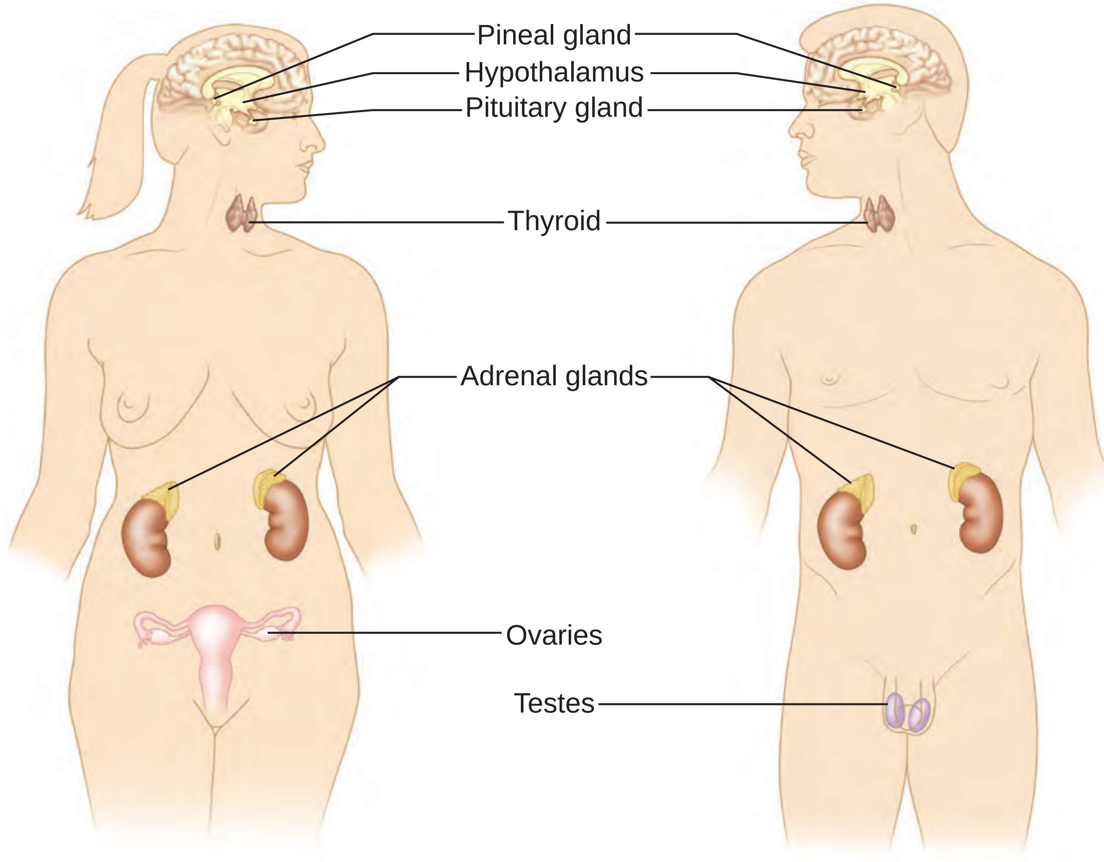


Fig. 4-19: The endocrine system in females and males.

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.

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 Islets of Langerhans, 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, sodium chloride and potassium balance. The body works to keep water and levels of electrolytes in the body in balance.

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

CRITICAL FACTS

The digestive system, or gastrointestinal system, consists of the organs that work together to break down food, absorb nutrients and eliminate waste.

(food passageway) and the accessory organs that help prepare food for the digestive process (Fig. 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 Islets of Langerhans, 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.

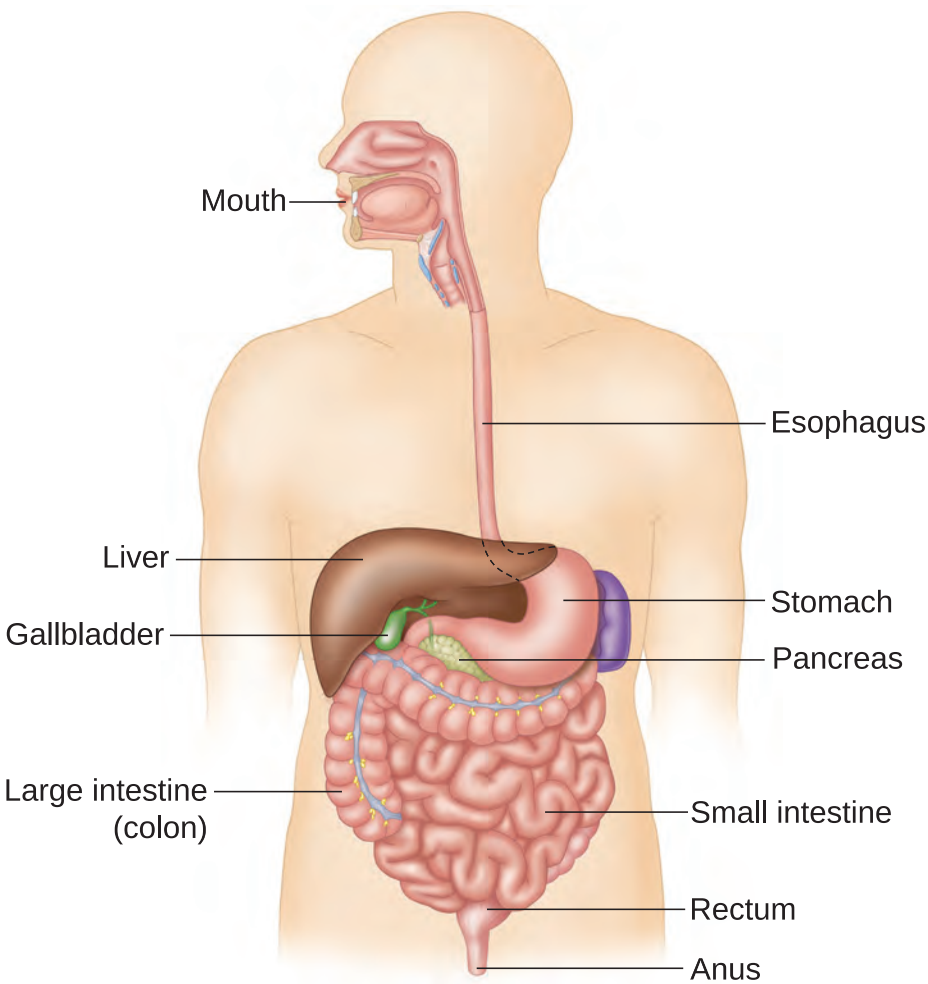


Fig. 4-20: The digestive system.

CRITICAL FACTS

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.

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 (Fig. 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.

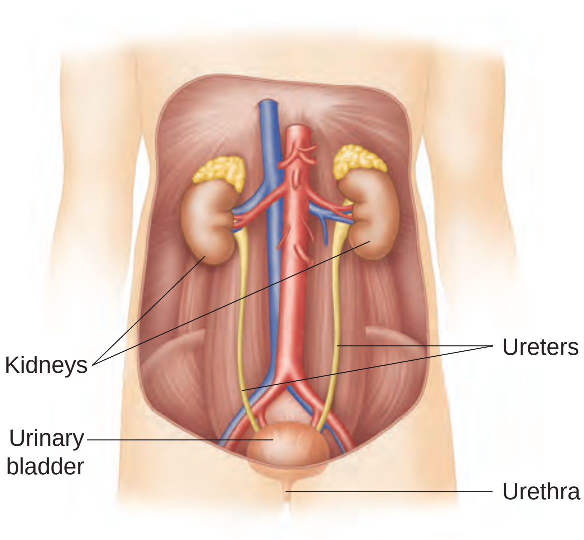


Fig. 4-21: The urinary system.

The Reproductive System

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

Male 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 (Fig. 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.

Female Reproductive System

The female reproductive system consists of the ovaries, fallopian tubes, uterus and vagina and is protected by the pelvic bones (Fig. 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 which, if united with a sperm, 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.

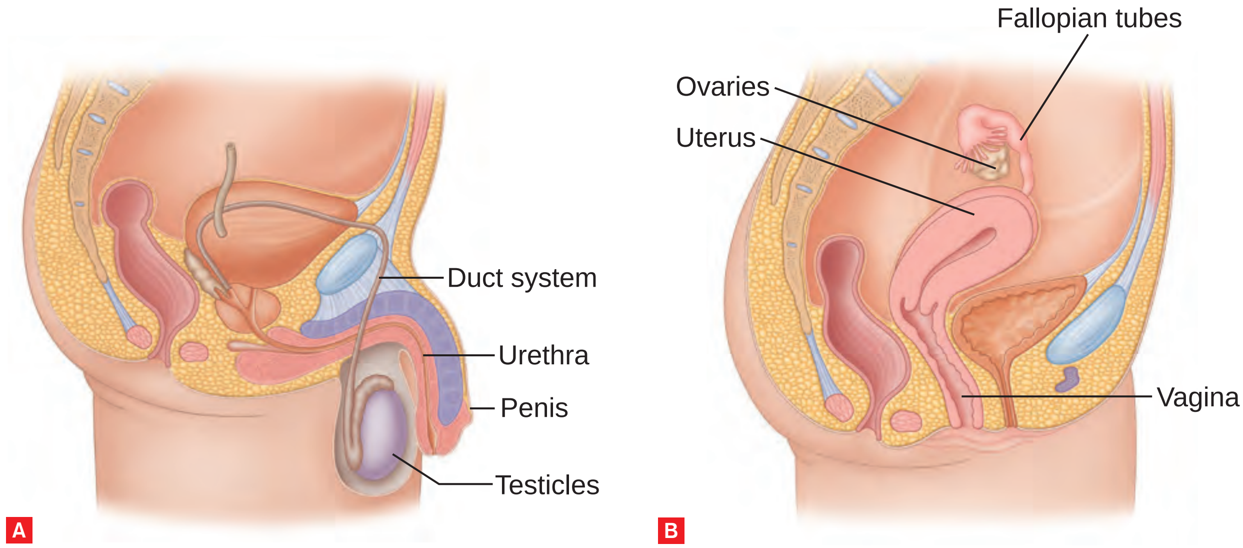


Fig. 4-22, A–B: **(A)** The male reproductive system. **(B)** The female reproductive system.

PUTTING IT ALL TOGETHER

By having a fundamental understanding of body systems and how they function and interact, coupled with knowledge of basic medical terminology, you will be more likely to accurately identify and describe injuries and illnesses.

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.

Generally, the more body systems involved in an emergency, the more serious the emergency. 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 patient may die.

Fortunately, basic care is usually all you need to provide support to 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.

You Are the Emergency Medical Responder

As you get closer to the woman in the car, you see that she is clutching one side of her abdomen, just below the rib cage. Her passenger is holding his right hip and looks dazed. The woman in the minivan now exhibits shallow breathing and her pulse is weak. What do you suspect is happening to the woman in the car?

5

LIFTING AND MOVING PATIENTS

You Are the Emergency Medical Responder

Your fire rescue unit is summoned to a recently remodeled building in response to a 9-1-1 call for a reported fire. You arrive to find smoke filling the area. Two people carry a man through a doorway. Three others stagger through and collapse to the ground. Smoke is blowing over them. Flames flicker inside the structure. You quickly size up the scene and determine that the structure should be secure for the next few minutes. There is a large grassy area that extends at least 200 feet in front of the building. Should you move victims away from the vicinity of the burning building? Why or why not?

KEY TERMS

Ankle drag: A method of moving a patient by grasping the patient's ankles; also known as the foot drag.

Backboard: A piece of equipment used to secure a patient when extricating them from the scene and moving them to a stretcher for transport.

Blanket drag: A method of moving a patient, using a blanket, in an emergency situation where equipment is limited and the patient is suspected of having a head, neck or spinal injury.

Body mechanics: The field of physiology that studies muscular actions and the function of the muscles in maintaining posture.

Clothes drag: A type of emergency move that uses the patient's clothing; used for a patient suspected of having a head, neck or spinal injury.

Direct carry: A method of moving a patient from a bed to a stretcher or vice versa; performed by two responders.

Direct ground lift: A nonemergency method of lifting a patient directly from the ground; performed by several responders.

Draw sheet: A method of moving a patient from a bed to a stretcher or vice versa by using the stretcher's bottom sheet.

Extremity lift: A two-responder, nonemergency lift in which one responder supports the patient's arms and the other the patient's legs.

Firefighter's carry: A type of carry during which the patient is supported over the responder's shoulders.

Firefighter's drag: A method of moving a patient in which the patient is bound to the responder's neck and held underneath the responder; the responder moves the patient by crawling.

Log roll: A method of moving a patient while keeping the patient's body aligned because of a suspected head, neck or spinal injury.

Pack-strap carry: A type of carry in which the patient is supported upright, across the responder's back.

Position of comfort: The position a patient naturally assumes when feeling ill or in pain; the position depends on the mechanism of injury or nature of illness.

Power grip: A hand position for lifting that requires the full surface of the palms and fingers to come in contact with the object being lifted.

Power lift: A lift technique that provides a stable move for the patient and protects the person lifting from serious injury.

Reasonable force: The minimal force necessary to keep a patient from harming themselves or others.

Recovery position: A side-lying posture used to help maintain a clear airway in an unresponsive patient who is uninjured and breathing normally.

Restraint: A method of limiting a patient's movements, usually by physical means such as a padded cloth strap; may also be achieved by chemical means, such as medication.

Shoulder drag: A type of emergency move that is a variation of the clothes drag.

Squat lift: A lift technique that is useful when one of the lifter's legs or ankles is weaker than the other.

Stair chair: Equipment used for patient transport in a sitting position.

Stretcher: Equipment used for patient transport in a supine position.

Supine: The body position of lying flat on the back.

Two-person seat carry: A nonemergency method of carrying a patient by creating a "seat" with the arms of two responders.

Walking assist: A method of assisting a patient to walk by supporting one of the patient's arms over the responder's shoulder (or each of the patient's arms over the shoulder of one responder on each side).

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Define body mechanics.
- Explain the safety precautions to follow when lifting and moving a patient.
- Describe the conditions that require an emergency move.
- Describe the indications for assisting in nonemergency moves.
- Describe the various devices associated with moving a victim in the out-of-hospital setting.
- Explain the guidelines for patient positioning and packaging for transport.
- Explain the indications for when to use restraints.
- Describe the types of restraints.
- Make appropriate decisions regarding the use of equipment for moving a victim in the out-of-hospital setting.

SKILL OBJECTIVES

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

- Demonstrate an emergency move.
- Demonstrate a nonemergency move.

INTRODUCTION

At some point in many emergency situations, you will need to lift and move a patient. Sometimes this will be to provide easier access to administer first aid. At other times, you will need to move the patient to a safer location. You may also need to move a patient to transport them to the hospital. This chapter will teach you how to quickly and safely lift and move patients.

ROLE OF THE EMERGENCY MEDICAL RESPONDER

When providing care, you will usually not face hazards that require you to immediately move patients. In most cases, you can provide care where you find the patient. Moving a patient needlessly can lead to further injury. For example, moving a patient who has a painful, swollen, deformed leg without taking the time to immobilize it could result in an open fracture if the end of the bone were to tear the skin. Soft tissue damage, damage to the nerves, blood loss and infection could all result unnecessarily. Needless movement of a patient with a head, neck or spinal injury could cause paralysis or even death. However, there are some situations in which moving a patient would be appropriate, *but only when you can do so safely*. These situations are when you need to protect a patient from immediate danger (e.g., a fire or flood), reach another patient who may have a more serious injury or illness, and provide proper care (e.g., moving a patient who needs CPR onto a hard, flat surface).

Safety Precautions

Before you act, always size up the scene and consider the factors affecting the situation:

- Any dangerous conditions at the scene
- The distance a patient must be moved
- The size of the patient
- Your physical ability
- Whether others can help you
- The mechanism of injury (MOI) and patient's possible condition
- Any aids or equipment to facilitate patient transport at the scene

Failing to consider these factors could cause injury. If you were to become injured, you might be unable to move the patient and could risk complicating the situation and making things worse.

Know Your Own Physical Limitations

Lifting and moving a patient requires physical strength and a high level of fitness. If you improperly lift a patient, you can permanently injure yourself. Adequate weight training, stretching and cardiovascular exercises will help ensure that you are ready for the physical demands of an emergency situation. You should only move a patient by yourself if you can do so safely and comfortably. Know your own physical limitations and, when in doubt, ask for assistance from other responders.

Body Mechanics

Body mechanics refers to the field of physiology that studies muscular actions and the function of the muscles in maintaining the posture of the body. In other words, it is the study of using your body in the safest and most efficient way to achieve a desired outcome.

Make sure to employ the following principles of body mechanics when lifting and moving a patient:

- Keep your back straight. Lift with the legs, not the back. Use the muscles in the legs, hips and buttocks and contract the muscles of your abdomen.
- Maintain a firm grip on the ***stretcher*** or the patient, as well as any other pieces of equipment being used to move the patient, being sure to never let go. Keep the patient's weight as close to your body as possible and maintain a low center of gravity. Follow the manufacturer's operating instructions for the stretcher and equipment you are using.
- Avoid twisting your body as you lift.
- Maintain a firm footing, and walk in small measured steps.
- When possible, move forward rather than backward.
- Use good posture. Poor posture can fatigue your back and abdominal muscles, making you more prone to injuries. When standing, your ears, shoulders and hips should be aligned vertically, your knees should be bent slightly and your pelvis tucked slightly forward. When sitting, your weight should be distributed evenly and your ears, shoulders and hips should be aligned.

PRINCIPLES OF MOVING PATIENTS

There are a number of different ways to move a patient to safety, and no one way is best. Any of the following moves is acceptable, providing that you can move a patient without injuring yourself or causing further injury to the patient. All team members should be trained in the proper techniques and have practiced them until the moves become automatic. Communicate your next moves clearly and frequently with your partner, the patient and other emergency medical services (EMS) personnel. If the patient is conscious, explain what you are doing or what you are about to do. Tell the patient what is expected of them, such as not reaching out to grab anything.

Back in Locked-In Position

Always begin your lift facing the patient or object and with your back in a locked-in position. Keep your legs shoulder-width apart, head up, back straight and shoulders square (Fig. 5-1). Keep the weight of the patient or object as close to your body as possible. Tighten the muscles in your back and abdomen and keep your back straight while you lift. Keep your arms locked and avoid twisting while carrying.

Power Grip

The ***power grip*** allows for maximum stability and strength from your hands. To perform the power grip, grab the object so that both palms and fingers come in complete contact with the object (Fig. 5-2). All of your fingers should be bent at the same angle.

Power Lift

The ***power lift*** technique provides a stable move for the patient while protecting you from serious injury. To perform the power lift correctly, remember

Fig. 5-1: When lifting patients, keep your back in a locked-in position, with your head up, back straight and shoulders square to the patient.

CRITICAL FACTS

Before you act, always size up the scene and consider the factors affecting the situation, including any dangerous conditions, your physical ability and the patient's possible condition.

Fig. 5-2: In a power grip, both palms and fingers should be in complete contact with the object being lifted.

to keep your back locked and avoid bending at the waist.

- Position your feet, making sure they are on a flat surface and are a comfortable distance apart (usually shoulder width), and turned slightly outward to provide maximum comfort and stability.
- Bend your knees. You should not feel like you are falling forward.
- Tighten your back and abdominal muscles. Keep your back as straight as possible and do not twist or turn. Make sure your feet are flat and your weight is evenly distributed.
- Position your hands. Use the power grip once your hands are in position. Grip the object in the way that is most comfortable and stable. For most people, that is approximately 10 inches apart.
- Lift, keeping your back locked, and make sure your upper body lifts before your hips do (Fig. 5-3).
- Reverse the process to lower.

Squat Lift

The ***squat lift*** is an alternative to the power lift and is useful if one of your legs or ankles is weaker than the other. Remember to avoid bending at the waist when performing this lift.

- Stand with your weaker leg slightly forward. The foot on the weaker side should remain flat on the ground throughout the lift sequence.
- Squat down until you can grasp the object. Use the power grip.
- Push yourself up with your stronger leg (Fig. 5-4). Keep your back locked and lead with your head, lifting your upper body before your hips.
- Reverse the procedure to lower.

Reaching

General Guidelines

Emergency medical responders (EMRs) will often have to reach for equipment or patients. To minimize the risk of injury, try to reposition the object to avoid reaching and lifting. If that is not possible, reach no more than 20 inches in front of your body. When reaching, keep your back in the locked position and do not twist. Support your upper body with your free arm. When reaching overhead, do not lean back from the waist (hyperextending).

Correct Reaching for Log Rolling

The ***log roll*** is usually performed when the patient is suspected of having a spinal injury. Ideally, *four* people working in tandem perform it. One responder is located at the patient's head, while two or three others perform the actual move (Fig. 5-5, A–E). The patient's arms should be at their side with the legs straight and together. The responder at the patient's head directs the movement and maintains spinal motion

Fig. 5-3: Perform the power lift with your back locked to provide stability for the patient and to prevent injuring yourself.

Fig. 5-4: The squat lift is a useful alternative to the power lift if one of your ankles or legs is weaker than the other.

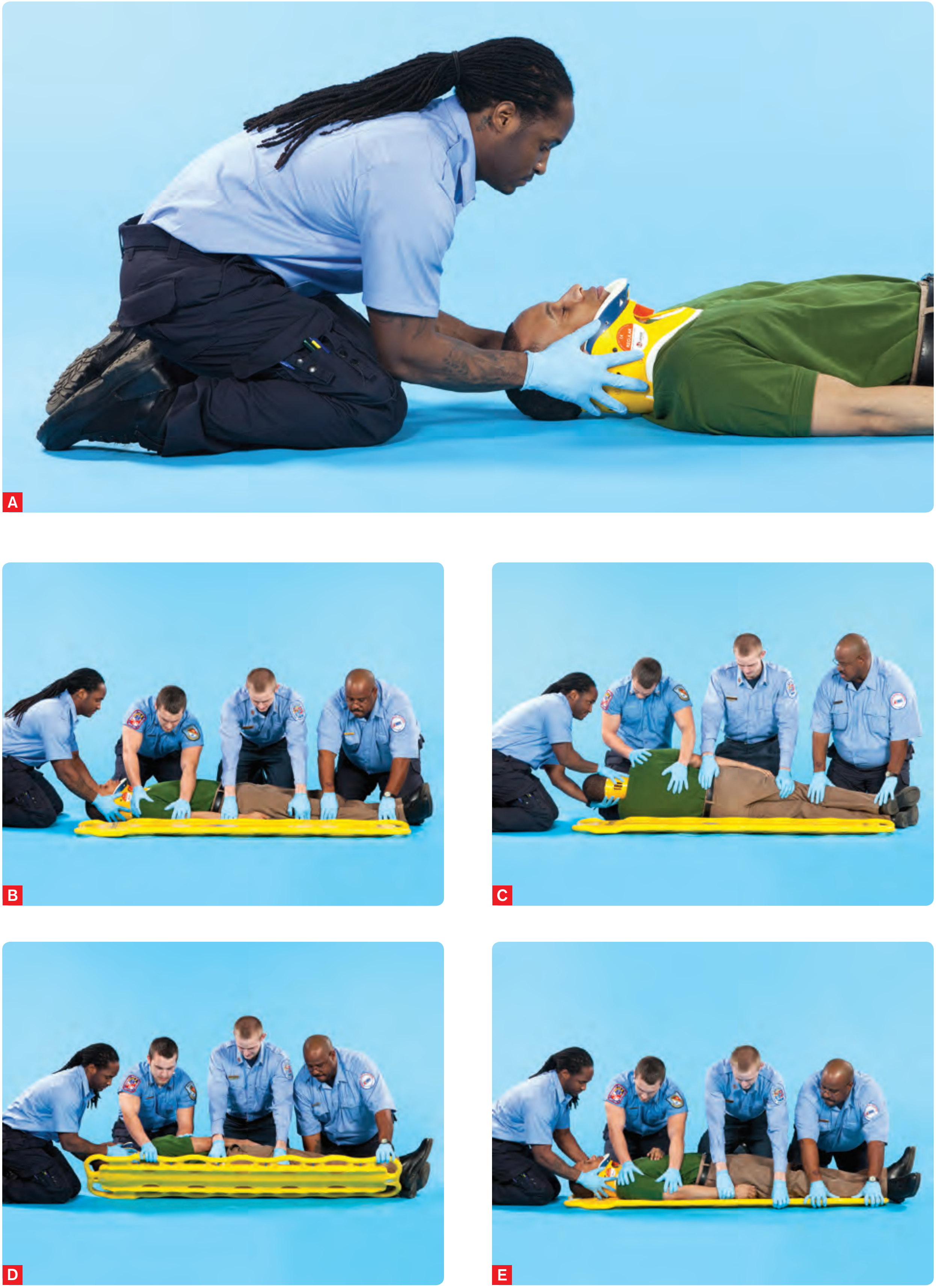


Fig. 5-5, A–E: To perform a log roll: **(A)** Have one responder maintain spinal motion restriction of the head while **(B)** three responders perform the actual move. **(C)** Roll the patient in tandem, **(D)** placing the backboard against the patient and **(E)** returning the patient in tandem, always maintaining spinal motion restriction.

restriction (SMR), a technique used to restrict spinal motion, until the patient is secured on the backboard. (For more information on SMR, see Chapter 23.) The other responders roll the patient onto the side, and onto the backboard.

When performing a log roll, keep your back straight and lean from the hips, not the waist. Use the shoulder muscles whenever possible.

Pushing and Pulling

There may be instances when you will need to push or pull an object. Push rather than pull whenever possible. If pulling an object is necessary, keep your back locked and bend your knees slightly. Keep the load between your shoulders and hips, and close to your body. This will keep the pull line centered with your body.

If you need to push an object, try to push from the area between your waist and shoulders whenever possible. If the weight is below waist level, push from a kneeling position, keeping your elbows bent and your arms close to your body. This will increase the force you can apply. Avoid pushing or pulling objects overhead, as there is an inherent risk and likelihood of injury.

Carrying

To minimize injury both to yourself and to the patient, follow these guidelines when carrying a patient:

- Before lifting or carrying, estimate the total weight to be lifted or carried. Do not forget to include the weight of any equipment used in addition to the weight of the patient.
- Know your own physical abilities and limitations. Do not overestimate your abilities or those of your team members. Call for additional assistance if required. Do not proceed with a patient move until you can do so safely, regardless of your first instinct.
- Communicate clearly and frequently with your partner, the patient and other EMRs.
- When you carry, keep the weight as close to your body as possible, with your back in the locked-in position.
- Bend and flex at your hips and knees rather than at your waist.

EMERGENCY MOVES

In any emergency move, take care to protect the head, neck and spine. If you suspect the patient of having a head, neck or spinal injury, only the clothes drag or blanket drag are safe ways to move the patient.

Indications for Emergency Moves

In general, treat patients at the scene rather than moving them to provide care. However, some situations require emergency moves. These include the following:

- Avoiding immediate danger: Danger to you or the patient from fire, close proximity of explosives or other imminent hazards, lack of oxygen, risk of drowning, possible explosion, collapsing structure or other reasons such as uncontrolled traffic hazards, civil unrest or extreme weather conditions.
- Gaining access to other patients: A person with minor injuries may need to be moved quickly to allow you to reach other patients who may have life-threatening conditions.
- Providing proper care: A patient with a medical emergency, such as cardiac arrest or heat stroke, may need to be moved to provide proper care. For example, someone in cardiac arrest needs CPR, which should be performed on a firm, flat surface with the patient positioned on the back. If the person collapses on a bed or in a small bathroom, the surface or space may not be adequate to provide appropriate care.

Moves used by EMRs include assists, carries and drags. One or two people can do most of these moves and most of them do not require equipment (the exception is the direct ground lift, which calls for *three* people). This is important because, with most emergency moves, equipment is not often immediately available and time is critical.

The greatest danger in moving a patient quickly is the possibility of aggravating a spinal injury. In an emergency, make every effort to pull the patient in the direction of the long axis of the body to provide as much protection to the head, neck and spine as possible. It is impossible to remove a patient from a vehicle quickly with an emergency move and at the same time provide much protection to the head, neck and spine.

CRITICAL FACTS

In any emergency move, take care to protect the head, neck and spine. If you suspect the patient of having a head, neck or spinal injury, only the clothes drag or blanket drag are safe ways to move the patient.

Clothes Drag

The ***clothes drag*** is an appropriate emergency move for a person suspected of having a head, neck or spinal injury (see Skill Sheet 5-1). This move helps keep the head and neck stabilized. To carry out a clothes drag, gather the patient's clothing behind the neck. Using the clothing, pull the patient to safety. During the move, cradle the patient's head by both the clothing and your hands. Move carefully, since you will be moving backward. Keep your back as straight as possible and bend your legs (Fig. 5-6). This type of emergency move is exhausting and may result in back strain for the responder, even when done properly.

Fig. 5-6: Clothes drag.

Blanket Drag

The ***blanket drag*** is a good way to move a patient in an emergency situation when stabilization equipment is unavailable or the situation dictates that there is not enough time or space to use stabilization equipment (see Skill Sheet 5-2). The blanket drag is appropriate for a patient suspected of having a head, neck or spinal injury. Position a blanket (or tarp, drape, bedspread or sheet) next to the patient. Keep the patient between you and the blanket. Gather half the blanket and place it against the patient's side. Being careful to keep about 2 feet of blanket above the patient's head, roll the patient toward your knees, reach across and position the blanket directly next to the patient. Gently roll the patient as a unit onto the blanket, being careful not to twist the patient's spinal column. After smoothing out the blanket, wrap it around the patient, gather up the excess at the patient's head, and drag, being sure to keep the patient's head as low as possible. Move carefully because you are moving backward, and keep your back as straight as possible (Fig. 5-7).

Fig. 5-7: Blanket drag.

Shoulder Drag

The ***shoulder drag*** is a variation of the clothes drag, in which you reach under the patient's armpits (from the back), grasp the patient's forearms and drag the patient (Fig. 5-8). Keep your back as straight as possible and do not twist (see Skill Sheet 5-3). This move is exhausting and should be done carefully, since you are moving backward. The move may result in back strain. This move is *not* safe for a patient suspected of having a head, neck or spinal injury.

Fig. 5-8: Shoulder drag.

Ankle Drag

For the ***ankle drag*** (also known as the foot drag), firmly grasp the patient's ankles and move backward (see Skill Sheet 5-4). Be careful to pull on the long axis of the body and not bump the patient's head. Keep your back as straight as possible and do not twist. Move carefully because you are moving backward, which may result in back strain (Fig. 5-9). This move is *not* safe for a patient suspected of having a head, neck or spinal injury.

Firefighter's Drag

For the ***firefighter's drag***, position the patient on the back. Bind the patient's hands together gently at the wrists (see Skill Sheet 5-5). Alternatively, you can strap a belt or other device behind the patient's scapulae, loop it through the straps on your air pack and fasten. Straddle the patient on your hands and knees, and slip your head through the patient's arms. Place the patient's bound wrists behind your head. Keeping your back as straight as possible, and keeping the patient centered under you, slowly crawl forward, carrying the patient with you (Fig. 5-10). Be careful not to bump the patient's head. This move is *not* safe for a patient suspected of having a head, neck or spinal injury.

Firefighter's Carry

The ***firefighter's carry*** is *not* appropriate for patients with suspected head, neck, spinal or abdominal injuries, since the patient's body is twisted, the head is not supported and the patient's abdomen bears the weight during the movement. To perform the carry for a patient who is lying face-up, grasp the patient's wrists (see Skill Sheet 5-6). While standing on the patient's toes, pull the patient over a shoulder. Finally, pass an arm between the legs and grasp the arm nearest you. Alternatively, you can kneel in front of a seated patient, place one shoulder against the patient's abdomen and hoist the patient across your shoulders. Pull the patient over a shoulder. The patient's feet should be on one side and the head on the other. Pass your arm between the patient's legs and grasp the patient's arm that is closest to you. Keep your back as straight as possible, lift with your legs and stand up (Fig. 5-11).

Pack-Strap Carry

The ***pack-strap carry*** can be used on both conscious and unconscious patients. Using it on an unconscious patient requires a second responder to help position the patient on your back. To perform the pack-strap carry, have the patient stand, or have a second responder support the patient (see Skill Sheet 5-7). Position yourself with your back to the patient, back straight and knees bent so that your shoulders fit into the patient's armpits. Cross the patient's arms in front of you and grasp the patient's wrists (Fig. 5-12). Lean forward slightly and pull the patient up onto your back. Stand and walk to safety. Depending on the size of the patient, you may be able to hold both the patient's wrists with one hand. This leaves your other hand free to help maintain balance, open doors and remove obstructions. This move is *not* safe for a patient suspected of having a head, neck or spinal injury.

Fig. 5-9: Ankle drag.

Fig. 5-10: Firefighter's drag.

Fig. 5-11: Firefighter's carry.

NONEMERGENCY MOVES

Uses

A nonemergency move requires no special equipment and is generally performed with other responders. Do not use nonemergency moves if there is a possibility of a spinal injury. A nonemergency move is used to move a patient from one location to another, such as from the incident scene to an ambulance or other transport vehicle or to a stretcher, from a bed to a stretcher or from

Fig. 5-12: Pack-strap carry.

the floor to a chair. It may also be used to move a patient to a different position as part of the medical treatment. The best way to move a patient in a nonemergency situation is the easiest way that will not cause injury or pain.

Nonemergency moves are used most frequently with patients with altered mental status, patients with inadequate breathing, patients who are in shock or patients in other situations that are potentially dangerous. Examples include a patient who is on a beach with the tide coming in or one who is lying on the ground in a busy traffic area.

Techniques

Walking Assist

The most basic move is the ***walking assist***. It is frequently used to help patients who simply need assistance to walk to safety (see Skill Sheet 5-8). Either one or two responders can use this method with a conscious patient.

To carry out a walking assist, place the patient's arm across your shoulders and hold it in place with one hand. Support the patient with your other hand around the patient's waist (Fig. 5-13, A). In this way, your body acts as a crutch, supporting the patient's weight while you both walk. A second responder, if present, can support the patient in the same way from the other side (Fig. 5-13, B).

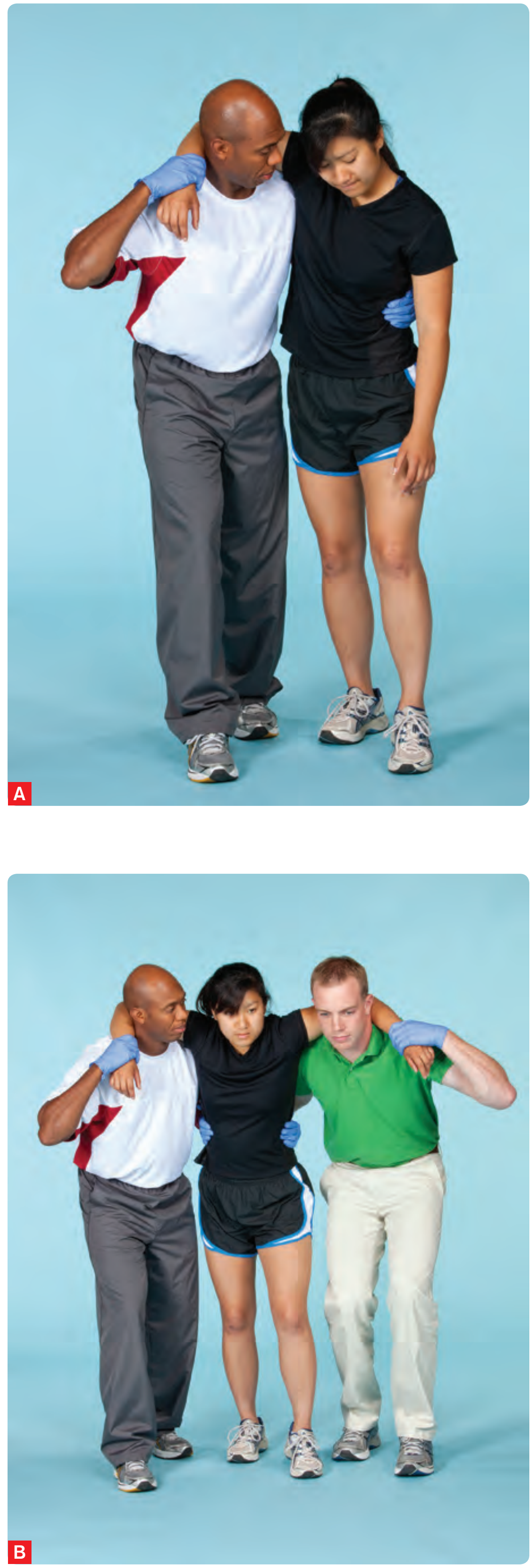


Fig. 5-13, A–B: Walking assist with **(A)** one responder and **(B)** two responders.

CRITICAL FACTS A nonemergency move is used to move a patient from one location to another. Do not use nonemergency moves if there is a possibility of a spinal injury.

Two-Person Seat Carry

The ***two-person seat carry*** is a method of moving a patient that requires a second responder. To perform the two-person seat carry, put one arm under the patient's thighs and the other across the patient's back (see Skill Sheet 5-9). Interlock your arms with those of a second responder, under the patient's legs and across the patient's back. The patient places their arms over the responders' shoulders. The patient is then lifted in the "seat" formed by the responders' arms (Fig. 5-14). Keep your back straight and lift with your legs. Do *not* use this move for a patient suspected of having a head, neck or spinal injury.

Direct Ground Lift

The ***direct ground lift*** requires at least *three* responders. The three responders line up on one side of the patient and kneel close to the patient (see Skill Sheet 5-10). The patient should cross arms over the chest. The responder kneeling at the patient's head places one arm under the patient's shoulders, cradling the head, and places the other arm under the patient's upper back. The next responder places one arm under the patient's waist and the other under the buttocks. The third responder cradles the patient's hips and legs. On a signal from the responder at the patient's head, all three responders lift the patient to their knees and support the patient by rolling the patient against their chests (Fig. 5-15). On the next signal, all will rise to their feet and move the patient to the stretcher. Reverse the steps to lower the patient. Responders should keep their backs straight and lift with their legs.

Extremity Lift

In the ***extremity lift***, one responder kneels behind the patient, keeping the back straight, reaches under the patient's arms and grasps the patient's opposite wrist (see Skill Sheet 5-11). The second responder kneels between the patient's legs and firmly grasps around the patient's knees and thighs. On a signal from the responder at the patient's head, both responders move from a crouching position to a standing position. The responders then move the patient to a stretcher (Fig. 5-16).

Moving Patients from a Bed to a Stretcher

There are two techniques designed for moving a patient from a bed to a stretcher or vice versa: the ***direct carry*** and the ***draw sheet***.

Fig. 5-14: Two-person seat carry.

Fig. 5-15: Direct ground lift.

Fig. 5-16: Extremity lift.

Direct Carry

Position the stretcher at a right angle to the bed, with the head of the stretcher at the foot of the bed. Two responders position themselves beside the bed on the same side as the stretcher. One responder slides their arms around the patient's shoulders and back, and the second responder cradles the patient's waist and hips. On a signal from the responder at the patient's head, the responders lift the patient simultaneously and curl the patient's body in toward their chest. With a minimum of steps, the responders can then turn and place the patient on the stretcher (Fig. 5-17, A–C). Responders should keep their backs straight, lift with their legs and not twist their bodies.

Draw Sheet

To transfer a patient from the stretcher to the bed, the responders loosen the bottom sheet on the stretcher and position the stretcher along the side of the bed. Responders stand beside the stretcher and on the other side of the bed. The responders on the bed side of the patient lean over the bed and grasp the sheet firmly at the patient's head and hips. The responders on the stretcher side grasp the sheets in the same place. They then slide the patient into the bed. If there are more responders available, they should be positioned to help support the patient's legs by grasping the sheet in the same manner as the initial responders (Fig. 5-18).

EQUIPMENT

To best decide on the most suitable equipment for patients under different conditions, it is important to familiarize yourself with the different types available and match the appropriate equipment for the size and condition of each patient.


A


B

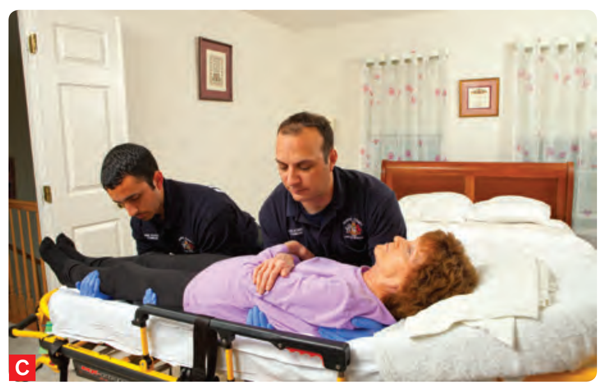

C

Fig. 5-17, A–C: To perform a direct carry: On a signal from the responder at the patient's head, **(A)** the responders lift the patient simultaneously, **(B)** the responders curl the patient's body in toward their chest and **(C)** place the patient on the stretcher.

Fig. 5-18: Draw sheet technique.

CRITICAL FACTS There are two techniques designed for moving a patient from a bed to a stretcher or vice versa: the direct carry and the draw sheet.

Stretchers

There are several types of stretchers designed to deal with patient transport:

- Wheeled stretchers are most commonly used when moving patients from a situation in which transport by ambulance for more advanced medical care is required (Fig. 5-19, A). They are equipped with a collapsible undercarriage for ease of loading. Some models are pneumatic or electronic and help reduce the amount of manual lifting involved in patient transport. They use a hydraulic lift system to raise and lower the frame.
- Portable stretchers are lightweight and often are used as auxiliary stretchers in ambulances

Fig. 5-19, A–F: Types of stretchers include: **(A)** wheeled stretcher; **(B)** portable stretcher; **(C)** bariatric stretcher (*photo: courtesy of Stryker*); **(D)** basket stretcher; **(E)** flexible stretcher; **(F)** scoop or orthopedic stretcher.

(Fig. 5-19, B). They are designed for use with additional patients, as well as for maneuvering in areas where space is limited.

- The bariatric stretcher was designed to accommodate a weight of up to 1600 pounds (Fig. 5-19, C).
- Basket stretchers, also known as Stokes baskets, get their name because of their basket-like shape (Fig. 5-19, D). They are capable of safely transporting and securing patients requiring a backboard. There are two types: a welded metal frame with a chicken wire web and a tubular aluminum frame that has been riveted to a molded polyethylene shell.
- Flexible stretchers are made of canvas or synthetic materials and are designed to allow easy transport of patients from confined spaces, narrow hallways and in situations with multiple steps or rough terrain (Fig. 5-19, E).
- Scoop or orthopedic stretchers are designed for patients weighing up to 300 pounds, and are made to be assembled and disassembled around the patient (Fig. 5-19, F).

Stair Chair

A ***stair chair*** is used when a wheeled stretcher is deemed too long for the rescue or extrication (Fig. 5-20). It is especially useful when there is a small elevator or staircase in which a long stretcher will not fit. It is recommended that *three* responders be present when using the stair chair to ensure patient safety, two to act as carriers and one to serve as a spotter to watch for potential difficulties.

Fig. 5-20: Stair chair. *Photo: courtesy of the Canadian Red Cross.*

Backboards

Backboards are used to move a patient from the scene of the incident to a stretcher or other transport device. Backboards can also be used to provide spinal motion restriction of a patient's head, neck and spine and are considered a standard piece of EMS equipment (Fig. 5-21, A–B).

A short backboard is an SMR device used for non-critical patients who are already in a sitting position. The vest type and/or corset design is most commonly used to secure patients in this situation, and allows the patient's head, chest and lower back to be strapped in. The Kendrick Extrication Device (KED) is a vest-type device that is commonly used to stabilize patients in vehicle collisions who are in an upright position. It is used together with a cervical collar (Fig. 5-22).

The full-body vacuum mattress can be used as either a backboard or moving device once the patient is secured. This design allows the mattress to conform to whatever shape is required to accommodate the patient's condition. It avoids the need for additional padding and becomes rigid once fully deflated.

PATIENT POSITIONING AND PACKAGING FOR TRANSPORT

Make patients as comfortable as possible while awaiting transport. Unless a life-threatening emergency dictates the necessity, do not move an injured patient. A patient is usually moved by EMRs once the patient has been examined, evaluated and stabilized. There are times when a patient's condition will dictate the position you place the patient in.

Position of Comfort

Indications for Use

Patients with various injuries or illnesses may be placed in a ***position of comfort***, which is the position that is most comfortable, unless the injury or illness prevents it. This might include a patient who is in pain, is experiencing breathing problems, is nauseated or is vomiting.

Techniques

Someone with abdominal pain will be more comfortable on the side with knees drawn up. If a patient is experiencing breathing difficulties, the patient may be more comfortable sitting up rather than lying down.

Fig. 5-21, A–B: (A) Adult backboard and **(B)** pediatric backboard.

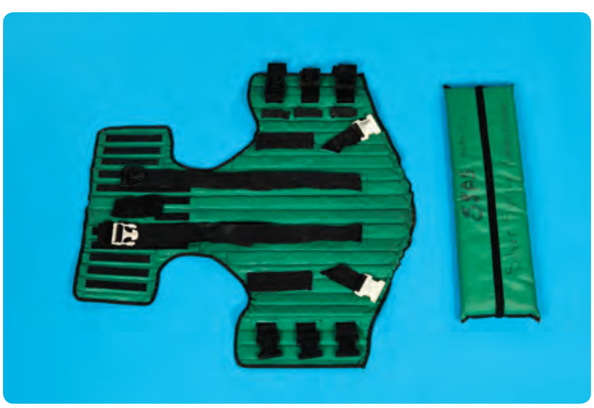


Fig. 5-22: Kendrick Extrication Device.

A patient who is nauseated or vomiting should be allowed to remain in whatever position is most comfortable. However, you should monitor the patient closely and position yourself to monitor and manage the patient's airway. An alert but nauseated person should be transported in a sitting-up position. If the patient is unresponsive, or you cannot maintain an open and clear airway because of fluids or vomit, transport the patient on their side in a recovery position.

Recovery Positions

Indications for Use

While ***recovery positions*** are not generally used in an EMS or healthcare setting, it is important to understand how and when to use them. For patients who are unresponsive, but breathing normally with no suspected head, neck, spinal, hip or pelvic injury, move the patient into a side-lying recovery position after completing your assessment and gathering a patient history, based on local protocols. Patients with a suspected head, neck, spinal, hip or pelvic injury should not be placed in a recovery position unless you are unable to manage the airway effectively or you are alone and need to leave the patient to call for additional resources.

CRITICAL FACTS

You should use a side-lying recovery position for patients who are unresponsive but breathing normally. Patients with a suspected head, neck, spinal, hip or pelvic injury should not be placed in a recovery position unless you are unable to manage the airway effectively or you are alone and need to leave the patient to call for additional resources.

Techniques

To place a supine adult or child in a recovery position (Fig. 5-23):

- Kneel at the patient's side.
- Lift the patient's arm that is closest to you up next to their head.
- Take the patient's arm that is farthest from you and place it next to their side.
- Grasp their leg that is closest to you and bend it up.
- Place one of your hands on the patient's shoulder and your other hand on their hip that is farthest from you.
- Using a smooth motion, roll the patient toward you by pulling their shoulder and hip with your hands. Make sure the patient's head remains in contact with their extended arm.
- Stop all movement when the patient is on their side.
- Place their knee on top of the other knee so that both knees are in a bent position.
- Place the patient's free hand under their chin to help support their head and airway.

To place an infant in a recovery position:

- Place the infant in a recovery position as would be done for an older child.
- You also can 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 (Fig. 5-24).

Supine Position

Indications for Use

In a ***supine*** position, the patient is lying face-up. The supine position should be used when assessing an unconscious patient, when a patient needs CPR or assisted ventilation, or when a patient has suspected head, neck or spinal injuries. In order to perform CPR effectively, for example, a patient must be lying in a supine position. Transport a patient in shock in a supine position.

Fig. 5-23: Use a side-lying recovery position for patients if they are unresponsive but breathing normally and have no evidence of head, neck, spinal, hip or pelvic injury. Patients with a suspected head, neck, spinal, hip or pelvic injury should not be placed in a recovery position unless you are unable to manage the airway effectively or you are alone and need to leave the patient to call for additional resources.

Fig. 5-24: An infant recovery position.

Techniques

A log roll is performed to transfer a patient to a supine position. Ideally, *four* responders should perform it. The most experienced member of the team should be at the patient's head. The responder at the head will be the lead for the move and will provide spinal motion restriction of the head and neck during the move. To provide SMR of the head, place your hands on either side of the patient's head at the jawline, with your fingers behind the head at the base of the skull. The second responder kneels at the patient's shoulders and upper back area. The third responder kneels at the patient's hips. The fourth responder kneels on the opposite side to position the backboard or other extrication device. The responder at the patient's head leads the move. On that responder's count, the other responders roll the patient as a team onto the patient's side, while the lead responder keeps the patient's head stable. The responder on the opposite side of the patient positions the backboard under the patient (Fig. 5-25, A–C).

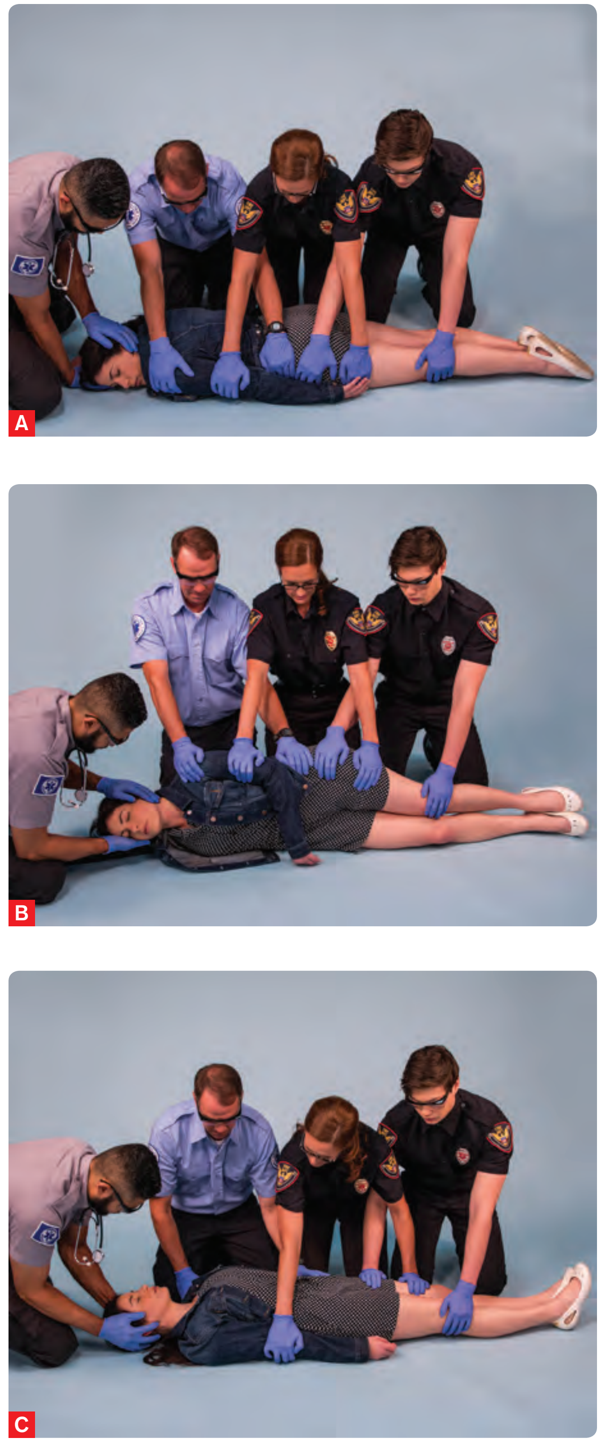


Fig. 5-25, A–C: To perform a log roll: **(A)** One responder provides spinal motion restriction to the head while three others perform the move. **(B)** One responder maintains spinal motion restriction of the head while **(C)** the others reach across and roll the patient onto their back.

MEDICAL RESTRAINT

If a patient is aggressive or violent and in need of emergency care, they may need to be restrained. However, an EMR should avoid restraining a patient unless the patient presents a danger to themselves

CRITICAL FACTS Restraint should be reserved only for situations where the patient presents a danger to themselves or to others. If state laws prohibit you from using restraints, ensure your safety and wait for proper authorities to arrive on the scene.

or to others. Also, be aware that some state laws require EMRs to have police authorization before they can use ***restraints***. If you are not authorized to use restraints, ensure your safety and wait for someone with proper authority to arrive at the scene.

Even if you are authorized to use restraints, it is still best to have police present, if possible. Seek approval from medical direction. Be aware of and follow local protocols involving the use of patient restraints. Restraining a patient without justification can give rise to a claim of assault and battery.

Altered Mental Status

Patients sometimes become aggressive or violent as a result of illness or trauma. Any condition that reduces the amount of oxygen to the brain, such as head injuries, can cause a significant change in behavior. Too little oxygen could make a normally calm patient suddenly become anxious or even violent. Physical illness as a result of substance abuse, diabetic emergencies, heat or cold exposure, or problems with the nervous system associated with aging can lead to alterations in behavior. Patients who are in an altered mental state may need to be restrained.

Reasonable Force

When restraining a patient, an EMR should always use ***reasonable force***—the minimum force necessary to keep a patient from injuring themselves or others. A force is considered reasonable if it is as great as or minimally greater than the force the patient is exerting to resist. The amount of force you should use depends on:

- The height and weight of the patient.
- The mental state of the patient.
- The type of behavior the patient is manifesting.
- The type of restraint to be used (e.g., humane restraints that are padded and made of cloth, leather or wide roller gauze versus metal handcuffs, which are not considered humane).

Using Restraints

If restraints must be used, be sure that you have adequate assistance. You will need at least *four* responders trained in the use of restraints, plus an additional EMR who can advise the patient what is taking place. Plan out your actions before you take them. You must know ahead of time what each responder will be doing so you can act quickly and safely. Remember that both medical and law enforcement personnel need to be consulted prior to the use of restraints. Always follow local protocols.

Use only the force necessary to successfully apply the restraint. Estimate the range of motion of the patient's arms and legs, and stay beyond range until ready. Once the decision has been made to restrain the patient, act quickly. Have one EMR talk to the patient throughout restraining. Approach the patient with four responders simultaneously, one preassigned to each limb. Use only restraints that have been preapproved by medical direction. Restraints should be humane—made of leather or cloth. In addition, use only commercial wrist- and ankle-restraining straps.

Never secure a patient in a prone position. You must have access to the patient's airways at all times. A patient in a prone position will not be able to adequately breathe because the weight of the body will force the organs toward the diaphragm, which could lead to hypoxia (lack of oxygen) and other conditions. The lack of oxygen may cause the patient to become more aggressive. Be sure to monitor the patient's condition frequently.

CRITICAL FACTS When restraining a patient, use reasonable force. Force is considered reasonable if it is as great as or minimally greater than the force the patient is exerting to resist.

Carefully and completely document, in detail, the events surrounding your use of force and the techniques that you used.

Types of Restraints

In circumstances where you need to restrain a patient, you will be using physical restraints, such as soft leather or cloth straps. There are also medications that act as a chemical form of restraint, but these must only be administered under medical authorization and by personnel trained to do so. Patients who are chemically restrained must be transported in an advanced life support (ALS) unit and should be monitored closely. *Never* leave any restrained patient unattended.

PUTTING IT ALL TOGETHER

Take the time to size up the scene upon arrival and determine if moving the patient is necessary before attempting to do so. Remember that your safety and the safety of your team always come first. This is especially true in incidents involving hazardous materials.

Avoid the common mistake of moving an injured or ill person unnecessarily. If you recognize a potentially life-threatening situation that requires the patient be moved immediately, use one of the techniques described in this chapter. Use the safest and easiest method to rapidly move the patient without causing injury to either yourself or the patient. Practice the lifts, moves and carries ahead of time so that they will be automatic to you when you need to use them.

It is important for you to familiarize yourself with some of the typical equipment used in local EMS systems. Practice using the different types of stretchers, backboards and extrication devices, as you could be called on to use them at any time.

If it becomes necessary to restrain a patient, follow the prescribed protocol carefully and ensure you have law enforcement and medical authorization before restraining a patient. Document the situation carefully to avoid future legal problems.

You Are the Emergency Medical Responder

You and two other firefighters get to the collapsed people. Two of them are unconscious. One man indicates his lower left leg may have been fractured. You recognize the immediate danger to the two unconscious patients and to the others who have escaped from the building. Time is critical. You need to get everyone to a safer place. Additional fire rescue units and EMS personnel have been called but have not arrived yet and the fire continues to build. How would you move the unconscious patients? How would you move the man with the lower leg injury?

Skill Sheet 5-1

Clothes Drag

NOTE: The clothes drag is an appropriate emergency move for a patient suspected of having a head, neck or spinal injury.

STEP 1

Position the patient on their back.

STEP 2

Kneel behind the patient's head.

STEP 3

Gather the patient's clothing behind the neck.

STEP 4

Using the clothing, pull the patient to safety.

- During the move, cradle the patient's head by both the clothing and your hands.
- Move carefully, since you will be moving backward.
- Keep your back as straight as possible and bend your legs.

Skill Sheet 5-2

Blanket Drag

NOTE: The blanket drag is appropriate for a patient suspected of having a head, neck or spinal injury.

STEP 1

Position a blanket (or tarp, drape, bedspread or sheet) next to the patient.

STEP 2

Keep the patient between you and the blanket.

STEP 3

Gather half the blanket and place it against the patient's side.

- Keep about 2 feet of blanket above the patient's head.

STEP 4

Roll the patient toward your knees, reach across and position the blanket directly next to the patient.

STEP 5

Gently roll the patient as a unit onto the blanket, being careful not to twist the patient's spinal column.

(*Continued*)

Skill Sheet 5-2

Blanket Drag *Continued*

STEP 6

After smoothing out the blanket, wrap it around the patient.

STEP 7

Gather up the excess at the patient's head and drag the blanket.

- Be sure to keep the patient's head as low as possible.
- Move carefully backward, keeping your back as straight as possible.

Skill Sheet 5-3

Shoulder Drag

NOTE: This move is not safe for a patient suspected of having a head, neck or spinal injury.

STEP 1

Reach under the patient's armpits (from the back), grasp the patient's forearms and drag the patient.

- Keep your back as straight as possible and do not twist.

STEP 2

Carefully move backward.

Skill Sheet 5-4

Ankle Drag

NOTE: This move is not safe for a patient suspected of having a head, neck or spinal injury.

STEP 1

Firmly grasp the patient's ankles and move backward.

- Be careful to pull on the long axis of the body and not bump the patient's head.

STEP 2

Carefully move backward.

- Keep your back as straight as possible and do not twist.

Skill Sheet 5-5

Firefighter's Drag

NOTE: This move is not safe for a patient suspected of having a head, neck or spinal injury.

STEP 1

Position the patient on the back. Bind the patient's hands together gently at the wrists.

STEP 2

Straddle the patient on your hands and knees, and slip your head through the patient's arms.

STEP 3

Place the patient's bound wrists behind your head.

STEP 4

Slowly crawl forward, carrying the patient with you.

- Keep your back as straight as possible.
- Keep the patient centered under you.
- Do not bump the patient's head.

Skill Sheet 5-6

Firefighter's Carry

NOTE: The firefighter's carry is not appropriate for patients with suspected head, neck, spinal or abdominal injuries.

To perform the firefighter's carry on a patient who is lying face-up:

STEP 1

Grasp the patient's wrists.

STEP 2

While standing on the patient's toes, pull the patient over a shoulder.

STEP 3

Pass an arm between the legs and grasp the arm nearest you.

- **Alternatively, kneel in front of a seated patient, place one shoulder against the patient's abdomen and hoist the patient across your shoulders.**

(*Continued*)

Skill Sheet 5-6

Firefighter's Carry *Continued*

STEP 4

Pull the patient over a shoulder.

STEP 5

The patient's feet should be on one side and the head on the other.

STEP 6

Lift with your legs and stand up.

- Keep your back as straight as possible.

Skill Sheet 5-7

Pack-Strap Carry

NOTE: This move is not safe for a patient suspected of having a head, neck or spinal injury. The pack-strap carry can be used on both conscious and unconscious patients.

To perform the pack-strap carry on either a conscious or unconscious patient:

STEP 1

Have the patient stand, or have a second responder support the patient.

STEP 2

Position yourself with your back to the patient.

- Keep your back straight and knees bent so that your shoulders fit into the patient's armpits.

STEP 3

Cross the patient's arms in front of you and grasp the patient's wrists.

(*Continued*)

Skill Sheet 5-7

Pack-Strap Carry *Continued*

STEP 4

Lean forward slightly and pull the patient up onto your back.

STEP 5

Stand and walk to safety.

Skill Sheet 5-8

Walking Assist

NOTE: Either one or two responders can use this method with a conscious patient.

STEP 1

Place the patient's arm across your shoulders and hold it in place with one hand.

STEP 2

Support the patient with your other hand around the patient's waist.

NOTE: A second responder, if present, can support the patient in the same way from the other side.

Skill Sheet 5-9

Two-Person Seat Carry

NOTE: Do not use this move for a patient suspected of having a head, neck or spinal injury.

STEP 1

Put one arm under the patient's thighs and the other across the patient's back.

STEP 2

Interlock your arms with those of a second responder, under the patient's legs and across the patient's back.

- The patient places their arms over the responders' shoulders.

STEP 3

Lift the patient in the "seat" formed by the responders' arms.

- Keep your back straight and lift with your legs.

Skill Sheet 5-10

Direct Ground Lift

NOTE: The direct ground lift requires at least three responders.

STEP 1

All responders line up on one side of and kneel close to the patient.

- The patient should cross arms over the chest.

STEP 2

The responder kneeling at the patient's head places one arm under the patient's shoulders, cradling the head, and places the other arm under the patient's upper back.

STEP 3

The next responder places one arm under the patient's waist and the other under the buttocks.

STEP 4

The third responder cradles the patient's hips and legs.

(*Continued*)

Skill Sheet 5-10

Direct Ground Lift *Continued*

STEP 5

On a signal from the responder at the patient's head, all three responders lift the patient to their knees.

- Provide support by rolling the patient against the responders' chests.

STEP 6

On the next signal, all carefully rise to a standing position and then move the patient to the stretcher.

- Reverse the steps to lower the patient.
- Keep backs straight and lift with the legs.

Skill Sheet 5-11

Extremity Lift

NOTE: The extremity lift requires two responders.

STEP 1

One responder kneels behind the patient, keeping the back straight, reaches under the patient's arms and grasps the patient's opposite wrist.

STEP 2

The second responder kneels between the patient's legs, and firmly grasps around the patient's knees and thighs.

(*Continued*)

Skill Sheet 5-11

Extremity Lift *Continued*

STEP 3

On a signal from the responder at the patient's head, both responders move from a crouching position to a standing position.

STEP 4

The responders then move the patient to the stretcher.

UNIT 2

Assessment

6 SCENE SIZE-UP

You Are the Emergency Medical Responder

You are summoned to a home where a 43-year-old mother and her two children were apparently overcome by carbon monoxide from a gas oven. The power went out earlier and has not been restored. The family members were found by a concerned neighbor. When you arrive, you see the mother and one of the children who are conscious and complaining of nausea and severe headaches. You also see a 6-year-old boy who appears to be unresponsive and not breathing. What should you be concerned with prior to conducting an assessment and providing care? Are there other services, such as fire or police, you should summon to the scene?

KEY TERMS

Blast injury: An injury caused by an explosion; may occur because of the energy released, the debris, or the impact of the person falling against an object or the ground.

Blunt trauma: An injury in which a person is struck by or falls against a blunt object such as a steering wheel or dashboard, resulting in an injury that does not penetrate the body, may not be evident, and may be more widespread and serious than suspected.

Chocking: The use of items such as wooden blocks placed against the wheels of a vehicle to help stabilize it.

Dispatcher: Personnel trained in taking critical information from emergency callers and call takers and relaying it to the appropriate rescue personnel.

Hazardous materials (HAZMATs): Chemical substances or materials that can pose a threat or risk to health, safety and property if not properly handled or contained.

Hematoma: A mass of usually clotted or partially clotted blood that forms internally in soft tissue space or an organ as a result of ruptured blood vessels.

Kinematics of trauma: The science of the forces involved in traumatic events and how they damage the body.

Mechanism of injury (MOI): The force or energy that causes a traumatic injury (e.g., a fall, explosion, crash or attack).

Nature of illness: The medical condition or complaint for which the person needs care (e.g., shock, difficulty breathing), based on what the patient or others report as well as clues in the environment.

Penetrating injury: An injury in which a person is struck by or falls onto an object that penetrates or cuts through the skin, resulting in an open wound or wounds, the severity of which is determined by the path of the object (e.g., a bullet wound).

Tripod position: A position of comfort that a person may assume automatically when breathing becomes difficult; in a sitting position, the person leans slightly forward with outstretched arms, and hands resting on knees or an adjacent surface for support to aid breathing.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Explain the rationale for sizing up a scene.
- Identify the elements of a scene size-up.
- Determine when a scene is safe to enter.
- Describe common hazards found at the scene of a trauma or medical emergency.
- Have a basic understanding of scene and traffic control and related safety issues.
- Describe the principles of personal safety at an emergency scene.
- Identify standard and specialized personal protective equipment (PPE).
- Describe common mechanisms of injury (MOIs) and natures of illness.
- Recognize an unstable vehicle.
- Explain the safety fundamentals of vehicle stabilization.
- Know when to request and what types of additional resources may be necessary at the scene.
- Describe other dangerous situations and hazardous materials (HAZMATs).

INTRODUCTION

It is natural when you arrive at the scene of an emergency to want to rush in and start helping people who may be in obvious pain or distress. But, no matter what the situation, it is essential to take the time to carefully and systematically prepare for and size up the scene. By doing this, you may save time later, prevent further harm to yourself and the patient, and reduce the risk of overlooked injuries.

In this chapter, you will learn about the priority of preparation, ensuring your personal safety, determining the number of patients, identifying the mechanism of injury or nature of illness, and assessing the possible need for additional resources.

DISPATCH INFORMATION

As an emergency medical responder (EMR), it is important that you come prepared with the best available information before arriving at any emergency scene. Therefore, paying close attention to the information the ***dispatcher*** has provided to you is essential. This information gives you the first clues as to what you may encounter, including hazards you may need to take into consideration. It will also affect the personal protective equipment (PPE) and other equipment you may need.

Keep in mind that the information provided by dispatch is likely to be incomplete and may not be entirely accurate. The caller may have only given a location and some indication that medical assistance was needed. Hazards may be present that were not relayed by the person who reported the emergency, or the person may deliberately lie or exaggerate the severity of the condition in order to get medical attention. However, never undervalue the information dispatch can provide you as a foundation for your preparations.

SAFETY

Scene Safety

Almost every emergency response carries a certain risk to the safety of the EMR. Upon arrival at an emergency scene, safety should be your first priority. Safety includes both personal safety and the safety of others, including patients and bystanders. Begin with assessment of the scene and the surroundings, both of which provide valuable information about the emergency situation and will help ensure your own well-being.

Use each of your senses to size up the scene. In addition to seeing and feeling for hazards, listen for unusual sounds, for example loud explosions or crackling sounds. Use your sense of smell to detect any unusual or unexpected odors, such as gasoline or other chemicals.

Always observe the scene thoroughly for dangers such as traffic, unstable structures, downed electrical lines, leaking fuels or fluids, smoke or fire, broken glass, swift-moving water, violence, explosions or toxic gas exposure. Some emergency scenes are immediately dangerous; others may become dangerous while you are providing care. Sometimes the dangers are obvious, such as at a fire or with the presence of hostile patients or bystanders. Other dangers may be less obvious, such as the presence of ***hazardous materials (HAZMATs)*** or unstable structures.

Take safety measures that are appropriate to the situation. In some cases, this might mean leaving or moving away from the scene if it is too dangerous, and may require a call for specialized personnel or other additional resources.

Controlling the Scene

Traffic Control

Once you have eliminated or removed the current dangers, you need to prevent new hazards from affecting the scene as you provide care for the patient(s). This is frequently a concern when dealing with emergencies on or near a road, and traffic control may be needed. Always pay attention to the road. Keep your eyes and ears open to avoid becoming a victim yourself.

Usually, the police will take responsibility for directing traffic at a scene. However, if the police have not yet arrived, you may need to manage this task. Always follow local protocols or guidelines, but, in general, one person should be designated to be in charge of traffic control. If possible, traffic should be directed onto an entirely different road. If another route is not possible, the blocked-off area should be arranged so that any moving traffic is at least 50 feet from the scene.

CRITICAL FACTS

Safety includes both personal safety and the safety of others, including patients and bystanders.

The redirection of the vehicles needs to start well back from the scene. Traffic may be moving quickly, and you need to provide plenty of time for vehicles to slow down and move over. Flares, reflective cones, signs and other warning devices should be put in position, about 10 to 15 feet apart in a slanting line (Fig. 6-1, A–C). Avoid placing a flare near puddles of fluid that may have spilled or leaked out of the involved vehicles, as the fluid may be flammable. On a curve, start the line of flares at the beginning of the curve; on a hill, start at the top of the hill. If the crash happened on a two-way road, put up flares or warning devices in both directions. Any responders setting out the flares or waving traffic away should be wearing reflective clothing based on local, state and national guidelines and always be walking toward traffic. Do not turn your eyes away from oncoming traffic.

Ambulances or other transport and emergency vehicles should be positioned to help control the scene. If there are other emergency vehicles present, ambulances should be parked in front of the scene with the tires angled away from where care is being provided and with the loading doors facing away from traffic. Ambulances and fire apparatus should be blocking the road as much as possible but allow other emergency vehicles to access the scene. If other emergency vehicles are present, they should park down from the scene with their tires angled away from where care is being provided. If there is a fire, park at least 100 feet away; in a HAZMAT situation, aim for a distance of 2000 feet or park where directed by on-scene personnel or the dispatcher. Also look for a location that is uphill and upwind if there are HAZMATs or fire. Leave emergency lights on to provide another warning to drivers approaching the scene, and turn headlights to a lower setting.

Positioning Flares to Control Traffic

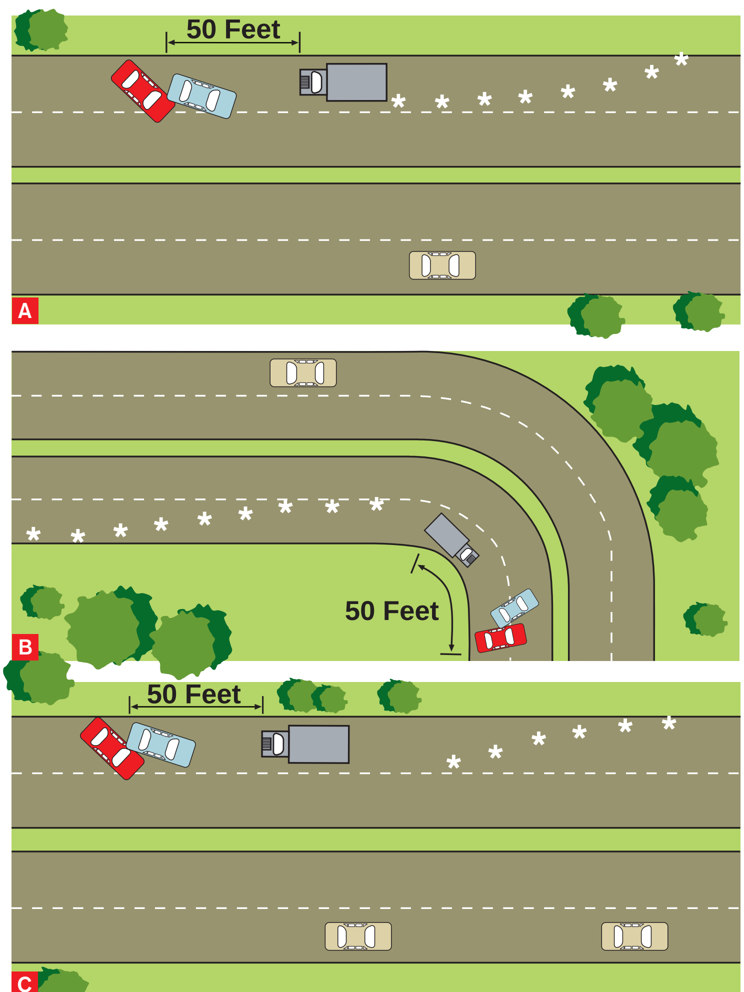


Fig. 6-1, A–C: **(A)** Proper position of flares on a straight road; **(B)** proper position of flares on a curved road; **(C)** proper position of flares on a hill.

Crowd Control

You can help keep the situation calm at the scene by staying calm yourself. For example, walk quickly to patients rather than run. Walking is not only safer but also sends a message to the crowd that you are in control and confident. In very chaotic situations, it may help to set up a barrier around the scene and designate one person to ensure people stay behind the barrier.

Re-Evaluating the Scene

Continually reassess the situation for new dangers that may arise. For example, a building or structure that seemed stable when you arrived may begin to crumble or become unstable. True scene safety and control is a continuous, not an initial, process. Ensure a responder has been assigned to serve as a safety officer to focus on overall scene safety. If resources allow, this responder should have no other task than ensuring scene safety.

Personal Safety

Of your primary responsibilities, safety should always be foremost. You should always ensure your own safety. When you arrive on the scene, your first priority is to determine your own personal safety needs. The only safe scene is one that does not represent a threat to you or to the response team. A cornerstone of personal safety is the use of appropriate PPE.

Approach all emergency scenes cautiously until you can size up the situation. If you arrive at the scene by vehicle, park a safe distance away. If the scene appears safe, continue to evaluate the situation as you approach (Fig. 6-2).

Fig. 6-2: Continue to evaluate the scene as you approach for the extent of the emergency, apparent danger, and number and behavior of patients and bystanders.

CRITICAL FACTS

Once you determine the scene is safe, approach and continue to evaluate the scene. Evaluation should include location and extent of the emergency, scene dangers, number of patients, and behavior of patients and bystanders.

To ensure the safety of all involved, always evaluate the scene, wear PPE, call for additional personnel if needed and only treat within the scope of your training.

Pay particular attention to the:

- Location of the emergency.
- Extent of the emergency.
- Apparent scene dangers.
- Apparent number of injured or ill people.
- Behavior of the patient(s) and any bystanders.

If at any time the scene appears unsafe, move to a safe distance. Notify additional personnel and wait for their arrival. Never enter a dangerous scene unless you have the training and equipment to do so safely. Well-meaning responders have been injured or killed because they forgot to watch for hazards. If your training has not prepared you for a specific emergency, such as a fire or an incident involving HAZMAT, notify appropriate personnel.

When arriving at an emergency scene, always follow these four guidelines to ensure your personal safety and that of bystanders:

1. Take time to evaluate the scene. Doing so will enable you to recognize existing and potential dangers.
2. Wear appropriate PPE for the situation. Be a constant advocate for the use of appropriate protective equipment.
3. *Do not* attempt to do anything you are not trained to do. Know what resources are available to help.
4. Get the help you need by notifying additional personnel. Be prepared to describe the scene and the type of additional help you require.

Another important aspect of personal safety is protecting yourself from exposure to infectious diseases. This is especially important if you are providing care for a patient when blood and other potentially infectious materials (OPIM) may be present. Since it is impossible to know if a patient may be infected or not, you should always take protective measures. These protective measures are discussed in detail in Chapter 2.

Personal Protective Equipment

Standard Precautions Overview

PPE is an important component of standard precautions, which are based on the principle that all blood and OPIM such as body fluids, secretions, excretions (except sweat), nonintact skin and mucous membranes may contain transmissible infectious agents. Standard precautions include a group of infection prevention practices that apply to all patients, regardless of suspected or confirmed infection status, in any healthcare delivery setting. They are based on universal precautions, which were developed for protection of healthcare personnel. Standard precautions focus on protection of responders and patients.

Implementation of Standard Precautions

The extent of standard precautions used is determined by the anticipated blood and OPIM exposure, and includes the use of:

- Hand washing. Keeping hands clean is one of the best ways to keep from getting sick and spreading illnesses.
- Gloves. Disposable latex-free gloves should be worn whenever you touch or are in contact with a patient. Gloves are essential for any rescue situation.
- Gowns. A gown may provide further protection from blood and OPIM that could otherwise be splashed onto your clothing or skin.
- Masks. Masks block blood and OPIM, including airborne droplets, from reaching your face; most germs and viruses can enter the body easily through the mouth or nose.
- Protective eyewear. In hazardous situations, these protect your eyes from debris and heat as well as blood and OPIM.
- CPR breathing barriers (e.g., resuscitation masks and bag-valve-mask [BVM] resuscitators). Use when providing ventilations to the patient is necessary.

Personal Protective Equipment

PPE includes clothing or specialized equipment that provide some protection to the wearer from substances that may pose a health or safety risk. Use the appropriate PPE, such as steel-toe boots, helmets, heat-resistant outerwear, self-contained breathing apparatus and leather gloves, that is specific to the potential hazard (Fig. 6-3).

Specialized protective equipment and gear are designed to protect appropriately trained responders, and include items such as:

- Chemical and biological suits.
- Specialized rescue equipment for difficult or complicated extrications.
- Ascent or descent gear for specialized rescue situations.

In addition to using appropriate PPE, do not forget the role that frequent hand washing or use of hand sanitizers play to keep you—and those around you—safe, by reducing the spread of germs.

Fig. 6-3: Protect yourself from substances that may be harmful or contaminated by using appropriate PPE specific to the potential hazard.

Safety of Others

You have a responsibility for the safety of others at the scene, as well as for your own personal safety. Discourage bystanders, family members or other responders from entering an area that appears unsafe. You can ask well-intentioned individuals to help you keep unauthorized people away from unsafe areas and summon more appropriate help. Some dangers may require you to take special measures, such as placing physical barriers to prevent onlookers from getting too close. Other situations may require you to act quickly to free someone who is trapped or to move a patient in immediate danger.

Patient Safety

Once you are confident of your own safety and the safety of the general scene, turn to the safety of the patient. As you approach the patient, continue to scan the area for possible dangers. Do not move a patient unless there is an immediate danger.

Ideally, you should move patients only after you have assessed and properly cared for them. If the patient does not seem to be seriously injured, and the area is dangerous, you can ask the patient to move to safety where you can provide care. If, however, immediate dangers threaten a patient's life, you must decide whether to move the person. If the area is dangerous and the patient is not able to move, move the patient as quickly and safely as possible without making the injuries or illness worse. If the situation is so dangerous that you cannot reach or move the patient, move to safety yourself and call for additional assistance. If there is no immediate danger, tell the patient not to move.

Situations that may require an emergency move include:

- The presence of explosives or other HAZMATs that present an immediate danger (such as a natural gas or gasoline/fuel leak or fire).
- The inability to make the scene safe (such as a structure about to collapse).
- The need to get to other patients who have a more serious problem to provide the appropriate care.
- When it is necessary to provide appropriate care (such as moving a patient to the top or bottom of a flight of stairs to perform CPR).

Chapter 5 provides more detailed information on how to safely move injured or ill patients.

Bystander Safety

Look for bystanders who are in potential danger at the scene. You may be able to take steps to reduce the danger, but if not, tell them to move to safety.

If the scene is safe and you need help, look for bystanders who may be able to assist you. They may be able to tell you what happened or how many people were involved, or they may help in other ways. A bystander who knows a patient may know whether there are any medical conditions or allergies you should be aware of. Bystanders can meet and direct an ambulance to your location, help keep the area free of unnecessary traffic and even help you provide care if it is appropriate.

Number of Patients

Another important aspect when you are sizing up the scene is the number of patients at the scene. Often this is quick and easy to determine. But in some cases—for example, a multiple-vehicle crash or a significant explosion—it can be quite challenging. Patients may be trapped inside motor vehicles or may have been forcefully ejected from their vehicles and away from the immediate scene. An open door provides a clue that a patient has left the vehicle or was thrown from it. If one patient is bleeding or screaming loudly, you may overlook another patient who is unconscious. It is also easy in any emergency situation to overlook a small child or an infant if they are not crying. Accounting for the number of patients who require care is also important for determining the number of ambulances needed.

If it appears that there are more patients than you and the others with you can care for, call for additional help immediately. If you start helping the patients right away, you are likely to forget to make the call. Once you have called for additional help, you can quickly assess the patients to determine which ones you will begin caring for first.

MECHANISM OF INJURY AND NATURE OF ILLNESS

Once you are able to work safely with the patient, observe the scene and the patient to gather information about what has happened and the mechanism of injury or nature of illness. As you gain experience, you will be able to arrive at a scene and quickly scan the area to make a rough determination of the injuries or illnesses you can expect to be dealing with.

Mechanism of Injury

Mechanism of injury (MOI) refers to the physical events that caused the injury. It is important to determine MOI because it can alert responders to possible hidden or more serious injuries that may not be immediately visible. Some of the most common MOIs an EMR will encounter are vehicle crashes, blunt trauma, falls and penetrating trauma.

Vehicle Crashes

The science of the energy of motion (kinetics), and the resulting damage to the human body (trauma), is called the ***kinematics of trauma***. Nowhere is the kinematics of trauma more apparent than in motor-vehicle crashes, which demonstrate all too vividly the effects of speed and rapid changes in speed (acceleration and deceleration) on the human body. When a car crashes into another vehicle or an object such as a tree, the people inside will continue moving at the same speed the car was traveling until something stops them. That "something" may be a seat belt, a car seat harness, the steering wheel, dashboard or air bag. Even when the person's body collides with the steering wheel, the person's internal organs continue to move until they are stopped by the body's framework—such as the ribs or skull. In a sense, there are *three* separate events, or collisions: first, the car hits another vehicle or an object and its forward motion is stopped; second, the person hits the interior of the car and stops; and finally the person's internal organs hit the skeleton or muscular framework of the body and stop (Fig. 6-4, A–C).

Just as the first collision can cause both obvious damage to the car—the crumpled fender—and hidden damage—the leaking radiator—so the last two collisions can cause both visible and invisible damage to the people in the vehicle. The extent of the damage will depend in part on the speed and weight of the vehicles and the kinetic energy of motion that is absorbed.

CRITICAL FACTS

Common MOIs include motor-vehicle crashes, falls, and blunt or penetrating trauma.

Motor-vehicle collisions clearly demonstrate the impact that the energy of motion has to cause damage to the human body. This is referred to as the kinematics of trauma.

Fig. 6-4, A–C: The kinematics of trauma are apparent in motor-vehicle crashes. **(A)** The car hits another vehicle or an object and its forward motion is stopped. **(B)** The person hits the interior of the car and is stopped. **(C)** The person's internal organs hit the skeleton or muscular framework of the body and stop.

The wreckage of cars, aircraft or machinery may contain hazards such as sharp pieces of metal or glass, fuel and moving parts. Therefore, do not try to rescue someone from wreckage unless you have the proper training and equipment, such as turnout (or "bunker") gear, safety glasses, gloves and a helmet. Specialized rescue teams can be called in for extensive or heavy rescue. Care for the patient is provided only after the wreckage has been stabilized. Gather as much information as you can, and make sure more advanced medical personnel have been called.

There are five types of motor-vehicle crashes, and each yields a different possible pattern of injuries: head-on, rear-end, side impact, rotational impact and rollover.

Head-On Crash

In a head-on crash, the driver will keep moving when the vehicle stops, and either will be thrown upward against the steering wheel and windshield, or downward under the steering wheel. In some cases, the driver may actually be thrown partially or completely through the windshield. If you see damage to the dashboard and windshield, you should anticipate that the driver may have abdominal, chest and head injuries. These can include abdominal injuries to the liver and spleen; serious chest injuries, such as fractured ribs, ruptured lungs and torn arteries; and head injuries including facial injuries. Keep in mind that the person's neck and brain may also be injured, and this sometimes happens without any bleeding or bruising on the face (Fig. 6-5).

Rear-End Crash

In a rear-end collision, the rear vehicle pushes the vehicle in the front forward. The driver and any passengers will feel their heads and necks whipped back at first, and then they will be jolted forward as the car stops. The backward motion of the head and neck often leads to a strained neck, or what is often called a whiplash injury. After this sudden acceleration, the car will usually come to an abrupt stop because of the damage to the vehicle. This sudden stopping may cause injuries

Fig. 6-5: A head-on car crash. *Photo: courtesy of Captain Phil Kleinberg, EMT-P.*

similar to those in a head-on crash. Typically, these crashes cause the brain to move backward, hitting the rear of the skull, and then forward, striking the front of the skull as the vehicle comes to a stop. A well-positioned headrest in a vehicle can often prevent these types of injuries.

Side Impact

If a vehicle hits the side of another car, the door and frame of the car can be pushed into the bodies of the driver and passengers. There may be injuries to any parts of the person's body, especially if the crash was forceful enough to crush the side of the car. If the person was not wearing a seat belt, the person may have been thrown against other passengers or against the far side of the car, so injuries can be found on both sides of the body.

Rotational Impact

Rotational impact occurs when the vehicle is thrown off center. It is the result of the vehicle striking an object and rotating around it. This can cause a variety of injury patterns, usually due to the person being struck by stationary objects inside the vehicle, such as the steering wheel, doorposts, windows or dashboard.

Rollover

When a car rolls over, the driver and/or passenger(s) inside experiences a series of impacts (Fig. 6-6). Each time the car starts to turn, the person is thrown in a new direction, possibly colliding with the door, the steering wheel, the roof of the car and any passengers. Injuries to many parts of the body are possible. If the person was not wearing a seat belt, the person may be ejected from the car through an open or broken window or door. This puts the person at greater risk, because the car may roll onto them. If the crash takes place on a road, the person may be ejected in front of oncoming traffic. Responders should check around the scene in case there are other people who have been ejected. Sometimes these individuals can land at some distance from the car. They may also be under the car.

Unstable Vehicles

Any movement of the vehicle during patient care or extrication can prove dangerous or even deadly to patients with severe injuries, or could result in injury to rescue personnel. Local fire department and rescue squad personnel specially trained in vehicle stabilization and extrication will respond to the scene when notified.

To make the rescue setting as safe as possible, it is important to ensure the vehicle is stable. You can assume a vehicle is unstable if it is:

- Positioned on a tilted surface.
- Stacked on top of another vehicle, even partly.
- Positioned on a slippery surface.
- Overturned or on its side.

Fig. 6-6: A rollover crash. *Photo: courtesy of Captain Phil Kleinberg, EMT-P.*

Vehicles must be stabilized in order to attempt to remove a patient. Placing blocks or wedges against the wheels of the vehicle will greatly reduce the chance of the vehicle moving. This process is called ***chocking***. You can use items such as rocks, logs, wooden blocks and spare tires. If a strong rope or chain is available, it can be attached to the frame of the vehicle and then secured to strong anchor points, such as large trees, guardrails or another vehicle. Letting the air out of the vehicle's tires also reduces the possibility of movement. For further details on how to stabilize a vehicle, see Chapter 28.

Seat Belts and Air Bags

In all types of motor-vehicle crashes, the benefits of seat belts and air bags far outweigh the risks, but there are also possible injuries associated with them.

If the lap belt is fastened too low on the person's body, across the base of the pelvis, it can dislocate the hips. If it is fastened too high, it can cause injury to the abdomen. Worn without a shoulder strap, a lap belt will keep the person from being ejected from the car but still allows a person's head to strike the dashboard; a back-seat passenger can also strike the back of the front seat as a result of lap belt-only usage. A shoulder strap prevents these injuries but can cause injuries to the shoulder, chest and abdomen.

Air bags may be in the front of the car only, or may be in the door panels, roof rails and the side of seat backs. They are designed to inflate very rapidly just before the initial impact and then deflate again just as quickly. Because they deflate so quickly, they may not stop all forward motion of the driver's head and chest, so it is important to check to see if the driver also hit the steering wheel. If the steering wheel is damaged, the driver may have serious abdominal or chest injuries, even if the air bag was activated. Be sure to lift the air bag to examine the steering wheel for evidence of damage. Air bags can also cause injuries to the head, face, eyes, spine and arms, especially if the person is less than 5'2" tall. These injuries can prove fatal.

In some collisions, the air bag is not deployed and may present a hazard during extrication. If the patient is pinned directly behind an undeployed air bag, both of the vehicle's battery cables should be disconnected following established safety protocols. Ideally, the system should be deactivated before any attempts are made to extricate the patient. Do not mechanically cut through or

CRITICAL FACTS

A vehicle is unstable when it is on a tilted or slippery surface, atop another vehicle, overturned or on its side.

displace the steering column until the system has been deactivated. The air bag module should not be cut or drilled into. Also, heat should not be applied to the area of the steering wheel hub; an undeployed air bag inflates in a normal manner if the chemicals sealed inside reach a temperature above 350° F or 177° C. For further details on an undeployed air bag, see Chapter 28.

Additional Hazards

Other hazards at a motor-vehicle crash include fire, leaking fluids, downed power lines and special considerations for alternative-fueled vehicles, such as hybrid and electric vehicles. For further details on alternative-fueled vehicles, see Chapter 28.

Motorcycle Crashes

Motorcycle riders do not have the protection of a vehicle body around them, so in a crash situation they are at particular risk for severe injuries. Motorcycle crashes may result in head-on impact, angular impact, ejection from the motorcycle or injury from "laying the bike down" (sliding down on one side of the bike).

If a crash is head-on, the sudden deceleration causes the rider to be thrown into or over the handlebars. Hitting the handlebars may cause injuries to the chest, abdomen or legs, depending on the rider's position. If the person is completely ejected from the bike, there may be internal injuries and head, neck, back and extremity injuries. Without a helmet, the rider is more likely to have serious or fatal head injuries.

Often when motorcycles crash, it is because the bike and rider come in contact with a protruding object, such as a tree branch, road sign or fence post, or another vehicle and often at high speeds. The rider may be injured by the object and then suffer further injuries as the bike falls or slides.

When a motorcycle rider realizes that a crash is likely, the rider may try to slow down the bike and reduce the risk by deliberately laying the bike down on its side, placing a leg between the bike and the road. This leads to injuries to the soft tissues of the leg, which can go quite deep, depending partly on what protective clothing the rider is wearing. If the lower leg is trapped against the exhaust pipe or engine, the patient can also have serious burns.

Recreational Vehicle Crashes

Since all-terrain vehicles (ATVs) are frequently ridden off-road or on uneven ground and are not very stable, they are prone to tipping over. In an ATV crash, expect to see injuries similar to those seen in motorcycle crashes. The rider is often ejected from the vehicle and the ATV may roll over onto the rider.

Snowmobile riders involved in a crash often experience serious head and neck injuries, and the snowmobile may roll over onto the rider. Winter weather may make it difficult for the rider to see protruding objects or wires and this can lead to collisions and injuries.

Blunt Injuries

When someone is struck by or falls against a blunt object—one with no sharp edges or points—the resulting injuries are often closed wounds. This type of wound is known as a blunt injury or ***blunt trauma***. This means that although the soft tissues of skin, muscle, nerves and blood vessels may be damaged, the skin is not broken and there is no visible bleeding. The patient may look unharmed, but there may be serious, even fatal, injuries to the internal organs as well as significant internal bleeding. The extent of the injuries may not be immediately visible and may only appear after a period of time. The injuries may also be more extensive than they appear.

The responder should look for:

- Contusions or bruises—Swelling, discoloration and pain where the person was hit.
- ***Hematoma***—A large, bluish lump formed by blood collecting under the skin (Fig. 6-7).

Small- or medium-sized contusions need to only have cold packs applied. Larger contusions and bruising or hematomas may indicate that there are more serious hidden injuries. It is also important to check

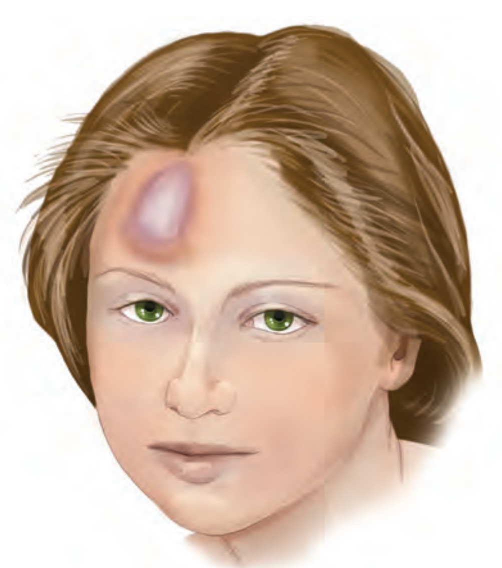


Fig. 6-7: A hematoma may indicate more serious hidden injuries.

for possible bone fractures, especially if there is a lot of swelling or pain or if the body part is deformed.

Falls

Falls are another common cause of injury. The severity of the injuries caused by a fall is determined by:

- The distance the patient fell (the speed of the fall increases when the person falls from a greater height).
- The surface the patient landed on (a soft, yielding surface will reduce the injuries).
- Any objects in the way that might have slowed the fall or, on the other hand, injured the patient during the fall.
- The position of the patient's body on landing.

If the patient falls from a height of more than 15 feet onto a hard surface, injuries may be severe, even if the patient looks unharmed at first glance. You may discover fractured bones in the feet, ankles, legs, pelvis and spine. In falls from a greater height, the patient may also have damage to internal organs.

It is a natural reflex to throw out your hands when you are falling. When a fall involves the hands hitting the ground, the person's wrists may be fractured and, if the person falls from a great enough height, there also might be a fracture or injury to the elbow and shoulder.

A person falling headfirst usually throws out the arms, so injuries or fractures in the arms and shoulders are typical. The head may be pushed forward or backward on landing, or may be pressed down by the person's body, and any of these can cause serious injury to the head and spine. The rest of the body will then hit the ground, and injuries to the chest and pelvis can happen during this phase of the fall.

Penetrating Injuries

A ***penetrating injury*** occurs when the patient is hit by or falls onto something that can penetrate or cut through the skin. This will cause an open wound (or wounds, as there may be both an entrance and exit wound) and bleeding.

The path of the projectile through the body usually determines the severity of the injury. For example, if a knife or bullet does not damage any internal organs or major blood vessels, the resulting injuries may be fairly minor, but a stabbing or shotgun blast that hits the heart or lungs or severs an artery can quickly lead to a fatality.

In addition to the path of the object, the speed with which the projectile travels through the body is also a determining factor: the faster the object is moving, the more widespread the damage done. If the patient falls onto something sharp, or is stabbed with a knife or another object, this is termed a low-velocity penetrating trauma. If the weapon or object used is available at the scene, it can provide some hints as to the extent of the injuries. A knife, for example, only harms the tissues it actually contacts, so knowing how long the knife is will indicate how deep the injuries may be. Knowing the angle of penetration will also give you clues about possible injuries.

Because it hits the body at greater speed, a bullet or pellet fired from a handgun, rifle or shotgun will cause damage to the body well beyond its actual pathway through the body. This is because it carries with it a wave of pressure that compresses tissues around it as it speeds through the body (Fig. 6-8, A–B). Always check for a possible exit wound, which may be larger than the entrance wound, because this helps to determine the bullet's pathway through the body. The most serious, and most often fatal, gunshots are to the head, chest and abdomen. While bullets that hit the arms and legs are less likely to be quickly fatal, they can cause severe bleeding and permanent damage to the limbs. Keep in mind that a small entrance hole, which may not bleed very much, may hide dramatic and serious internal injuries.

Blast Injuries

Another type of injury is a ***blast injury***, which is caused by an explosion. There are three phases to an explosion and, therefore, three possible MOIs from it (Fig. 6-9, A–C):

- In the primary phase, the energy released during the explosion sends a wave of pressure expanding outward from the center of the blast. Individuals hit by this pressure can experience injury to any body part that is air-filled, especially the lungs, stomach, intestines and inner ears. In some cases, this can be fatal, even though the person may show no external injuries.
- In the secondary phase, the debris around the center of the blast is blown outward and can cause injury when it strikes the person—often with considerable speed and force. These blunt or penetrating injuries will generally be visible and easily recognized. If some of the debris is on fire, the person may be burned.
- In the tertiary phase, the person is knocked to the ground or against a wall or other objects by the force of the explosion. Depending on how far

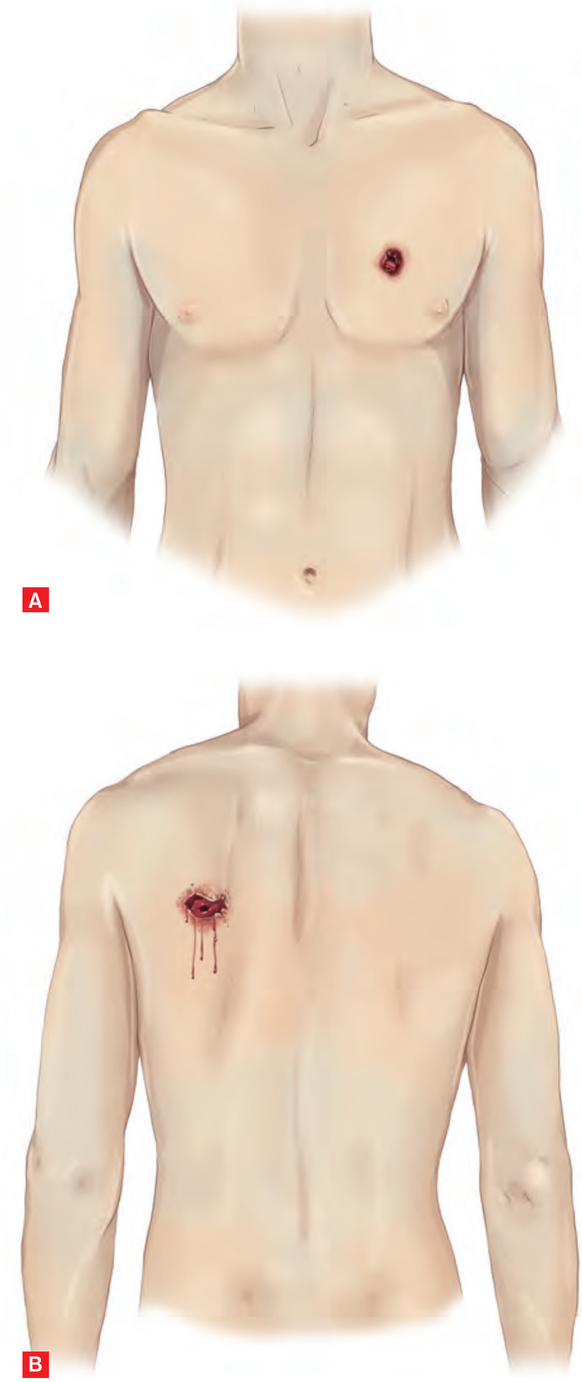


Fig. 6-8, A–B: For a penetrating injury, always check for **(A)** an entrance wound and **(B)** a possible exit wound.

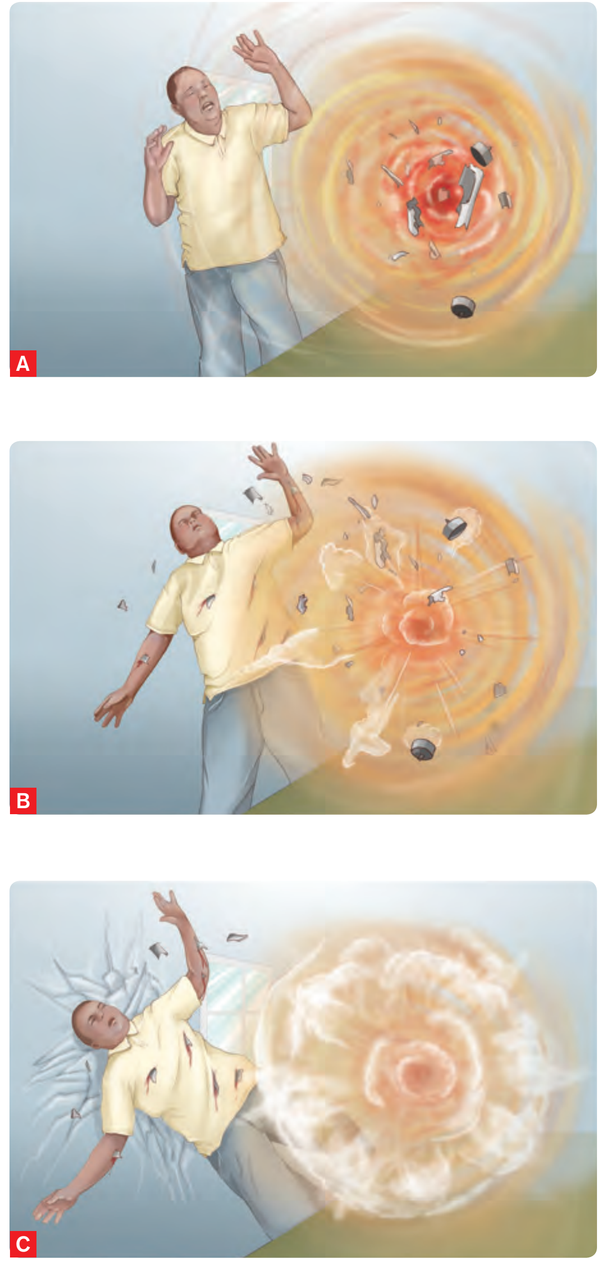


Fig. 6-9, A–C: There are three phases of a blast injury. **(A)** Primary phase: Energy sends a wave of pressure expanding outward from the center of the blast. **(B)** Secondary phase: Debris around the center of the blast blows outward, causing blunt or penetrating injuries and sometimes burns. **(C)** Tertiary phase: Force of the explosion knocks a person to the ground, against a wall or into other objects.

away the person is, and how large the explosion, the injuries may be similar to those sustained by someone ejected during a car crash.

Nature of Illness

In some situations, you may be called to a scene because a person is ill. Or, if you are called to an emergency and there is no evidence of trauma, but the patient has signs and symptoms of a problem, you may suspect an illness or a medical condition. Recognizing the ***nature of illness*** helps you to plan the steps to provide immediate care.

A conscious patient may be able to describe the symptoms, or there may be obvious signs (e.g., labored breathing, vomiting). If the patient is unable to speak, ask any bystanders or family what they have observed about the patient, and about any pre-existing conditions.

Fig. 6-10: The tropod position.

Determining the nature of illness can be made more difficult if the patient or others do not tell the truth. If a person overdosed on drugs, for example, the family may deny knowing what caused the problem and may lie about drug use if you ask about it directly. It is important to scan the scene for items that may provide clues about the problem. Look for prescription and nonprescription medications, evidence of alcohol or recreational drug use, and medical equipment in regular use.

Consider the patient's location and environment as well. For example, has the patient been in the woods or long grass? Then you might need to examine the patient for snake or spider bites. Is the weather extremely hot and humid? Heat stroke or other heat-related illnesses are a possibility.

Simply observing the patient can also tell you a great deal. Patients with chest pain or breathing problems often lean forward while sitting in what

Fig. 6-11: Patients with abdominal pain might pull the knees in toward the chest.

is called the ***tripod position*** (Fig. 6-10). Patients with abdominal pain often pull their knees up toward their chest, either lying down or sitting with their back against a hard surface (Fig. 6-11). Loss of bladder or bowel control can indicate that the patient has had a stroke or a seizure.

Any observations should be recorded, as they not only help you evaluate the situation, but may help the healthcare provider who will see the patient in an entirely different environment.

ADDITIONAL RESOURCES

Once you have sized up the scene and determined the mechanism of injury or nature of illness, you will be able to decide what additional resources are needed to keep you and the patient safe or to provide care. The number of resources will depend on any hazards at the scene, the number of injured or ill persons, as well as the nature of injuries or illnesses.

Chemical and biological suits can provide protection against HAZMATs and biological threats of varying degrees. Specialized rescue equipment may be necessary for difficult or complicated extrications.

Calling for Additional Resources

You may need to call for:

- Advanced life support (ALS), to provide a higher level of care for patients with a severe illness or trauma.

CRITICAL FACTS

You may be called to a scene because a person is ill and there is no evidence of trauma. Recognizing the nature of illness helps you to plan the steps to provide immediate care.

- Air medical transport (e.g., helicopter), to provide the fastest transport to the appropriate hospital or trauma center.
- Utilities (e.g., power/gas company), to assess, turn off or isolate dangerous downed power lines or leaking pipes.
- Fire department, to contain or extinguish fires from any source.
- Law enforcement, to direct or reroute traffic, or to maintain control with any potentially violent bystanders, patients or perpetrators.

Hazardous Materials

HAZMATs are any chemical substances or materials that can pose a threat to the health, safety and property of an individual. Any HAZMAT poses a special risk for responding personnel. When you approach an emergency scene, look for clues that indicate the presence of HAZMATs. These include:

- Signs (placards) on vehicles, storage facilities or railroad cars identifying the presence of hazardous materials.
- Clouds of vapor.
- Spilled liquids or solids.
- Unusual odors.
- Leaking containers, bottles or gas cylinders.
- Chemical transport tanks or containers.

Those who transport or store HAZMATS in specific quantities are required by the U.S. Department of Transportation to post placards identifying the specific hazardous material, by name or number, and its specific dangers.

In order to identify the material, it is helpful to have binoculars on hand. Binoculars allow you to view the scene from a safe distance. If you do not see a placard but suspect a HAZMAT is present, try to get information before you approach the scene. Do not approach a HAZMAT scene unless you are trained to do so and have appropriate PPE such as a self-contained breathing apparatus (SCBA) and chemical protective suit.

If you find clues that there may be HAZMATs on the scene:

- Notify dispatch so that the appropriate personnel may be brought to the scene.
- Do not approach the scene.
- Remain uphill and upwind a safe distance from the scene (Table 6-1).
- Await specialized resources.

For more information on HAZMAT emergencies, including training and guides that are available, refer to Chapter 29.

Violence

Violence can take place in a wide variety of settings, but certain factors make it much more likely to occur. These include scenes of domestic violence, fights in bars, gang fights, street fights, potential suicide, or any situation where angry bystanders or family members are present. At scenes where there has been arguing, fighting or threats, the potential for violence is increased. Look for anything that indicates violence has taken place, such as broken glass, overturned furniture, weapons, or alcohol or drug use. The risk of violence may be increased in situations where there is yelling, swearing, threatening, pacing, or when a person is using clenched fists or throwing objects. There may be other signs of tension, for example an awkward silence in a situation where you expect a lot of activity and noise. You may also discover a history of aggressive behavior, which increases the risk of violence.

There are times when restraining a patient may be necessary, to ensure the safety of the patient, yourself and bystanders. Restraint should be used as a last resort, however, and must be carried out only after consultation with law enforcement and medical direction. Use only as much force as is necessary to restrain the patient, and always follow local protocols. Always keep your personal safety in mind when restraining patients. For further information on the use of restraint, refer to Chapter 5.

If you arrive at the scene of violence or a crime, do not try to reach any patient until you are sure the scene is safe. Someone who has been shot, stabbed or sustained other injuries from violence may have severe injuries but, until the scene is safe,

CRITICAL FACTS

Once you have sized up the scene and determined the mechanism of injury or nature of illness, you will be able to decide what additional resources are needed to keep you and the patient safe or to provide care. The number of resources will depend on any hazards at the scene, the number of injured or ill persons, as well as the nature of injuries or illnesses.

there is nothing you can do to provide care. For the scene to be safe, law enforcement personnel must make it secure. Wait for law enforcement to arrive and secure the scene before attempting to provide care unless you are part of a team working under specific protocols with responding law enforcement agencies.

Police usually gather evidence at a crime scene, so do not touch anything except what you must to provide care. Once law enforcement secures the crime scene and allows you to enter to provide care, make sure that they are aware of your presence and actions. Always have and use appropriate PPE.

Table 6-1:
Responding to Specific Emergency Situations

SITUATION	APPROPRIATE BEHAVIOR
Hazardous materials	If you suspect hazardous materials, stay a safe distance away, upwind and uphill. Do not create sparks. Notify dispatch immediately.
Motor-vehicle crashes	Do not attempt a rescue until wreckage has been stabilized.

Domestic Violence

Domestic violence situations are among the most potentially dangerous scenes you may encounter as an emergency medical responder (EMR). Domestic violence crosses all boundaries, affecting people of all ages, races, education, socioeconomic classes and sexual orientations. However, there are certain circumstances that may indicate that domestic violence may be a factor. Any of the following conditions should lead you to suspect domestic violence and respond accordingly:

- The injured person will not admit to being abused.
- The injuries sustained do not fit the history, and the patient seems to be ashamed or embarrassed about the injuries.
- You observe injuries that involve contusions and lacerations of the face, head, neck, breasts and abdomen.
- The suspected perpetrator of the violence is unwilling to allow the injured person to give a history or be alone with emergency medical services (EMS) personnel.
- There are excessive delays between the injury and seeking treatment.
- The patient repeatedly uses EMS services.
- The injuries occur during pregnancy.
- Substance abuse is involved.
- There are frequent suicide gestures.

Law enforcement agencies generally send two officers to answer domestic disturbances, to reduce the potential of danger. EMRs should take a similar approach to domestic disturbances, with heightened awareness to all possible clues. For example, the calling party denies calling EMS personnel when you arrive at the door. This may be a clue that should lead you to suspect potential danger and heighten your awareness when responding to the scene.

If law enforcement has not been called, call them right away and do not approach until the police arrive and secure the scene. Your personal safety always outweighs the need to respond.

Once inside, your awareness must continue. While the police may have already secured the scene, it is appropriate for you to do so also; visually check everyone for weapons. Determine who is in the residence and where they are. Once identified, any bystanders should be asked to leave. Do not allow residents to get between you and an exit route, and do not let yourself be backed into a corner. Know where your team members are at all times and ensure that they are equally aware of what else is going on. Look at body cues such as clenched fists, flared nostrils and flushed cheeks. If there are weapons present, ask law enforcement to intervene.

Remember that while you were originally called to help, your presence, along with that of law enforcement, may change the dynamics of the scene.

Stay calm. Take your time and take nothing for granted. Assume control of the situation slowly. Introduce yourself, speaking directly to the patient. Explain what you are doing. Ask open-ended questions, allowing the patient to talk. Restore control to the patient. Do not be judgmental. If you can, separate yourself and the patient from the suspected perpetrator.

PUTTING IT ALL TOGETHER

Use the information you received from the dispatcher to begin your planning, but remember that it may be inaccurate or outdated. Make sure you have whatever protective equipment you will need available. Your first priority is your own safety, so look first for any hazards that might put you at risk.

After your own safety, your next priority is to keep patients and bystanders safe. This may mean redirecting traffic or preventing people from intruding on the scene. In some cases, it may mean moving the patient. A safe scene may change to a dangerous one quickly. As you care for the patient, be aware of your surroundings and be prepared to take any necessary steps to ensure your safety.

Analyze the scene to determine the number and locations of patients and also the MOI or nature of illness. Then create a plan to provide appropriate care. If your assessment tells you that you will need help, call the appropriate personnel before beginning to provide care for the patient.

You Are the Emergency Medical Responder

You have taken the proper precautions to make it safe for you to enter the scene and begin assessing and providing care for carbon monoxide poisoning. What if the mother and children lived in a place other than a single-family home? What additional considerations or actions might there be?

ENRICHMENT

Dealing with Hazards at the Scene

In addition to the specific emergency situations already discussed, other hazardous scenes require special consideration (Table 6-2). Remember to always expect the unexpected and make sure the scene is safe before entering. If it is not, notify the necessary agencies to do what is necessary to provide you with a safe working environment.

Traffic

Traffic is often the most common danger you and other emergency personnel will encounter. If you drive to a collision scene, always try to park where your vehicle will not block other emergency vehicle traffic, such as an ambulance that needs to reach the scene. The only time you should park in a roadway or block traffic is:

- To protect an injured person.
- To protect any responders, including yourself.
- To warn oncoming traffic, if the situation is not clearly visible.

Others can help you put reflectors, traffic cones, flares or lights along the road. These items should be placed well back from the scene to enable oncoming motorists to stop or slow down in time (Fig. 6-12).

Table 6-2:
Additional Emergency Situations

SITUATION	APPROPRIATE BEHAVIOR
Traffic	Leave a path for arriving emergency vehicles. Put up reflectors, traffic cones, flares or lights to direct dangerous traffic away from the scene.
Fire	Never approach a burning vehicle or enter a burning building without proper equipment and training. If in a burning building, do not open hot doors or use elevators, and stay close to the floor.
Electricity	Assume all downed wires are dangerous. Do not attempt to move them. Do not touch any metal fence, metal structure or body of water in contact with a wire. Notify the fire department and power company immediately.
Water and ice	Follow the rule of reach, throw, row then go. Never enter water or go on ice unless you are trained to do so and have proper rescue equipment.
Unsafe structures	Do not enter structures that you suspect are unsafe. Call for trained and equipped personnel. Gather as much information as possible about the victim(s).
Natural disasters	Report to the incident commander in charge (incident commanders are covered in Chapter 30). Follow the rescue plan and standard operating procedures. Avoid obvious hazards and be cautious when using equipment.
Multiple patients	Report to the incident commander in charge. Care for patients with the most life-threatening conditions first.
Hostile situations	If the victim or bystanders threaten you, retreat to safety. Never try to restrain, argue with or force care on a victim. Summon law enforcement personnel.
Suicide	Do not enter until summoned by law enforcement personnel. Do not touch anything except what you must to provide care.
Hostage situations	Do not enter until summoned and cleared by law enforcement personnel. Gather as much information as possible about the victims.

ENRICHMENT

Dealing with Hazards at the Scene *CONTINUED*

Fig. 6-12: You may have to control traffic to maintain a safe scene if the emergency occurs on or near a roadway.

Emergency personnel are sometimes injured or killed by traffic at emergency scenes. In fact, hazards on the roadway are the number-one cause of death among EMS workers. If you are not a law enforcement officer, and dangerous traffic makes the scene unsafe, wait for more help to arrive before providing care.

There are several important reasons to control traffic at the scene: to protect the crash scene from further potential collisions, prevent injury to the rescue team, ensure minimal disruption and allow emergency vehicles to reach the scene. On arrival, request the assistance of additional law enforcement and fire services to help control the scene.

Fire

Any fire can be dangerous. Make sure the local fire department has been summoned. Only firefighters, who are highly trained and properly equipped against fire and smoke, should approach a fire. Do not let others approach. Gather information to help the responding fire and EMS units. Find out the possible number of people trapped, their location, the fire's cause, and whether any explosives or chemicals are present. Give this information to emergency personnel when they arrive. If you are not trained to fight fires or lack the necessary equipment, follow these basic guidelines:

- Do not approach a burning vehicle.
- Never enter a burning or smoke-filled building.

CRITICAL FACTS

Hazards on the roadway are the number-one cause of death among EMS workers.

Continued on next page

ENRICHMENT

Dealing with Hazards at the Scene *CONTINUED*

- If you are in a building that is on fire, always check doors before opening them with the back of your hand. If a door is hot to the touch, do not open it.
- Avoid smoke and fumes by staying close to the floor.
- Never use an elevator in a building that may be burning.

Downed Electrical Lines

Downed electrical lines also present a major hazard to responders. Always look for downed wires at a scene, and always treat them as dangerous. If you find downed wires, follow these guidelines:

- Move the crowd back from the danger zone. The safe area should be established at a point twice the length of the span of the wire (i.e., the distance between the poles).
- Never attempt to move downed wires.
- Notify the fire department and the power company immediately. Always assume that downed wires are energized, or live. Even if they are not energized at first, they may become energized later.
- If downed wires are in contact with a vehicle, do not touch the vehicle and do not let others touch it. Tell anyone in the vehicle to stay still and stay inside the vehicle. Never attempt to remove people from a vehicle with downed wires across it, no matter how seriously injured they may seem.
- Do not touch any metal fence, metal structure or body of water in contact with a downed wire. Wait for the power company to shut off the power source.

Water and Ice

Water and ice also can be serious hazards. To help a conscious person in the water, always follow the basic rule of "reach, throw, row then go." You may reach out to someone in trouble with a branch, a pole or even your hand, being careful not to be pulled into the water. When the person grasps the object, lean back and pull the person to safety.

If you cannot reach the person, try to throw the person something nearby that floats. If you have a rope available, attach an object that floats to one end, such as a life jacket, plastic jug, ice chest or empty gas can. Never enter a body of water to rescue someone unless you have been trained in water rescue, and then only as a last resort. If possible, you can use a boat to get closer (row), but not close enough that the patient can grab the side of the boat and tip it. The "go" part of this technique is only for those who can perform deep-water rescue.

Fast-moving water is extremely dangerous and often occurs with floods, hurricanes and low head dams. Ice is also treacherous. It can break under your weight, and the cold water beneath can quickly overcome even the best swimmers. Never enter fast-moving water or venture out on ice unless you are trained in this type of rescue. Such rescues require careful planning and proper equipment. Wait until trained personnel arrive.

Unsafe Structures

Buildings and other structures, such as mines, wells and unreinforced trenches, can become unsafe because of fire, explosions, natural disasters, deterioration or other causes. An unsafe building or structure is one in which:

- The air may contain debris or hazardous gases.
- There is a possibility of being trapped or injured by collapsed walls, weakened floors and other debris.

Try to establish the exact or probable location of anyone in the structure. Gather as much information as you can, call for appropriate help and wait for the arrival of personnel who are properly trained and equipped.

Natural Disasters

Natural disasters include tornadoes, hurricanes, earthquakes, forest fires and floods. Rescue efforts after a natural disaster are usually coordinated by local resources until they become overwhelmed. Then the rescue efforts are coordinated by a government agency such as the local, regional or state emergency management

ENRICHMENT

Dealing with Hazards at the Scene *CONTINUED*

Fig. 6-13: When responding to a natural disaster, be sure to carefully size up the scene and avoid obvious hazards. *Photo: courtesy of Captain Phil Kleinberg, EMT-P.*

agency. If the disaster is large enough or a federal disaster is declared, it may be coordinated with the assistance of the Federal Emergency Management Agency (FEMA). Typically, you first would report to the incident commander or the individual they designate to be in charge at the scene, then work with the disaster response team and follow the rescue plan.

Natural disasters pose more risks than you might realize. Often, more injuries and deaths result from electricity, HAZMATs, rising water and other dangers than from the disaster itself. When responding to a natural disaster, be sure to carefully size up the scene, avoid obvious hazards and use caution when operating rescue equipment (Fig. 6-13). Never use gasoline-powered equipment, such as chain saws, generators and pumps, in confined spaces.

Multiple Patients

Scenes that involve more than one patient are referred to as multiple-casualty incidents (MCIs). Such scenes make your task more complex, since you must determine who needs immediate care and who can wait for more help to arrive. MCIs are covered in more detail in Chapter 30.

Hostile Situations

Environmental factors, such as HAZMATs, electricity and unsafe structures, are not the only dangers you may encounter. You may sometimes encounter a hostile patient or family member. Any unusual or hostile behavior, including rage, may be a result of the emergency, injury, illness or fear. Many patients are afraid of losing control and may show this as anger. Hostile behavior also may result from the use of alcohol or other drugs, lack of oxygen or an underlying medical condition.

Continued on next page

ENRICHMENT

Dealing with Hazards at the Scene *CONTINUED*

Fig. 6-14: If a patient or person with the patient becomes hostile, remain calm and remember that you cannot provide care without consent.

If a patient needing care is hostile toward you, try to calmly explain who you are and that you are there to help. Remember that you cannot provide care without the patient's consent (Fig. 6-14). If the person accepts your offer to help, keep talking as you assess the patient's condition. When the patient realizes you are not a threat, the hostility usually goes away.

If the patient refuses your care or threatens you, withdraw from the scene. Never try to restrain, argue with or force care on a patient. If the patient does not let you provide care, wait for more advanced medical personnel to arrive. Sometimes a close friend or a family member will be able to reassure a hostile patient and convince the patient to accept your care.

However, family members or friends who are angry or hysterical can make your job more difficult. Sometimes they may not allow you to provide care. At other times, they may try to move the patient before they have been stabilized. A terrified parent may cling to a child and refuse to let you help. When family members act this way, they often feel confused, guilty and frightened. Be understanding and explain the care you are providing. By remaining calm and professional, you will help calm them.

Hostile crowds are a threat that can develop when you least expect it. As a rule, you cannot reason with a hostile crowd. If you decide the crowd at a scene is hostile, wait at a safe distance until law enforcement and additional EMS personnel arrive. Approach the scene only when police officers declare it safe and ask you to help. Never approach a hostile crowd unless you are trained in crowd management and supported by other trained personnel.

ENRICHMENT

Dealing with Hazards at the Scene *CONTINUED*

Suicide

Never enter a suicide scene unless police have made it secure. If the person is obviously dead, be careful not to touch anything at the scene such as a weapon, medicine bottle, suicide note or other evidence. If the scene is safe and the person is still alive, provide emergency care as needed. Concentrate on your care for the patient and leave the rest to law enforcement personnel.

Never approach an armed suicidal person unless you are a law enforcement officer trained in crisis intervention. Approach only if you have been summoned to provide care once the scene has been secured.

If you happen to be on the scene when an unarmed individual threatens suicide, try to reassure and calm the person. Make sure that appropriate personnel have been notified. You cannot physically restrain a suicidal person without medical or legal authorization. Listen to the person and try to keep the person talking until help arrives. Try to be understanding. Do not dare the person to act, or trivialize the person's feelings. Unless your personal safety is threatened, never leave a suicidal person alone.

Hostage Situation

If you encounter a hostage situation, your first priority is to not become a hostage yourself. Do not approach the scene unless you are specially trained to handle these situations. Assess the scene from a safe distance and call for law enforcement personnel. A police officer trained in hostage negotiations should take charge.

Try to get any information from bystanders that may help law enforcement personnel. Ask about the number of hostages, any weapons seen and other possible hazards. Report any information to the first law enforcement official on the scene. Remain at a safe distance until law enforcement personnel summon you.

7 PRIMARY ASSESSMENT

You Are the Emergency Medical Responder

Your rescue unit arrives at a scene to find a distraught mother who says, “I can’t wake my baby up.” The infant appears to be unconscious and is turning blue. How would you respond? What are your immediate priorities? What should you do first?

KEY TERMS

Agonal breaths: Isolated or infrequent gasping in the absence of normal breathing in an unconscious person; can occur after the heart has stopped beating. Agonal breaths are not normal breathing and are considered a sign of cardiac arrest.

Airway: The pathway for air from the mouth and nose through the pharynx, larynx and trachea and into the lungs.

AVPU: Mnemonic describing the four levels of patient response: Alert, Verbal, Painful and Unresponsive.

Brachial artery: The main artery of the upper arm; runs from the shoulder down to the bend of the elbow.

Breathing rate: Term used to describe the number of breaths per minute.

Capillary refill: A technique for estimating how the body is reacting to injury or illness by checking the ability of the capillaries to refill with blood.

Carotid artery: The major artery located on either side of the neck that supplies blood to the brain.

CPR breathing barrier: Device that allows for ventilations without direct mouth-to-mouth contact between the responder and the patient; includes resuscitation masks, face shields and bag-valve-mask (BVM) resuscitators.

Cyanotic: Showing bluish discoloration of the skin, nailbeds and mucous membranes due to insufficient levels of oxygen in the blood.

Glasgow Coma Scale (GCS): A measure of level of consciousness (LOC) based on eye opening, verbal response and motor response.

Head-tilt/chin-lift maneuver: A common method for opening the airway unless the patient is suspected of having an injury to the head, neck or spine.

Hypoxic: Having below-normal concentrations of oxygen in the organs and tissues of the body.

Jaw-thrust (without head extension) maneuver: A maneuver for opening the airway in a patient suspected of having an injury to the head, neck or spine.

Level of consciousness (LOC): A person's state of awareness, ranging from being fully alert to unconscious; also referred to as mental status.

Minute volume: The amount of air breathed in a minute; calculated by multiplying the volume of air inhaled at each breath (in mL) by the number of breaths per minute.

Perfusion: The circulation of blood through the body or through a particular body part for the purpose of exchanging oxygen and nutrients with carbon dioxide and other wastes.

Primary (initial) assessment: A check for conditions that are an immediate threat to a patient's life.

Pulse: The beat felt from each rhythmic contraction of the heart.

Respiratory arrest: A condition in which there is an absence of normal breathing.

Respiratory distress: A condition in which a person is having difficulty breathing or requires extra effort to breathe.

Signs: Term used to describe any observable evidence of injury or illness, such as bleeding or unusual skin color.

Signs of life: A term sometimes used to describe normal breathing and a pulse in an unresponsive patient.

Stoma: A surgical opening in the body; a stoma may be created in the neck following surgery on the trachea to allow the patient to breathe.

Symptoms: What the patient reports experiencing, such as pain, nausea, headache or shortness of breath.

Vital signs: Important information about the patient's condition obtained by checking respiratory rate, pulse and blood pressure.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Summarize the reasons for forming a general impression of the patient.
- Explain the purpose of the primary (initial) assessment.
- Describe methods for assessing a patient's level of consciousness (LOC).
- Explain the differences in assessing the LOC of an adult, a child and an infant.
- Describe methods of assessing whether a patient is breathing.
- Distinguish a patient with adequate breathing from a patient with inadequate breathing.
- Describe the methods used to assess circulatory status.
- Explain the differences in obtaining a pulse in an adult, a child and an infant.
- Explain the need to assess a patient for external bleeding.
- Describe how to assess a patient for severe bleeding.
- Describe how to assess breathing rate and quality, pulse rate and quality, and skin appearance.
- Describe how to establish priorities for care including recognition and management of shock.

SKILL OBJECTIVES

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

- Perform a primary assessment.
- Demonstrate how to assess LOC.
- Demonstrate how to open the airway using the head-tilt/chin-lift maneuver and the jaw-thrust (without head extension) maneuver.
- Demonstrate how to use a resuscitation mask.

INTRODUCTION

In previous chapters, you learned how to prepare for an emergency, the precautions to take when approaching the scene and how to recognize a dangerous situation. You also learned about your roles and responsibilities. As an emergency medical responder (EMR), you can make a difference in an emergency—you may even save a life. But to do this, you must learn how to provide care for an injured or ill person, and set priorities for that care.

When an emergency occurs, one of the most essential aspects of your job is the ***primary (initial) assessment***. The primary assessment is the process used to quickly identify those conditions that represent an immediate threat to the patient's life, so that you may properly treat them as they are found. An effective primary assessment includes creating a general impression of the patient, checking for responsiveness and checking airway, breathing and circulatory status.

THE IMPORTANCE OF THE SCENE SIZE-UP

Once you recognize that an emergency has occurred and decide to act, always remember the importance of sizing up the scene first. A primary assessment should never occur until after the scene size-up. The four main components to consider during a scene size-up include:

1. Scene safety.
2. The mechanism of injury (MOI) or nature of illness.
3. The number of patients involved.
4. The resources needed.

Ensuring Scene Safety

Always begin by making sure the scene is safe for you, other responders, the patient(s) and any bystanders, as discussed in Chapter 6. Take the necessary precautions when working in a dangerous environment. If you do not have the necessary training and equipment, do not approach the patient—summon the appropriate personnel. Keep assessing the situation, and, if conditions change, you then may be able to approach the patient. Remember, nothing is gained by risking your safety. An emergency that begins with one injured or ill person could end up with two if you are hurt.

Determining Mechanism of Injury or Nature of Illness

When attempting to determine the MOI or nature of illness, you must look around the scene for clues to what caused the emergency and the extent of the damage (Fig. 7-1). Consider the force that may have been involved in creating an injury. These considerations will help you to think about the possible types and extent of the patient's injuries. Take in the whole picture. How a motor vehicle is damaged or the presence of nearby objects, such as shattered glass, a fallen ladder or a spilled medicine container, may suggest what happened. If the patient is unconscious, determining the MOI or nature of illness may be the only way you can identify what occurred.

Recognizing Patients

When you size up the scene, look carefully for more than one patient. You may not see everyone at first. For example, in a motor-vehicle collision, an open door may be a clue that someone has left the vehicle or was thrown from it. If one patient is bleeding or screaming loudly, you may overlook another patient who is unconscious. It is also easy in an emergency situation to overlook small children or infants if they are not crying.

Summoning More Advanced Medical Personnel

At times, you may be unsure if more advanced medical personnel are needed. For example, the patient may ask you not to call an ambulance or transport vehicle to avoid embarrassment about creating a scene. Your training as an EMR will help you make the decision. As a general rule, summon

Fig. 7-1: Search the scene for clues to determine what caused the emergency or injury and the extent of the damage.

CRITICAL FACTS

Primary assessment is essential to the job of an EMR to ensure proper care. However, a scene size-up to evaluate safety, MOI or nature of illness, number of patients and resources needed should always be done first.

To determine the MOI or nature of illness, check the scene for clues and consider the force that may have been involved.

more advanced medical personnel for any of the following conditions:

- Unconsciousness, an altered level of consciousness (LOC) or a brief loss of consciousness
- Breathing problems (difficulty 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
- No pulse
- Severe, life-threatening bleeding (bleeding that spurts or gushes steadily from a wound)
- 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

It is impossible to provide a complete or definitive list—there are always exceptions. Trust your instincts and follow local protocols. It is better to have more advanced medical personnel respond to a nonemergency than arrive at an emergency too late to help.

The Role of Bystanders

Do not underestimate the role of bystanders in an emergency situation. Scene safety is always first and foremost, so look for bystanders who are in potential danger and instruct them to move to safety. Ask anyone present how many people may be involved in the emergency; bystanders may provide essential information to help you identify patients. Bystanders may also be able to tell you what happened or help in other ways. A bystander who knows the patients may know whether they have any medical conditions or allergies. Bystanders can also meet and direct an ambulance to your location.

GENERAL IMPRESSION OF THE PATIENT

Once you have conducted a scene size-up and assessed that the scene is safe for you and your colleagues, your first step in the primary assessment is to determine what has occurred and what is happening with the patient—a general impression. This general impression will determine your immediate course of action.

Questions to ask yourself include:

- Does the patient look sick or injured?
- Is there a noticeable MOI?
- Is the patient awake or alert?
- Does the patient appear to be breathing?
- Is the patient bleeding?
- What is the patient's approximate age?

Your general impression may alert you to a serious problem that requires additional resources or to a minor problem you can care for easily. You will discover these problems by looking for any signs and symptoms the patient may have. ***Signs*** are evidence of injury or illness that you can observe, such as bleeding or unusual skin appearance. ***Symptoms*** are what the patient reports experiencing, such as pain, nausea, headache or shortness of breath. If you see severe, life-threatening bleeding as you are forming your general impression, immediately control the bleeding with any available resources if it is safe to do so, or delegate the responsibility to another responder so you can begin your primary assessment. You may even ask the patient, if they are conscious and alert, to apply pressure to their wound while you prepare to provide care. For step-by-step instructions on performing a primary assessment, see Skill Sheet 7-1.

! CRITICAL FACTS

Many conditions warrant summoning advanced medical personnel. These include severe, life-threatening bleeding, breathing problems, prolonged chest pain, seizures, and suspected head, neck or spinal injuries—to name a few.

Age Delineation

As part of gaining a general impression, attempt to determine the patient's age. For the purpose of this text, an adult is considered anyone approximately 12 years old or older. A child is considered 1 to about 12 years of age, and an infant is under 1 year of age. The approximate age of the patient will have an effect on the care you provide.

For use of automated external defibrillators (AEDs)—based on Food and Drug Administration (FDA) approval of these devices—a child is considered to be between the ages of 1 and 8 or weighing less than 55 pounds. If precise age or weight is not known, the responder should use their best judgment and not delay care in determining age.

Fig. 7-2: When approaching a patient, approach from the front so the patient can see you without needing to turn their head.

As you perform the primary assessment, check for immediate life-threatening conditions. This means assessing whether the patient:

- Is conscious.
- Has an open and clear airway.
- Is breathing.
- Has a pulse.

As you assess the patient, determine if spinal precautions are necessary based on your general impression and the suspected MOI. If the scene suggests an MOI in which the patient may have a head, neck or spinal injury, you must ensure that the patient's head and neck do not move by using manual stabilization and the jaw-thrust (without head extension) maneuver.

RESPONSIVENESS

Establishing Responsiveness

When approaching a patient, check for responsiveness and assess their ***level of consciousness (LOC)***. This can range from being fully alert to being unconscious and unresponsive to any stimuli such as voice or pain.

First, speak to the patient. This may be to warn the patient to remain still if there is a situation that could cause damage to the head, neck or spine. For example, in a motor-vehicle collision or a fall off a ladder, the patient would need to remain still. Identify yourself as a responder and state that you are there to help. Obtain consent from the patient before beginning the primary assessment and providing care.

When approaching a patient, you should try to approach from the front so that the patient can see you without needing to turn their head (Fig. 7-2). This is especially important in the case of a suspected head, neck or spinal injury.

Ask questions such as:

- What happened?
- What is your name?
- Where are you?
- What day of the week is it?

CRITICAL FACTS

Always check for life-threatening conditions: unconsciousness; severe, life-threatening bleeding; a blocked airway; abnormal or absent breathing; and no pulse.

The answers to these questions will give you an idea of the patient's LOC and orientation. Keep in mind that certain pre-existing conditions and diseases may be responsible for a patient's orientation. If possible, speak with family members to establish if this is usual behavior for the patient or if it represents a change.

Pediatric Considerations

Be aware that children and infants may be fully aware of you but unable to answer your questions. This response can be for a variety of reasons. Children may not be able to speak or understand your questions, they may not speak or understand English, they may be too frightened of the situation or of you as a stranger, or they may be crying too hard and be unable to stop. If possible, try to assess a young child or an infant in a parent's or caregiver's arms or lap. Approach slowly and gently, and give the child or infant some time to get used to you, if possible. Use the child's name, if you know it.

Considerations for Older Adults

In older patients, certain conditions and diseases may be responsible for changes in LOC. For example, a patient with dementia may be confused by your questions. The patient also may not speak or understand English. When you think this might be the case, speak with family members if possible to establish if this is usual behavior for the patient or if it represents a change. Also, do not assume that difficulty responding to questions about time and current events necessarily means the patient is disoriented. It is not unusual for people who live alone to lose track of time, and some may not follow current events. In this case, alter your questions so that they address information related to the patient's immediate environment and the circumstances surrounding why you were called in order to truly gauge the patient's orientation.

Patient Response—AVPU

In describing a patient's LOC, a four-level, mnemonic scale is traditionally used, referred to as ***AVPU***. The letters A, V, P and U each refer to a stage of awareness (Table 7-1).

- **A**lert: Patients who are alert are conscious and aware of their surroundings, able to acknowledge your presence and able to respond to your questions.
- **V**erbal: Sometimes the patient is only able to react to sounds, such as your voice. The patient's eyes may be closed but they open when hearing your voice or when the patient is told to open them. The patient may appear to be lapsing into unconsciousness. A patient who has to be stimulated by sound to respond is described as responding to verbal stimuli.
- **P**ainful: A patient who does not respond to verbal stimuli or commands, but does respond when someone inflicts pain, is described as responding to painful stimuli. Pinching the earlobe or the skin above the collarbone are examples of painful stimuli used to try to get a response (Fig. 7-3). Be cautious however about pinching the earlobe in patients who may have neck trauma, as they may try to move their head away from an irritating stimulus. Instead, forcefully pinch or squeeze the fleshy section of skin between the patient's thumb and forefinger.
- **U**nresponsive: Patients who do not respond to any stimuli are described as being unconscious or unresponsive to stimuli.

Table 7-1:

Levels of Consciousness

LEVEL	CHARACTERISTIC BEHAVIOR
Alert	Able to respond appropriately to questions
Verbal	Responds appropriately to verbal stimuli
Painful	Only responds to painful stimuli
Unresponsive	Does not respond

CRITICAL FACTS

To assess LOC, ask simple questions such as, "What is your name?" LOC can range from being fully alert to unconsciousness. Always approach a patient from the front to avoid head turning.

In describing a patient's LOC, a four-level, mnemonic scale is traditionally used, referred to as AVPU. The letters A, V, P and U each refer to a stage of awareness.

Fig. 7-3: A patient may respond only to painful stimuli, such as a pinch or pull of the skin above the collarbone.

Once you have assessed the patient's LOC, the next thing you must do is to check the patient's airway, breathing and circulation (pulse and skin characteristics).

AIRWAY STATUS

The pathway for air passage between the mouth and nose to the lungs is called the ***airway***. Without an open airway, the patient cannot breathe. A patient who can speak or cry is conscious, has an open airway, is breathing and has a pulse. However, the patient may still be at risk of a compromised airway.

Assess the airway with the unconscious patient face-up. First, verify if the airway is patent (open and clear). If the patient is breathing (chest is rising and falling with air moving in and out) or the patient is speaking to you and aware of the surroundings, then you need to ensure that the airway remains open and clear. Continue to assess the patient's respiratory status throughout the period that you provide care. The airway can become blocked by fluids, solid objects, the tongue or swollen tissue caused by trauma or severe allergic reaction.

Determine whether there is a need for any interventions to establish or maintain patency. For example, does the patient require suctioning to remove fluids or a finger sweep to remove solid objects or debris? Will an oral (or nasal) airway be necessary to prevent the tongue from falling back in the throat and blocking the airway? Refer to Chapter 11 for information on suctioning and the use of airways.

If the patient is wearing dentures, leave them in place unless they become loose and block the airway. Dentures help support the patient's mouth and cheeks, making it easier to seal the resuscitation mask if you need to provide ventilations.

Opening the Mouth

If you need to open the mouth to clear the airway of fluids or debris and the patient is unresponsive, use the cross-finger technique to open the patient's mouth with a gloved hand:

- Kneel beside the patient near their head.
- Ensure that the patient is unresponsive.
- Cross the thumb and forefinger of one hand.
- Put your thumb on the patient's lower teeth and your forefinger on the patient's upper teeth (Fig. 7-4).
- Use a scissors motion to open the mouth.

Assessing Airway and Breathing in the Responsive Patient

If the patient speaks, you know that the airway is functional, but the patient may still be at risk. If a patient's breathing is noisy, the sounds can indicate the type of problem. For example, stridor (high-pitched whistling sound) can indicate that the airway is narrowing through swelling, a foreign body or trauma. Continually reassess and monitor the patient's breathing because breathing status, rate and quality can change suddenly.

Assessing Airway and Breathing in the Unresponsive Patient

It is more difficult to tell if an unconscious patient has an open airway. To open the airway for a patient who has not suffered an injury to the head, neck or spine, open and maintain the airway using

CRITICAL FACTS

Without an open airway, the patient cannot breathe. A patient who can speak or cry is conscious, has an open airway, is breathing and has a pulse. However, the patient may still be at risk of a compromised airway.

Fig. 7-4: The cross-finger technique uses a scissoring motion of the thumb and forefinger to open an unresponsive patient's mouth.

the ***head-tilt/chin-lift maneuver***. For patients of all ages, tilt the head back and lift the chin to open the airway. Do not tilt a child's or an infant's head back as far as an adult's. Tilting the head back too far can close off a child's airway. Tilt a child's head so the airway is slightly past the neutral position and tilt an infant's head so the airway is in a neutral position.

Opening the Airway—Head-Tilt/ Chin-Lift Maneuver

To open the airway with the head-tilt/chin-lift maneuver:

1. Kneel beside the patient's head and neck.
2. Place one hand on the patient's forehead.
3. Place the fingertips of two or three fingers of your other hand under the bony part of the patient's lower jaw near the chin. If the patient is a child or an infant, use only one or two fingers.
4. Use firm backward pressure from the palm of your hand to tilt the head back while lifting the jaw up with the fingertips to extend the chin forward (Fig. 7-5, A). If the patient is a child, tilt the head so the airway is only slightly past neutral (Fig. 7-5, B). For an infant, tilt the head so the airway is in a neutral position (Fig. 7-5, C).
5. Keep pressure on the patient's forehead to help maintain the airway in an open position.

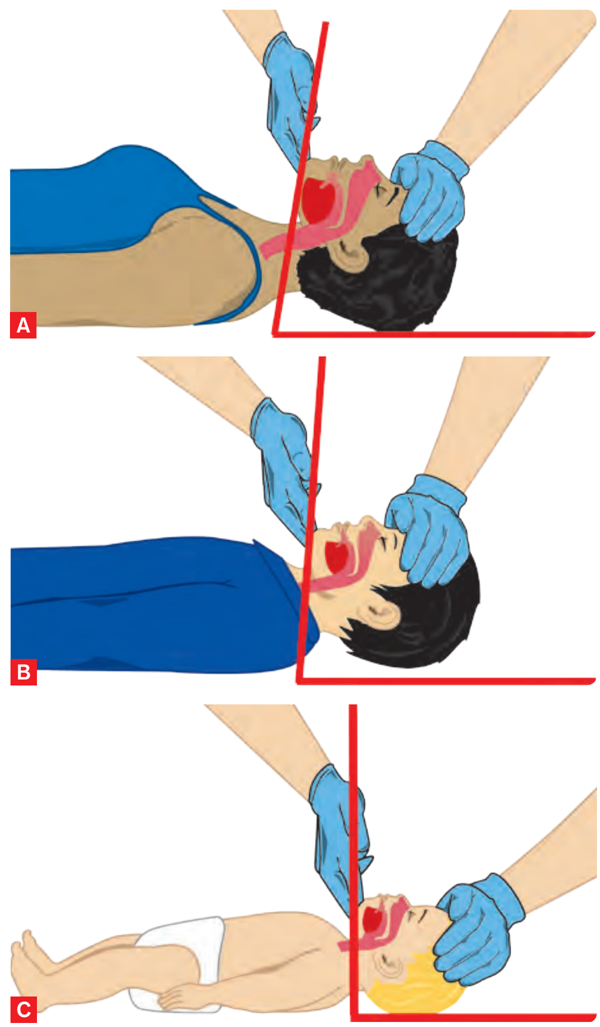


Fig. 7-5, A–C: (A) Correct angling of head-tilt/chin-lift maneuver in an adult; **(B)** correct angling of head-tilt/chin-lift maneuver in a child; **(C)** correct angling of head-tilt/chin-lift maneuver in an infant.

Fig. 7-6: Jaw-thrust (without head extension) maneuver.

Opening the Airway—Jaw-Thrust (Without Head Extension) Maneuver

To open the airway for someone who has a suspected head, neck or spinal injury, use the ***jaw-thrust (without head extension) maneuver*** to keep the head and neck in a neutral position (Fig. 7-6). This maneuver moves the tongue away from the back of the throat, allowing air to enter the lungs without moving the head and neck. After opening the airway, look, listen and feel for breathing.

Do not move the head to the side, forward or back. You can perform this maneuver with or without a resuscitation mask. Note that if you cannot establish an open airway using the jaw-thrust (without head extension) maneuver, use the head-tilt/chin-lift maneuver instead. For step-by-step instructions on performing the jaw-thrust (without head extension) maneuver, see Skill Sheet 7-2.

BREATHING STATUS

If the patient is breathing, the chest will rise and fall. However, you must also *listen* and *feel* for signs of breathing. Position your ear over the patient's mouth and nose so you can hear and feel air as it escapes. At the same time, look for the chest to rise and fall. Look, listen and feel for breathing *for at least 5 seconds, but no more than 10 seconds*. You will simultaneously check for breathing and a pulse. Pulse checks will be discussed later in this chapter.

Check the patient's neck to see if they breathe through a stoma. A ***stoma*** is an opening in the neck to allow a person to breathe after surgery to remove part or all of the larynx (voice box) or other structures of the airway (Fig. 7-7). The person

Fig. 7-7: A stoma is an opening in the neck that allows a person to breathe. *Photo: courtesy of the International Association of Laryngectomees.*

CRITICAL FACTS

For an unconscious and unresponsive patient, look, listen and feel for breathing and check for a pulse for *at least 5 seconds, but no more than 10 seconds.*

may breathe *partially* through this opening, or may breathe *entirely* through the stoma instead of through the nose and mouth. Use a round, pediatric mask if you need to provide ventilations.

Isolated or infrequent gasping in the absence of normal breathing in an unconscious person may be ***agonal breaths***, which can occur after the heart has stopped beating. Agonal breaths are not breathing and are considered a sign of cardiac arrest. Do not confuse this with normal breathing. If there are only agonal breaths, care for the patient as if they are not breathing at all.

If the patient is breathing, assess the rate and depth of the breathing. A healthy adult breathes regularly, quietly and effortlessly. The normal ***breathing rate*** for an adult is between 12 and 20 breaths per minute. However, some people breathe slightly slower or faster (Table 7-2). You can usually observe the chest rising and falling.

To determine the breathing rate, listen for the sounds as the patient inhales and exhales. Count the number of times the patient breathes (inhaling and exhaling is one breath) for either 15 seconds and multiply that number by 4, or 30 seconds and multiply that number by 2. If the patient is awake and alert, do not to let the patient know or disclose when you are observing breathing, as the patient may become self-conscious. This can cause a change in breathing pattern and not provide an accurate assessment. Simultaneously checking breathing and the pulse is a good way to not alert the conscious patient that you are observing their breathing. If the patient is breathing, continue to maintain an open airway.

Pediatric Considerations

Children and infants breathe more quickly than adults. Children can breathe up to 30 breaths per minute, while infants can have a respiratory rate up to 50 breaths per minute. While counting the breaths, assess whether breathing is shallow, deep or normal, and whether the child or infant appears to be having difficulty breathing. Normal (effective) breathing appears effortless. Keep in mind that infants have periodic breathing, so changes in the pattern of breathing are normal. Also, agonal breaths do not occur frequently in children.

As with adults, if a child or an infant is breathing spontaneously, you must still reassess regularly to ensure that the breathing status does not change.

Breathing rate may be abnormal for the patient's age, meaning either too slow or too fast. Respirations may be too slow: less than 8 per minute for adults, less than 10 per minute for children and less than 20 per minute for infants; or they may be too fast: greater than 20 per minute for adults, greater than 30 per minute for children and greater than 60 per minute for infants.

Depth of breathing may also be abnormal, with shallow movement of the chest as it rises and falls. Abnormal breathing may be noisy. There may be a gurgling noise without secretions in the mouth or wheezing. Other abnormal breath sounds include whistling sounds, crowing sounds or snoring.

Table 7-2:
Normal Breathing Rates

AGE	NUMBER OF BREATHS PER MINUTE	ADDITIONAL NOTES
Adults (12 years old or older)	12 to 20	▪ Normal chest rise and fall ▪ Quiet breathing (no abnormal breathing sounds) ▪ No great effort of breathing ▪ Rates may alter due to emotional and physical conditions
Children (1 to about 12 years old)	15 to 30	▪ Sometimes breathe irregularly, so may need to assess for 1 minute and repeat frequently ▪ Rates may alter due to emotional and physical conditions
Infants (under 1 year of age)	25 to 50	▪ Have periodic breathing (periods of rapid, shallow breathing that occur during sleep; normal for infants)

The amount of effort a conscious patient puts into breathing can be observed by watching to see if the patient is using the accessory muscles—the muscles in the neck, between the ribs and/or the abdomen—to breathe. Nasal flaring is another indication of difficulty breathing, as is the tripod position, where the patient sits and leans forward, bracing both arms on knees or an adjacent surface for support to aid breathing.

Administer supplemental oxygen or provide ventilations as appropriate, based on local protocols, if the patient is having trouble breathing. This would be necessary if the patient is:

- Unresponsive. Monitor the patient's airway to ensure that respirations are continuing and are effective.
- ***Hypoxic***. Pale, cool, clammy, moist skin is an early sign of inadequate oxygenation.
- ***Cyanotic***. The patient is not receiving adequate oxygen. This is a clear but late sign of inadequate oxygenation. The mouth, lips and nailbeds would appear blue in color.
- Breathing very shallow respirations. The patient is likely not receiving an adequate supply of oxygen.
- Breathing increasingly slow. Oxygen intake will be dropping and the patient is likely not receiving an adequate supply of oxygen.
- Tolerant of assisted ventilation. For those who are not tolerant of assisted ventilation, you can use a "blow-by" technique. Refer to Chapter 12 for more information.

It is important to remember that the respiratory status of a patient can change suddenly (Table 7-3).

If the patient is not breathing normally and has no pulse and the cause is the result of a drowning, give 2 ventilations prior to beginning CPR. Provide ventilations using a resuscitation mask or BVM. These ***CPR breathing barriers*** can help protect against disease transmission when performing CPR or giving ventilations to a patient.

Table 7-3:
Respiratory Status and Providing Care

SIGNS	RESPIRATORY STATUS	PROVIDING CARE
▪ Normal rate and depth of breathing ▪ Absence of abnormal breath sounds ▪ Air moves freely in and out of the chest ▪ Normal skin color	▪ Breathing is adequate	▪ Monitor breathing for any changes ▪ Administer supplemental oxygen, if available, based on local protocols
▪ Rate and/or depth of breathing is slower or faster than normal range ▪ Breathing is shallow ▪ There are no breath sounds or breath sounds are diminished ▪ Breathing is noisy: crowing, stridor, snoring, gurgling or gasping ▪ Cyanosis (blue or gray skin color) ▪ Decreased ***minute volume***	▪ Breathing is inadequate ▪ Breathing is either slow or shallow ▪ Patient is moving some air in and out of the chest ▪ Breathing is not enough to sustain life	▪ Assist ventilations ▪ Administer supplemental oxygen, if available, based on local protocols
▪ The chest does not rise ▪ No evidence of air moving in through mouth or nose ▪ There are no breath sounds	▪ Patient is not breathing	▪ Provide ventilation ▪ Administer supplemental oxygen, if available, based on local protocols

CRITICAL FACTS

It is important to remember that the respiratory status of a patient can change suddenly.

Resuscitation Mask

To use a resuscitation mask, select the proper size of mask for the patient (adult, child or infant), kneel to the side of or above the patient's head and then:

- Assemble the mask and valve, attaching the one-way valve to the mask, if necessary.
- Open the airway past a neutral position for an adult and slightly past neutral for a child. For an infant, tilt the head so that the airway is in a neutral position.
- Place the mask over their mouth and nose, starting from the bridge of the nose. Place the bottom of the mask below the mouth but not past the chin.
- Seal the mask.
- Blow into the mask (Fig. 7-8). Give 2 ventilations. Each ventilation should last about 1 second and make the chest begin to rise. Pause briefly between ventilations to let the exhaled air escape.

For step-by-step instructions on using a resuscitation mask, see Skill Sheets 7-3 and 7-4. See Table 7-4 and Chapter 10 for more information about the use of breathing devices and artificial ventilations.

If breathing is too slow for the age of the patient, speak to the patient; response to verbal stimuli may increase breathing. If the patient is unresponsive, painful stimuli may increase breathing. If these work in regulating the respirations, monitor the patient to ensure the respiratory rate does not drop again. If the patient is not breathing, the patient will likely need assistance. Assist breathing by either giving ventilations or administering supplemental oxygen, if available, based on local protocols.

Someone with asthma or emphysema who is in ***respiratory distress*** may try to do pursed-lip breathing. Have the patient assume a position of comfort. After the patient inhales, have them slowly exhale through the lips, pursed as though blowing out candles. This creates back pressure, which can help open airways slightly until more advanced medical personnel arrive.

Fig. 7-8: Seal the properly positioned mask over the patient's mouth and nose, use the head-tilt/chin-lift maneuver to open the airway and blow into the mask.

Table 7-4:
Artificial-Ventilation Rates

AGE	NUMBER OF VENTILATIONS PER MINUTE*
Adult (12 years old and older)	About 12 (1 ventilation about every 5–6 seconds)
Child (1 year to about 12 years old)	About 20 (1 ventilation about every 3 seconds)
Infant (under 1 year of age)	About 20 (1 ventilation about every 3 seconds)
Newborn	30 to 60 (1 ventilation about every 1–2 seconds)

*Each ventilation should be approximately 1 second in duration.

Bag-Valve-Mask Resuscitators

Bag-valve-mask (BVM) resuscitators are difficult to use by a single responder. Two emergency medical responders (EMRs) should provide ventilations with a BVM: one to establish and maintain the airway and seal of the mask, and the other to deliver ventilations by squeezing the bag. EMRs should not use the BVM during one-responder CPR. Instead, they should use a technique, such as mouth-to-mask, that minimizes the need for changes in position and minimizes interruptions of chest compressions during CPR.

Only responders who are well trained in—and have frequent opportunities to perform—one-responder BVM should consider using this technique. These responders need to continuously monitor their efforts to ensure adequate ventilations, and change to an alternate method if necessary.

When providing BVM ventilations, one responder maintains the airway and seals the mask while the other delivers ventilations.

If the patient is not breathing normally (***respiratory arrest***) but has a pulse, provide ventilations with a resuscitation mask and administer supplemental oxygen, if available, based on local protocols. If additional EMRs and equipment are available, use a BVM. Once you have begun giving ventilations, continue until the patient begins to breathe spontaneously and adequately or until more advanced medical personnel take over.

CIRCULATORY STATUS

While assessing the patient's airway and breathing, you should simultaneously assess blood circulation by feeling for a pulse. If the heart has stopped, blood will not circulate throughout the body. If blood does not circulate, the patient will suffer severe brain damage or die because of a lack of oxygen (Fig. 7-9).

Pulse

The most commonly used method of checking for adequate circulation is to check for a pulse. With every heartbeat, a wave of blood moves through the blood vessels. This creates a beat called the ***pulse***. You can feel it with your fingertips in the arteries near the skin.

When the heart is healthy, it beats with a steady rhythm. This beat creates a regular pulse. A normal pulse for an adult ranges from 60 to 100 beats per minute (Table 7-5). A well-conditioned athlete may have a pulse of 50 beats per minute or lower. A pulse of greater than 100 beats per minute is too

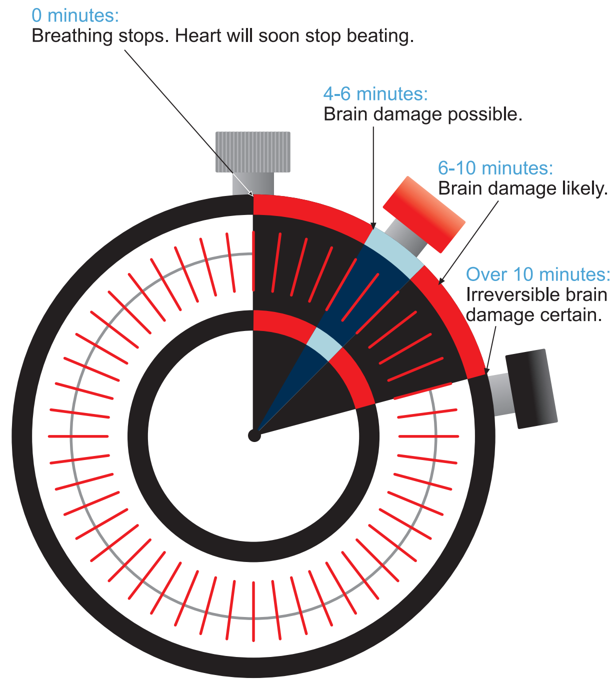


Fig. 7-9: Time is critical in life-threatening emergencies.

Table 7-5:
Normal Pulse Rates

AGE	NUMBER OF BEATS PER MINUTE	ADDITIONAL NOTES
Adults (12 years old or older)	60 to 100	▪ A well-conditioned athlete may have a pulse of 50 beats per minute or lower. ▪ An adolescent (11–14 years old) may have a pulse rate of 60 to 105.
Children (1 to about 12 years old)	Toddler (1–3 years): 80 to 130 Preschool-age (3–5 years): 80 to 120 School-age (6–10 years): 70 to 110	▪ Normal pulse rates vary based on the child's age. ▪ An adolescent (11–14 years old) may have a pulse rate of 60 to 105.
Infants (under 1 year old)	Newborn: 120 to 160 Infant (1–5 months): 90 to 140 Infant (6 months to 1 year): 80 to 140	▪ Normal pulse rates vary based on the infant's age.

! CRITICAL FACTS

A "normal" pulse is relative. Ask about any known congenital disorders or other natural explanations for an irregular pulse as part of your patient history.

fast for an adult at rest. Certain medications, such as beta-blockers, can cause the heart to beat at slower rates, which would be considered normal for that person.

Pediatric Considerations

A normal pulse in a child varies according to age, from 80 to 130 for children ages 1–3, to 60 to 105 in adolescents ages 11–14. An infant can have a normal pulse ranging from 80 to 140 beats per minute. A slow or fast pulse for a child and an infant varies according to age.

If the heartbeat changes, so does the pulse. An abnormal pulse may be a sign of a potential problem. Signs of an abnormal pulse include:

- Irregular pulse.
- Weak and hard-to-find pulse.
- Excessively fast or slow pulse.

When someone is severely injured or ill, the heart may beat unevenly, producing an irregular pulse. The rate at which the heart beats can also change. The pulse speeds up when a person is excited, anxious, in pain, losing blood or under stress. It slows down when a person is relaxed. Some heart conditions or medications can also speed up or slow down the pulse rate. Sometimes changes may be very subtle and difficult for you to detect. The most important change to note is a pulse that changes from being present to no pulse at all. It is important to remember that the definition of what is a "normal" pulse may be different for some. Be sure to ask if there are known congenital disorders or other natural explanations for a seemingly slow or irregular heartbeat as part of the patient history.

Checking a pulse involves placing two fingers on top of a major artery located close to the skin's surface and over a bony structure. Pulse sites that are easy to locate are the ***carotid arteries*** in the neck, the radial arteries in the wrists and the ***brachial arteries*** in the upper arms (Fig. 7-10, A–C). There are also other pulse sites you may use. To check the pulse rate, count the number of beats in either 15 seconds and multiply that number by 4 or in 30 seconds and multiply that number by 2. The number you get is the number of heartbeats per minute.

An injured or ill patient's pulse may be hard to find. If you have trouble finding a pulse, keep checking for one periodically. If a patient is breathing normally, the heart is also beating. There may be a loss in circulation to the injured area, however,

Fig. 7-10, A–C: A pulse can be checked in arteries located close to the skin's surface and over a bony structure. These include the **(A)** carotid, **(B)** radial and **(C)** brachial arteries.

causing a loss of pulse. If you cannot find the pulse in one place of a responsive patient, try another location, such as in the other wrist.

If the patient is conscious and breathing, check the pulse to determine the rate and quality of the pulse. For conscious adults and children, you usually check the radial pulse on the thumb side of the patient's wrist. For infants, you should check the brachial artery located on the inside of the upper arm, midway between the shoulder and elbow.

If the patient is unconscious, remember to simultaneously find out whether the patient has an open and clear airway, is breathing and has a pulse. If the patient is not breathing normally, you should only be concerned whether the pulse is present or absent and not with the rate and quality. Check the pulse for an adult or a child at either of the carotid arteries located in the neck. Check the brachial pulse of an infant in the middle of the upper arm. Check for breathing and a pulse for *at least 5 seconds, but no more than 10 seconds*.

To find the carotid pulse, place two fingers on the front of the neck, then slide your fingers toward you and down into the groove at the side of the neck. Feel for *at least 5 seconds, but no more than 10 seconds*. Sometimes the pulse may be difficult to find, since it may be slow or weak. However, if you do not find a definite pulse within 10 seconds, do not waste any more time attempting to find one. Assume there is no pulse and begin resuscitation immediately.

In some cases, the person may be unresponsive but breathing normally. Generally that person should be placed in a side-lying recovery position, if there is no suspected head, neck, spinal, hip or pelvic injury. However, there are a few situations when you should move a person into a recovery position even if there is a suspected head, neck, spinal, hip or pelvic injury. Examples of these situations include if you are alone and have to leave the person (e.g., to call for additional resources), or you cannot maintain an open and clear airway because of fluids or vomit. Placing a person in a recovery position will help keep the airway open and clear (Fig. 7-11).

If the patient does not have a pulse, you need to keep blood containing oxygen circulating. This involves performing chest compressions to circulate the oxygen to the brain and providing ventilations to get oxygen into the patient's lungs. This procedure is called CPR and is described in Chapter 13.

Perfusion

The next step is to establish whether the patient is maintaining adequate blood flow. ***Perfusion*** describes the circulation of blood through the body or through a particular body part. The appearance of the skin and its temperature can be helpful in providing information about the patient's circulation. Checking the skin characteristics requires you to look at and feel the skin. There are four aspects of skin conditions to note, including:

- Color. Is it pale and ashen, or flushed and pink?
- Temperature. Is it hot or cold?
- Moisture. Is it moist or dry?
- Capillary refill. Is it normal or slow?

Skin Color

In some people, the skin looks red when the body is forced to work harder. The heart pumps faster to get more blood to the tissues, and this increased blood flow causes reddened skin or a flushed appearance. Reddening or flushing may not appear in darker skin tones. In contrast, the skin may look

Fig. 7-11: Use a side-lying recovery position for an unresponsive patient with no suspected head, neck, spinal, hip or pelvic injury.

pale or bluish if blood flow is inadequate. Pale skin may indicate low body temperature, blood loss, shock or poor blood flow to a body part. For individuals with darker skin tones, this pallor can be found on the palms of the hands.

Skin Temperature

Skin temperature is also a sign of blood circulation. Increased blood flow makes the skin feel warm. Cool skin may indicate low body temperature or shock (Fig. 7-12).

Skin Moisture

You can also gain information from the degree of moisture on the skin. Normal skin is dry or slightly moist. Wet or sweaty skin may indicate physical exertion, stress, severe pain or shock.

Capillary Refill

One technique for estimating how the body is reacting to injury or illness is to check the ability of the capillaries to refill with blood. This technique, known as ***capillary refill***, is more reliable in children and infants up to the age of 6 than it is in adults.

Fig. 7-12: Assess a person's skin temperature by partially removing your glove and feeling the skin.

Capillary refill is an estimate of the amount of blood flowing through the capillary beds, such as those in the fingertips. The capillary beds in the fingertips are normally rich with blood, which causes the pink color under the fingernails. When a serious injury or illness occurs, the body attempts to conserve blood in the vital organs. As a result, capillaries in the fingertips are among the first blood vessels to constrict, thereby limiting their blood supply.

Environmental temperature can play a role in the effectiveness of capillary refill. If the patient is exposed to cold temperatures, the capillary refill will normally be slow. Refill slows because blood is directed away from the peripheral areas of the body, like the limbs, in an effort to maintain core body temperature.

Pediatric Considerations

In children, check capillary refill in fingernails or toenails. In infants, check capillary refill in the forearm or over the kneecap.

To check capillary refill, squeeze the body part (tip of a finger or thumb) for about 2 seconds and then release. In a healthy child, the normal response is for the area to turn pale as you press it and immediately turn pink again as you release (Fig. 7-13). If the area does not return to pink within 2 seconds (the time it takes to say "capillary refill"), this indicates insufficient circulation and a potentially serious injury or illness. Remember that environmental temperature can play a role in the effectiveness of this technique. If the child is exposed to cold temperatures, the capillary refill normally will be slow as the body is attempting to maintain core body temperature.

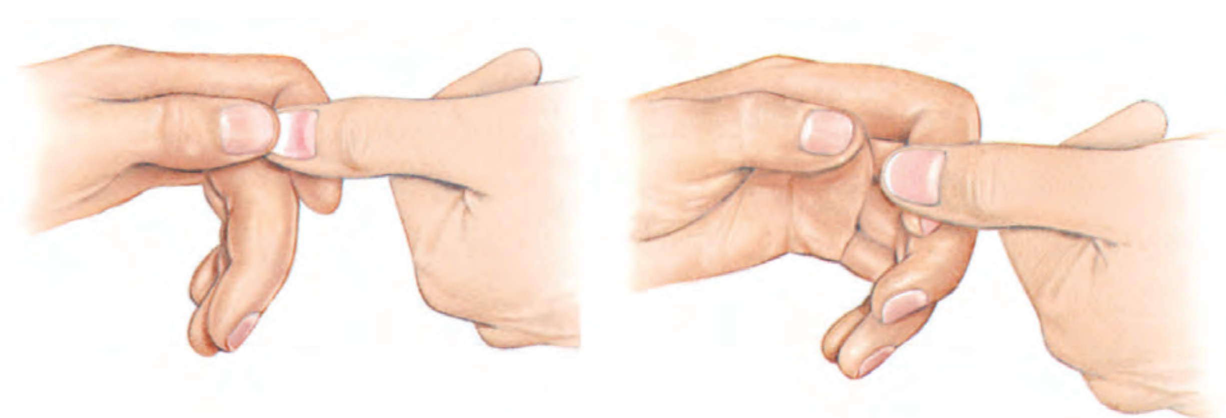


Fig. 7-13: To check capillary refill, squeeze the tip of a finger or thumb for about 2 seconds and then release.

CRITICAL FACTS Check vital signs, such as pulse and respiratory rate, often while you wait for more advanced medical personnel to take over.

IDENTIFYING LIFE THREATS

Consciousness, breathing and circulation, including pulse and skin characteristics, are called ***vital signs***. They are sometimes referred to as ***"signs of life."*** Check the vital signs often as you monitor a patient while you wait for more advanced medical personnel to take over. Assess the patient to determine if it is a life-threatening condition. If the patient is unstable, care for the life-threatening condition as soon as it is discovered. For stable patients (vital signs within normal range), assess the patient's condition and provide care as necessary. Patients who are unstable should be reassessed at least every 5 minutes, or more often if indicated by the patient's condition. Reassess stable patients every 15 minutes, or as deemed appropriate by the patient's condition.

Newborn Considerations

The APGAR scoring system is the universally accepted method of assessing a newborn at 1 minute after birth, at 5 minutes after birth and again at 10 minutes after birth. APGAR stands for Appearance, Pulse, Grimace, Activity and Respiration. The term APGAR also stands for the person who developed it, Virginia Apgar, MD. For more information on assessing a newborn, refer to Chapter 24.

SHOCK

If the patient shows signs of shock, you will need to provide care for shock during the primary assessment. In order to determine whether shock should be treated immediately, watch for:

- Decreased responsiveness.
- Unresponsiveness to verbal commands.
- A heart rate that is too fast or too slow.
- Skin signs of shock.
- A weak or no radial pulse (brachial pulse for infants).

Other signs that indicate a person may be going into shock include restlessness or irritability; altered LOC; nausea or vomiting; pale, ashen, cool, moist skin; rapid breathing and pulse; and excessive thirst. In particular, restlessness and irritability are often the first signs of shock.

If the patient is in shock, control any external bleeding as soon as possible to minimize blood loss and administer supplemental oxygen, if available, based on local protocols. Lay the patient flat (supine). Keep the patient from getting chilled or overheated.

PUTTING IT ALL TOGETHER

The primary assessment helps to identify any life-threatening conditions so they can be cared for rapidly. Problems that are not an immediate threat can become serious if you do not recognize them and provide care. By following the proper steps when conducting the primary assessment, you will give the patient with a serious injury or illness the best chance for survival. Before you proceed with a primary assessment, be certain to size up the scene to make sure there are no dangers to you, the patient and bystanders, and to consider the MOI, nature of illness, the number of patients involved and additional resources you may need.

The essential aspects to the primary assessment are making a general impression of the patient and checking responsiveness, airway, breathing and circulation. Determine if there are any immediate threats to life, such as the presence of severe, life-threatening bleeding, or an absence of breathing or pulse.

Although this plan of action can help you decide what care to provide in any emergency, providing care is not an exact science. Because each emergency and each patient is unique, an emergency may not occur exactly as it did in a classroom setting. Even within a single emergency, the care needed may change from one moment to the next.

You Are the Emergency Medical Responder

As you begin a primary assessment, you verify that the infant is unconscious. What are your next steps in the primary assessment? Should you call for more advanced medical personnel? Why or why not?

Skill Sheet 7-1

Primary Assessment

NOTE: Always follow standard precautions when providing care.

Size up the scene for safety, form a general impression and then:

STEP 1

Check for responsiveness:

- Shout, "Are you OK?" and then tap the shoulder and shout again, "Are you OK?"

- For an infant, tap the underside of the foot.

STEP 2

If no response:

- Summon more advanced medical personnel if you have not already done so.
- If the patient is face-down, roll the patient onto their back while supporting the head, neck and back.

(Continued)

Skill Sheet 7-1

Primary Assessment *Continued*

STEP 3

Open the patient's airway and simultaneously check for breathing and a pulse for *at least 5 seconds, but no more than 10 seconds.*

- To open the airway from the side, use the head-tilt/chin-lift maneuver. To open the airway from above the patient's head, use the jaw-thrust (with head extension) maneuver. If a head, neck or spinal injury is suspected, use the jaw-thrust (without head extension) maneuver.
- For an adult or a child, feel for a carotid pulse by placing two fingers in the middle of the patient's throat and then sliding them into the groove at the side of the neck closest to you. Press in lightly; pressing too hard can compress the artery.

- For an infant, feel for the brachial pulse on the inside of the upper arm between the infant's elbow and shoulder. Press in lightly; pressing too hard can compress the artery.

NOTE: For a drowning victim, give 2 ventilations prior to Step 4.

(*Continued*)

Skill Sheet 7-1

Primary Assessment *Continued*

STEP 4

Provide care based on the conditions found.

NOTE: If a patient is unresponsive, but breathing normally with no suspected head, neck, spinal, hip or pelvic injury, move the patient into a side-lying recovery position. Patients with a suspected head, neck, spinal, hip or pelvic injury should not be placed in a recovery position unless you are unable to manage the airway effectively or you are alone and need to leave the patient to call for additional resources.

Skill Sheet 7-2

Jaw-Thrust (Without Head Extension) Maneuver

NOTE: Always follow standard precautions when providing care.

After sizing up the scene and establishing that the patient is unresponsive, lying face-up and a head, neck or spinal injury is suspected:

STEP 1

Kneel above the patient's head.

STEP 2

Put one hand on each side of the patient's head, with your thumbs near the corners of the mouth pointed toward the chin.

STEP 3

Use your elbows for support if needed.

STEP 4

Slide your fingers into position under the angles of the patient's jawbone.

- For a child or an infant, only use two or three fingers of each hand.

STEP 5

Without moving the patient's head, apply downward pressure with your thumbs and lift the jaw.

NOTE: If the patient's lips close, pull back the lower lip with your thumbs.

Skill Sheet 7-3

Using a Resuscitation Mask—Adult, Child and Infant

NOTE: Always follow standard precautions when providing care. Size up the scene for safety. Always select a properly sized mask for the patient.

STEP 1

Assemble the mask and valve.

- Attach the one-way valve to the resuscitation mask, if necessary.

STEP 2

Open the airway.

- Using the head-tilt/chin-lift maneuver, open the airway so it is:
  - Past a neutral position for an adult.
  - Slightly past a neutral position for a child.
  - In a neutral position for an infant.

STEP 3

Position the mask.

- Kneel to the side of or above the patient’s head and place the mask over their mouth and nose, starting from the bridge of the nose.
- Place the bottom of the mask below the mouth but not past the chin.

(Continued)

Skill Sheet 7-3

Using a Resuscitation Mask—Adult, Child and Infant *Continued*

STEP 4

Seal the mask.

- From the *side* of the patient's head:
  - With your top hand, place your thumb and fingers around the top of the resuscitation mask to create a "C."
  - With your other hand, slide your first two fingers into position on the bony part of the patient's chin.
  - Apply even, downward pressure with your top hand and the thumb of your lower hand to seal the top and bottom of the mask.
- From *above* the patient's head:
  - Place your thumbs and index fingers along each side of the resuscitation mask to create a "C" on both sides of the mask.
  - Slide your other fingers into position behind the angles of the patient's jawbone to create an "E" on both sides of the patient's jawbone.
  - Apply even, upward pressure with your fingers to "lift" the jaw into the mask.

STEP 5

Blow into the mask.

- Give 2 ventilations to the patient.
- Each ventilation should last about 1 second and make the chest begin to rise. Pause briefly between ventilations to let the exhaled air escape.

Skill Sheet 7-4

Using a Resuscitation Mask—Head, Neck or Spinal Injury Suspected: Jaw-Thrust (Without Head Extension) Maneuver—Adult or Child

NOTE: Always follow standard precautions when providing care. Size up the scene for safety. Always select a properly sized mask for the patient.

If a head, neck or spinal injury is suspected:

STEP 1

Assemble the resuscitation mask.

- **Attach the one-way valve to the resuscitation mask, if necessary.**

STEP 2

Position the mask.

- **Kneel above the patient's head.**
- **Place the mask over the patient's mouth and nose, starting from the bridge of the nose.**
- **Place the bottom of the mask below the mouth but not past the chin.**

(Continued)

Skill Sheet 7-4

Using a Resuscitation Mask—Head, Neck or Spinal Injury Suspected: Jaw-Thrust (Without Head Extension) Maneuver—Adult or Child *Continued*

STEP 3

Seal the mask.

- Slide your fingers into position under the angles of the patient's jawbone.
- Without moving the patient's head, apply even, downward pressure to seal the mask.

STEP 4

Open the airway.

- Without tilting the head back, open the airway by pushing or thrusting the lower jaw up with your fingers along the jawbone.

STEP 5

Blow into the mask.

- Give 2 ventilations to the patient.
- Each ventilation should last about 1 second and make the chest begin to rise. Pause briefly between ventilations to let the exhaled air escape.

ENRICHMENT

Glasgow Coma Scale

The ***Glasgow Coma Scale (GCS)*** is a tool used to assess a patient's LOC (Table 7-6). Originally intended to assess LOC following a head injury, it is now considered valuable for primary and ongoing assessments of any medical or trauma patient.

A GCS score is based on three parameters: eye opening (E), verbal response (V) and motor response (M). The total score will range from 3 to 15 (E+V+M = 3–15), with 3 representing coma or death and 15 representing a fully awake and alert patient. A GCS score of 8 or less indicates severe brain injury, 9–12 indicates moderate brain injury and 13–14 indicates mild brain injury.

For patients more than 5 years of age, use the standard scale. For children under the age of 5, the verbal responses must be adjusted using the Pediatric Glasgow Coma Scale (PGCS) (Table 7-7).

Table 7-6:
Glasgow Coma Scale

RESPONSE	STATUS	SCORE
Eye Opening (E)	Spontaneous	4 points
	Opens to verbal command	3 points
	Opens to pain	2 points
	No response	1 point
Verbal Response (V)	Oriented and speaks	5 points
	Confused conversation, but able to answer questions	4 points
	Inappropriate responses, words discernible	3 points
	Incomprehensible speech or sounds	2 points
	No response	1 point
Motor Response (M)	Obeys verbal commands	6 points
	Purposeful movement to painful stimulus	5 points
	Withdraws from pain (flexion)	4 points
	Abnormal flexion from pain	3 points
	Extension in response to pain	2 points
	No response	1 point

ENRICHMENT

Glasgow Coma Scale *CONTINUED*

Table 7-7:

Pediatric Glasgow Coma Scale[1]

AREA ASSESSED	CHILDREN	INFANTS	SCORE
Eye Opening (E)	Opens spontaneously	Opens spontaneously	4 points
	Opens in response to verbal stimuli	Opens in response to verbal stimuli	3 points
	Opens in response to pain only	Opens in response to pain only	2 points
	No response	No response	1 point
Verbal Response (V)	Oriented, appropriate	Coos and babbles	5 points
	Confused	Irritable cries	4 points
	Inappropriate words	Cries in response to pain	3 points
	Incomprehensible words or nonspecific sounds	Moans in response to pain	2 points
	No response	No response	1 point
Motor Response (M)	Obeys commands	Moves spontaneously and purposefully	6 points
	Localizes painful stimulus	Withdraws to touch	5 points
	Withdraws in response to pain	Withdraws in response to pain	4 points
	Responds to pain with decorticate posturing (abnormal flexion)	Responds to pain with decorticate posturing (abnormal flexion)	3 points
	Responds to pain with decerebrate posturing (abnormal extension)	Responds to pain with decerebrate posturing (abnormal extension)	2 points
	No response	No response	1 point

[1]Adapted from Davis RJ et al: Head and spinal cord injury. In *Textbook of pediatric intensive care,* edited by MC Rogers. Baltimore, Williams & Wilkins, 1987; James H, Anas N, Perkin RM: *Brain insults in infants and children.* New York, Grune & Stratton, 1985; and Morray JP et al: Coma scale for use in brain-injured children. *Critical Care Medicine* 12:1018, 1984.

8 HISTORY TAKING AND SECONDARY ASSESSMENT

You Are the Emergency Medical Responder

You arrive at the scene of a motor-vehicle collision, a fender bender, in which a woman who was driving her husband to the hospital because he was complaining of chest pain, struck the car in front of her. A police unit is on the scene assisting the husband, who collapsed and apparently is unconscious. Your partner proceeds to help the police officer with the unconscious patient. You notice that the woman is clutching one of her arms. As a responding firefighter, how would you respond to and assess the injured woman?

KEY TERMS

Auscultation: Listening to sounds within the body, typically through a stethoscope.

Blood pressure (BP): The force exerted by blood against the blood vessel walls as it travels throughout the body.

Chief complaint: A brief description, usually in the patient's own words, of why emergency medical services (EMS) personnel were called to the scene.

DCAP-BTLS: A mnemonic to help remember the signs to look for during a physical exam, which is often done during the secondary assessment; the initials stand for deformities, contusions, abrasions, punctures/penetrations, burns, tenderness, lacerations and swelling.

Detailed physical exam: An in-depth head-to-toe physical exam; takes more time than the rapid assessment, and is only done when time and the patient's condition allow.

Diastolic blood pressure: The force exerted against the arteries when the heart is between contractions, or at rest.

DOTS: A mnemonic to help remember what to look for during the physical exam; the initials stand for deformities, open injuries, tenderness and swelling.

Focused trauma assessment: A physical exam on a trauma patient, focused only on an isolated area with a known injury such as a hand with an obvious laceration.

Ongoing assessment: The process of repeating the primary assessment and physical exam while continually monitoring the patient; performed while awaiting the arrival of more highly trained personnel or while transporting the patient.

OPQRST: Mnemonic to help remember the questions used to gain information about pain; the initials stand for onset, provoke, quality, region/radiate, severity and time.

Palpation: Examination performed by feeling part of the body, especially feeling for a pulse.

Physical exam: Exam performed after the primary assessment; used to gather additional information and identify signs and symptoms of injury and illness.

Pulse oximetry: A test to measure the percentage of oxygen saturation in the blood using a pulse oximeter.

Rapid medical assessment: A term describing a rapid head-to-toe exam of a medical patient.

Rapid trauma assessment: A term describing a rapid head-to-toe exam of a trauma patient.

Respiratory rate: The number of breaths per minute; normal rates vary by age and other factors.

SAMPLE history: A way to gather important information about the patient, using the mnemonic SAMPLE; the initials stand for signs and symptoms, allergies, medications, pertinent medical history, last oral intake and events leading up to the incident.

Secondary assessment: A head-to-toe physical exam as well as the focused history; completed following the primary assessment and management of any life-threatening conditions.

Sphygmomanometer: A device for measuring BP; also called a BP cuff.

Stethoscope: A device for listening, especially to the lungs, heart and abdomen; may be used together with a BP cuff to measure BP.

Systolic blood pressure: The force exerted against the arteries when the heart is contracting.

Vial of Life: A community service program that provides emergency medical services (EMS) personnel and other responders with vital health and medical information (including any advance directives) when a person who suffers a medical emergency at home is unable to speak; consists of a label affixed to the outside of the refrigerator to alert responders and a labeled vial or container that has pertinent medical information, a list of medications, health conditions and other pertinent medical information regarding the occupant(s).

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Explain the purpose of the patient history.
- Explain the components of the SAMPLE history.
- Explain the purpose of the secondary assessment.
- Explain the importance of properly assessing a patient's vital signs.
- Explain the components of a physical exam.
- State the areas of the body that are evaluated during the physical exam.
- Identify further questions that may be asked during the physical exam.
- Identify the components of the ongoing assessment.
- Explain the importance of properly assessing a patient's blood pressure (BP).
- Describe the techniques used to measure BP.

SKILL OBJECTIVES

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

- Demonstrate how to obtain a SAMPLE history.
- Demonstrate how to obtain baseline vital signs.
- Demonstrate how to obtain BP by auscultation and palpation.
- Demonstrate how to perform a secondary assessment.

INTRODUCTION

In Chapter 7, you learned how to conduct a primary assessment, which helps you to determine if the patient has any life-threatening conditions through checking level of consciousness (LOC), airway, breathing and circulatory status. However, as you will learn in this chapter, you can obtain more information about the patient through history taking and the secondary assessment, which includes interviewing the patient and bystanders, monitoring vital signs and conducting a physical exam. As with the primary assessment in the case of serious injury or illness, performing and documenting a thorough history and secondary assessment can increase the patient's chance of survival.

OBTAINING THE FOCUSED/ MEDICAL HISTORY

A crucial aspect of your job is to find out as much as possible about the emergency situation, so that you can communicate this information to more advanced medical personnel. In addition to your close observation of the scene and patient, interviews with those involved are generally your best sources of information. Remember never to enter a scene unless you are sure you can do so safely.

Asking the patient about the incident and any existing medical conditions is called obtaining a history. Obtaining a history should not take much time and may be done before or during the physical exam. Keep in mind that, for a critical trauma

CRITICAL FACTS

A crucial aspect of your job is to find out as much as possible about the emergency situation so that you can communicate this information to more advanced medical personnel.

Asking the patient about the incident and any existing medical conditions is called obtaining a history. Obtaining a history should not take much time and may be done before or during the physical exam.

patient or an unconscious medical patient, the history will likely be performed after the physical exam. For a medical patient who is responsive, the history will likely be performed first.

Under ideal circumstances, patients will be able to tell you themselves all you need to know about what happened and any related medical issues. Help relieve the patient's anxiety by explaining who you are and that you are there to help. Also ask the patient's name and use it. Always obtain consent before touching or providing care to a patient.

Pediatric Considerations

If a child or an infant does not respond to your questions, it does not always mean the child or infant is unable to respond. Children and infants may be frightened of you or the situation, may not understand the question or may not be able to speak. Position yourself at or below eye level with the child to avoid being intimidating. Do not separate the child from a parent or legal guardian, unless absolutely necessary.

Necessary information cannot always be obtained from the patient. The patient may be unconscious, disoriented, agitated or otherwise uncooperative, or the patient may not understand and/or speak English. In these cases, interviews with family, friends, caregivers, bystanders or public safety personnel may be helpful.

Considerations for Older Adults

Keep in mind that older people usually prefer to be addressed more formally, as in "Mr. Smith" or "Mrs. Smith." Position yourself at eye level with the patient and speak slowly. Older patients may sometimes appear confused. This can be caused by conditions such as dementia or Alzheimer's disease. It can also be the result of an acute medical condition and may not be typical behavior for that person. Make sure the patient can see and hear you, as an older patient may have vision or hearing problems. Allow time for the older patient to respond. Always treat the patient with dignity and respect (Fig. 8-1).

Sources of information may also be all around you. Be sure to check the patient for a medical identification tag or bracelet, or other medical information sources, such as wallet cards or mobile phone apps. Other hints include the presence of medication containers, medical equipment or a service animal. If you are in the patient's home, you should also look for a ***Vial of Life*** label on the outside of the refrigerator door—it signifies that a vial or container, such as a sealable plastic bag, contains vital medical information and has been placed on the top shelf of the refrigerator door. Some people keep their medications in the refrigerator, so it also is a good idea to look for these items.

Fig. 8-1: Always treat older patients with dignity and respect.

CRITICAL FACTS

Necessary information cannot always be obtained from the patient. The patient may be unconscious, disoriented, agitated or otherwise uncooperative, or the patient may not understand and/or speak English. In these cases, interviews with family, friends, caregivers, bystanders or public safety personnel may be helpful.

The most important component of a patient history is the chief complaint. This is the reason why EMS personnel were called to the scene.

COMPONENTS OF A PATIENT HISTORY

Obtaining a full patient history involves several components. Key among them is the chief complaint, which will allow you to make the important distinction of whether you are dealing with a trauma or medical emergency. Other components to consider are the mechanism of injury (MOI) or nature of illness, the presence and assessment of pain, as well as an evaluation of any relevant medical information.

Chief Complaint

The most important component of a patient history is the ***chief complaint***. This is the reason why emergency medical services (EMS) personnel were called to the scene. The best way to determine the chief complaint is to ask the patient, "Why did you call for EMS personnel?" Record the chief complaint in the patient's own words (Fig. 8-2).

Keep in mind that the most obvious problem is not always the most serious problem. For instance, if a patient's arm is mangled in a car crash, it may appear to be the chief complaint, until you find out the patient is having chest pain and crashed the car after blacking out. When interviewing the patient about the chief complaint, remember to ask the "who, what, when, where and how" of the incident.

Understanding the chief complaint generally makes it clear whether you are dealing with a trauma patient—someone who is injured—or a medical patient—someone who is ill—or a combination. This primary division will guide how you manage the patient.

Mechanism of Injury or Nature of Illness

The next piece of information to determine is the MOI for a trauma patient or the nature of illness for a medical patient.

Fig. 8-2: Understanding the chief complaint will help you determine if you are dealing with someone who is injured or someone who is ill. *Photo: courtesy of Terry Georgia.*

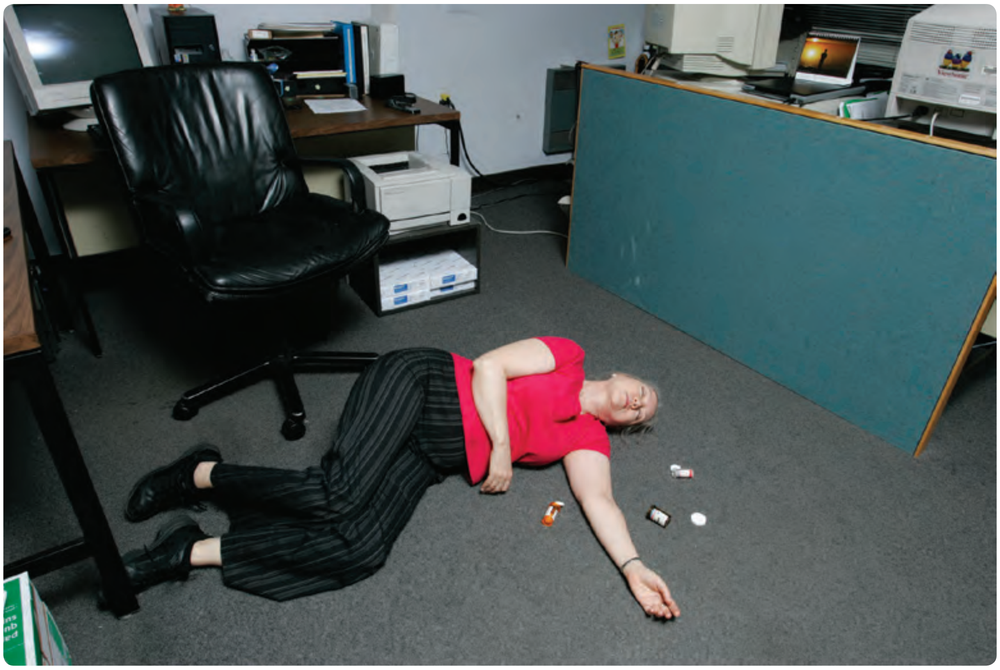


Fig. 8-3: If no one is available to interview, look for clues on the scene to determine what might have happened. *Photo: courtesy of the Canadian Red Cross.*

Mechanism of Injury

In the case of an injury, it is important to find out how the injury occurred and determine what the forces were that caused the injury. This may help predict the specific type of injuries the patient may have.

It will also help you determine whether there is any risk of a spinal injury. If the MOI suggests there is, tell the patient not to move and provide manual stabilization by restricting motion and supporting the head and neck in the position in which you found it. Once you have dealt with the risk of spinal injury, follow the steps for trauma patients. These steps depend on whether there is a significant MOI or not.

Examples of a significant MOI include:

- Being ejected from a vehicle or thrown from a motorcycle.
- A fall from greater than 15 feet or three times the patient's height.
- A vehicle rollover.
- A vehicle collision.
- A pedestrian struck by a vehicle.
- An injury that causes a change in mental status, respiratory distress or signs of shock.
- A penetrating injury to the head, neck, chest or abdomen.
- A blast injury or significant burn.

Nature of Illness

In the case of a medical patient, ask the patient, family, friends or any bystanders why EMS personnel were called. If no one is available to interview, observe the scene. Look for clues such as a very hot or very cold environment or the presence of drugs or poisons (Fig. 8-3).

The steps involved in conducting a secondary assessment on a medical patient depend on whether the patient is responsive or unresponsive.

If the medical patient is responsive, obtain the history first and then perform your exam. In this situation, the history is your first priority because it may be the most valuable information you obtain and also because it is prudent to speak immediately with a responsive patient, since this status might change.

SAMPLE HISTORY

Using the mnemonic SAMPLE, determine the following six items for the patient history:

- **S**igns and symptoms
- **A**llergies
- **M**edications
- **P**ertinent medical history
- **L**ast oral intake
- **E**vents leading up to the incident

Fig. 8-4: Family members or friends may be able to provide information about children.

For step-by-step instructions on obtaining a SAMPLE history, see Skill Sheet 8-1.

In addition to the ***SAMPLE history***, ask the patient to explain what happened. Ask questions such as:

- What happened?
- Are you having any pain?
- How would you describe the pain? You can expect to hear descriptions such as burning, throbbing, aching or sharp pain.
- Is the pain spreading or radiating?
- On a scale of 1 to 10, with 1 being lowest and 10 being highest, how bad is the pain?
- When did the pain start? (See OPQRST.)

Sometimes the patient will be unable to give you the information. This is often the case with a child or with an adult who momentarily lost consciousness and may not be able to recall what happened or is disoriented. Ask family members, friends or bystanders what happened (Fig. 8-4). They may be able to give you helpful information, such as telling you if a patient has a medical condition you should be aware of. They may also be able to help calm the patient, if necessary.

Obtain consent before approaching or touching the patient. Patients may be frightened; offer reassurance. Be calm and patient and, if possible, ensure you are in a comfortable and private location where you will not be interrupted. Use open-ended questions, and encourage the patient to talk using verbal and nonverbal cues. Show you are listening by repeating and paraphrasing the patient's replies. Maintain eye contact and speak slowly, deliberately and in simple terms.

CRITICAL FACTS

Assessing the MOI may help predict the specific type of injuries the patient may have. Significant MOIs include being ejected or thrown from a vehicle; falling from greater than 15 feet or three times the patient's height; receiving a penetrating injury to the head, neck, chest or abdomen; or any injury that causes an altered mental status, respiratory distress or signs of shock.

In the case of a medical patient, ask the patient, family, friends or any bystanders why EMS personnel were called.

The mnemonic SAMPLE refers to what essential information to obtain when taking a history. It refers to signs and symptoms, allergies, medications, pertinent medical history, last oral intake and event leading up to the incident.

Signs and Symptoms

Signs include any medical or trauma assessment findings you can see, feel, hear or smell. For example, this would include measuring blood pressure (BP), seeing an open wound or feeling skin temperature. Symptoms refer to what the patient reports, for example, "I'm having trouble breathing," "I have a headache" or "My chest hurts." For further symptoms, ask the patient to describe the current problem. Ask questions such as:

- Where do you have pain?
- Are you feeling nauseated?
- Do you have a headache?
- Are you having any difficulty breathing?

Allergies

Ask the patient whether they are allergic to any medications, food or environmental elements, such as dust, pollen or bees.

Medications

Ask the patient questions to determine whether they are currently using any medications, both prescription and over-the-counter (OTC). Ask additional questions such as:

- Do you take any vitamins or herbal remedies?
- Have you taken someone else's medications?
- Did you take any recreational drugs?
- Are you using any medication patches?

Pertinent Medical History

Determine whether the patient is under a healthcare provider's care for any condition, if the patient has had a similar problem in the past, or if the patient has been recently hospitalized or had recent surgeries. If the patient is female, ask if she is or could be pregnant.

Last Oral Intake

Determine when the patient last had something to eat or drink and what it was. Also, ask if the patient has recently taken any medication, and if so, what.

Events Leading Up to the Incident

Determine what the patient was doing before and at the time of the incident. The events leading up to the incident could help identify the MOI or nature of illness.

THE SECONDARY ASSESSMENT

The purpose of the ***secondary assessment*** is to locate and further assess the signs and symptoms of an injury or illness. The secondary assessment consists of a head-to-toe ***physical exam***. It may only consist of a rapid assessment (rapid trauma assessment or rapid medical assessment) or it may also include a ***detailed physical exam*** at a later stage.

If you find life-threatening injuries or medical conditions during the primary assessment, such as unconsciousness; severe, life-threatening bleeding; no breathing or no pulse, do not waste time with the detailed physical exam. Instead, focus your attention on providing care for the life-threatening conditions. Complete a secondary assessment following the primary assessment, once all life-threatening conditions are addressed and have been stabilized, if time and resources permit.

For patients with a significant MOI or other critical finding such as altered mental status, take the following steps during the secondary assessment:

1. Continue to maintain spinal motion restriction and an open airway.
2. Consider the need for additional resources, including basic life support or advanced life support, and the need for transport (e.g., for life-threatening conditions, such as airway trauma).
3. Reassess the patient's mental status, as this may change at any time.
4. Perform a ***rapid trauma assessment***, which is a rapid head-to-toe physical exam.
   - A rapid trauma assessment involves checking the head, neck, chest, abdomen, pelvic region, legs, arms and then the back for signs of trauma.
5. Assess baseline vital signs.
6. Obtain a SAMPLE history. If the patient is responsive, ask some history questions simultaneously with the physical exam.
7. Prepare the patient for transport (simultaneously as assessment is being conducted).
8. Provide emergency care.
9. Obtain trauma score (e.g., Glasgow Coma Scale [GCS]), if trained.

Your major concern during the rapid trauma assessment is any potentially life-threatening injuries that you must manage immediately.

CRITICAL FACTS

Complete a secondary assessment following the primary assessment, once all life-threatening conditions are addressed and have been stabilized, if time and resources permit.

For the trauma patient who does not have a significant MOI such as those outlined above, follow these steps:

1. Perform a ***focused trauma assessment*** (e.g., for a laceration to the leg).
2. Obtain a SAMPLE history and baseline vital signs.
3. Perform components of a detailed physical exam, as needed.
4. Provide emergency care.

For a responsive trauma patient, follow these steps for the secondary assessment (Skill Sheet 8-2):

1. Obtain the SAMPLE history.
2. Assess the patient's complaints (OPQRST—onset, provoke, quality, region/radiate, severity and time).
3. Perform a focused trauma assessment unless signs and symptoms make the focus unclear, in which case you would perform a rapid trauma assessment (head to toe).
4. Assess baseline vital signs.
5. Perform components of the detailed physical exam, as needed.
6. Provide emergency care.
7. Consider the need for additional resources, including basic life support or advanced life support, and the need for transport (e.g., for life-threatening conditions, such as anaphylaxis).

If a medical or trauma patient is unresponsive, consider the patient as critical, requiring that you begin with a rapid patient assessment, to gain as much information as possible on the nature of illness.

For an unresponsive patient who is breathing normally, take the following steps for the secondary assessment (Skill Sheet 8-3):

1. Consider the need for additional resources, including advanced life support, and the need for transport (e.g., for life-threatening conditions, such as a heart attack).
2. Perform a rapid medical or trauma assessment (head to toe).
   - A ***rapid patient assessment*** involves checking the head, neck, chest, abdomen, pelvic region, legs, arms and then the back for signs of medical problems.
3. Assess baseline vital signs.
4. Position a patient who is unresponsive, but breathing normally, with no suspected head, neck, spinal, hip or pelvic injury, in a side-lying recovery position and ensure protection of their airway.
5. Obtain a SAMPLE history from the family or any bystanders, if available.
6. Provide emergency care.

Physical Exam

Many patients view a physical exam with apprehension and anxiety—they feel vulnerable and exposed. Maintain professionalism throughout the physical exam and display compassion toward the patient. Explain what areas you are going to assess. If you have questions about an area and the patient is responsive, ask questions prior to examining the area. Maintain the patient's privacy during the physical exam, such as by conducting the exam in an area that cannot be seen by bystanders. When you need to remove the patient's clothing, cut it away rather than manipulating the patient to remove it. Cover each area after you have examined it. Try to keep the patient calm, and keep the patient from moving the head, neck and spine and any body part that hurts to move.

Pediatric Considerations

You may find it helpful to use distracting measures, such as a teddy bear or doll, to gain the trust of a child. Keeping the child with the parent or legal guardian can also help ease the child's fear. If the child becomes extremely agitated or upset, conduct a toe-to-head assessment of the child, unless there is a suspected life-threatening injury or illness.

Considerations for Older Adults

When assessing older patients, consider that they may have glasses and/or hearing aids and will be better able to participate in the assessment process if they are wearing them. Expect the assessment to take a little longer with older adult patients than with a younger adult. Keep in mind that it might take older adult patients a little longer to respond. For other considerations for older adults, refer to Chapter 26.

Your exam may focus on a specific area, based on the patient's chief complaint, or be specific to a particular injury or illness. As you discover certain signs and symptoms, there may be specific relevant questions you should ask.

For the rapid assessment, be sure to examine the patient systematically from head to toe, placing special emphasis on areas suggested by the chief complaint, but remembering to examine the whole body. The patient may focus on a bothersome complaint or a painful one, and fail to identify a more serious problem.

The physical exam for trauma and medical patients is similar, in that the purpose is to gather additional information. However, the type of information you are assessing for may be different in the two different types of patients. With the trauma patient, you are looking for evidence of injury; with the medical patient, you are trying to determine the severity of the condition. For example, if you are examining a limb in the trauma patient, you may be most interested in tenderness, pain, swelling and deformities, as well as pulse and motor/sensory function, as an indication of injury. For the medical patient, you may be looking for signs of inadequate circulation, discoloration or swelling, as well as motor/sensory function, as a sign of the status of the brain or heart.

When you perform the physical exam, gather additional information on the patient's condition. As you examine the patient, compare each body part on one side of the body to the other. You can gain information by inspecting visually as well as palpating (feeling) areas of the body.

DOTS

The mnemonic ***DOTS*** may be helpful during the physical exam for patients who have been injured. It stands for:

- **D**eformities. Deformities may include depressions or indentations, parts that have shifted away from their usual position, parts that are more rigid or less rigid than normal (e.g., abdomen) or obvious signs of broken bones.
- **O**pen injuries. Open injuries may include anywhere there is bleeding, including the scalp. These may be serious, such as open injuries to the chest, or less serious, as in cuts and scrapes. Open injuries also include penetrating wounds, such as knife or gunshot wounds.
- **T**enderness. Tenderness may be experienced even when there are no obvious signs of injury. When there is tenderness of the abdomen, it is important to determine in which quadrant the patient feels pain. Begin in the quadrant where the patient feels the least pain so this does not influence the remaining assessment of the abdomen.
- **S**welling. Swelling may indicate an accumulation of blood, air or other fluid in the tissues below the skin. In an extremity, it may indicate that the bone is broken.

OPQRST

As part of the physical exam, if the patient is responsive, ask questions to gain information about pain. One method of questioning can be remembered using the mnemonic ***OPQRST***, which stands for onset, provoke, quality, region/radiate, severity and time. It can be used for both patients who have been injured and those who have a medical condition.

- **O**nset: What were you doing when the pain started? Was the onset abrupt or gradual?
- **P**rovoke or palliation: What makes it worse? What makes it better?
- **Q**uality: Is the pain blunt, sharp, burning, crushing or tearing?
- **R**egion/**R**adiate: Where is the pain and does it radiate (spread)? Do you have pain or discomfort somewhere else?
- **S**everity: On a scale of 1 to 10, how intense is the pain?
- **T**ime: When did it start? How long has it been present? How has it changed since it started?

For trauma patients, the mnemonic DCAP-BTLS will remind you of the most common signs you may find.

CRITICAL FACTS

As part of the physical exam of a responsive patient, ask questions using the OPQRST mnemonic.

DCAP-BTLS

During the detailed physical exam, the mnemonic ***DCAP-BTLS*** may help you remember the signs you are looking for as you conduct your head-to-toe assessment. The letters stand for:

- **D**eformities.
- **C**ontusions.
- **A**brasions.
- **P**unctures/**P**enetrations.
- **B**urns.
- **T**enderness.
- **L**acerations.
- **S**welling.

Keep these types of injuries in mind as you check each major area. Remember to use each of your senses. Many of these types of injuries can be seen upon examination. By palpating (feeling) for injuries, you can determine if there are any deformities or swelling and if the patient is experiencing any pain or tenderness. Even if the patient cannot tell you, you can observe any grimacing on the patient's face. In addition to seeing and feeling for signs of injury, listen for abnormal breathing sounds, for example gurgling or stridor in the upper airway. Auscultate (listen) to the lungs with a stethoscope for breath sounds. You can also listen for the sound of broken bones rubbing against each other, which is called crepitus. Use your sense of smell. This is one way you can detect any unusual or unexpected odors such as the presence of alcohol or a fruity-smelling breath, as well as the possible presence of urine or feces.

As with any physical exam, try to keep the patient calm and comfortable. Rather than focusing on your findings, explain what you are doing to minimize any distress about the injuries. Do not move the patient unnecessarily if you suspect a neck or spinal injury.

If there is a serious MOI, it is crucial to completely expose the patient to look for additional injuries. Protect the patient's privacy by covering all patients, male or female of any age, with a sheet and only expose the area you are examining.

When you need to remove clothing, cut it away rather than manipulating the patient to remove it. Cover each area after you have examined it.

DETAILED PHYSICAL EXAM

Once the focused history and physical exam have been completed and any life-threatening conditions have been managed, a detailed physical exam may be conducted. This exam is not carried out on every patient. It requires much more time than a rapid assessment to conduct, as it is more detailed, and so can only be performed when time and the patient's condition allow. Often, it is conducted in the ambulance or other transport vehicle, en route to the hospital.

The detailed physical exam is a systematic head-to-toe exam that helps you gather additional information about injuries or conditions that may need care. These injuries or conditions are not immediately life threatening but could become so if not cared for. For example, you might find minor bleeding or possible broken bones as you conduct your exam of the patient. As you conduct the physical exam, tell the patient what you are going to do.

The physical exam process involves looking (inspection), listening (***auscultation***) and feeling (***palpation***). You may even smell something you can gather as information, such as the smell of bleach on the breath, which may indicate poisoning. After telling the patient exactly what you are going to do and asking the patient to hold still, inspect and palpate each part of the body, starting with the head, before you move on to the next area (see Skill Sheet 8-4).

Ask the patient to tell you if any areas hurt. Avoid touching any painful areas or having the patient move any area that causes discomfort. Watch facial expressions and listen for a tone of voice that may reveal pain. Look for a medical identification tag or bracelet or a medical identification app on the patient's mobile phone (Fig. 8-5, A–B). This information may help you determine what is wrong, whom to call for help and what care to provide.

As you do the head-to-toe exam, think about how the body normally looks and feels. Be alert for any sign of injuries—anything that looks or feels

Fig. 8-5, A–B: A medical identification tag **(A)** or mobile phone app **(B)** may help determine what is wrong, what care to provide and whom to call. *Photos: N-StyleID.com.*

unusual. If you are uncertain whether your finding is unusual, check the other side of the body for symmetry. Once the detailed physical exam is complete, reassess the vital signs and continue emergency care.

Head

To check the head, gently feel for any deformities. If you feel a depression or soft area, do not place any pressure over the area. Look for blood or clear fluid in or around the ears, nose and mouth. Blood or clear fluid can indicate a serious head injury. Is there presence of vomit around the mouth? Look at the teeth (Fig. 8-6).

Check the LOC again and note any change. Look at facial symmetry. Check the pupils. If they are unequal, this is an abnormal finding. Do they react to light by constricting and to darkness by dilating? This reaction is normal. If they remain constricted or dilated, this is an abnormal finding. Does the shape of the eyes look unusual? Look for bruising on the face, especially around the eyes.

Neck

To check the neck, look and feel for any abnormalities (Fig. 8-7, A–C). Does the patient breathe through a stoma? A stoma is an opening in the neck to allow a person to breathe after surgery to remove part, or all, of the larynx (voice box) or other structures of the airway. The person may breathe *partially* through this opening, or may breathe *entirely* through the stoma instead of through the nose and mouth.

Fig. 8-6: Blood or clear fluid in the ears, mouth or nose can indicate a serious head injury.

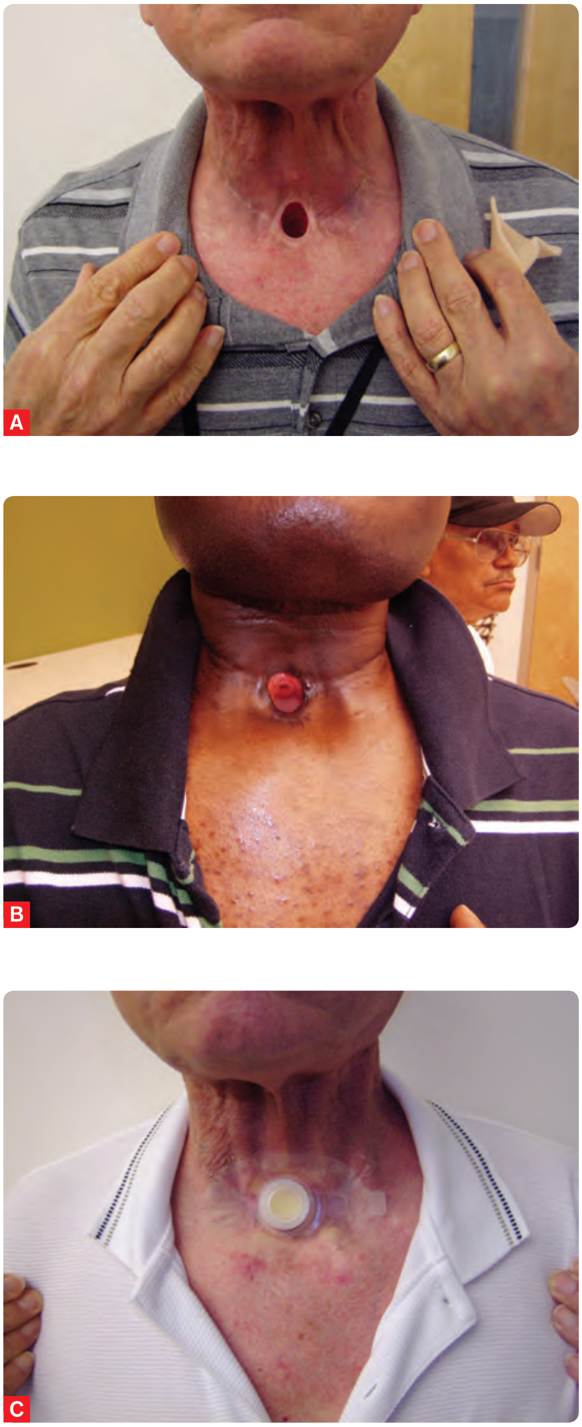


Fig. 8-7, A–C: (A) A stoma without a prosthesis. **(B)** A stoma with tracheoesophageal prosthesis. Prosthesis should not be removed by an EMR. **(C)** A stoma with a heat and moisture exchange filter. The filter should be removed in an emergency. *Photos: courtesy of the International Association of Laryngectomees.*

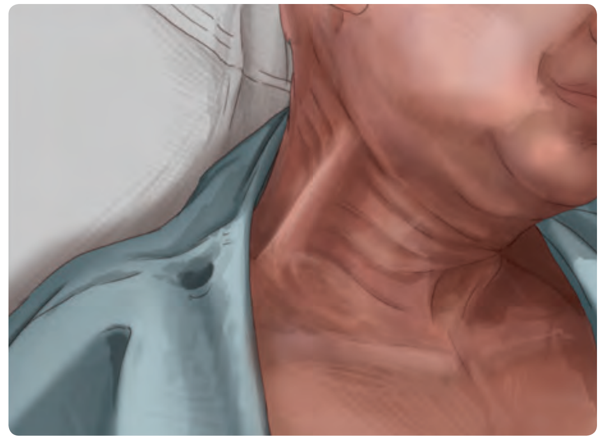


Fig. 8-8: A distended jugular vein.

Are there any open wounds? Is the patient using the accessory muscles for breathing (a sign of difficulty)? Is the jugular vein distended (enlarged and protruding) (Fig. 8-8)?

If the patient has not suffered an injury involving the head or trunk and does not have any pain or discomfort in the head, neck or back, then there is little likelihood of spinal injury. You should proceed to check other body parts. If, however, you suspect a possible head or spine injury because of the MOI, such as a motor-vehicle collision or a fall from a height, minimize movement to the patient's head and spine. You will learn about spinal motion restriction (SMR), techniques for stabilizing and immobilizing the head and spine, in Chapter 23.

Chest

Check the collarbones and shoulders by feeling for deformity (Fig. 8-9). Check the chest by asking the patient to take a deep breath and then blow the air out. Ask the patient if there is any pain. Auscultate for lung sounds if you are trained to do so. Look and listen for more subtle signs of breathing difficulty, such as wheezing or diminished lung sounds. Feel the ribs for deformity. Examine the chest. Does it rise and fall without effort or is there evidence of an effort to breathe? Are there any open wounds? Is the chest symmetrical?

Abdomen

Next, ask if the patient has any pain in the abdomen. Expose the abdomen and look for discoloration, open wounds or distension (swelling). Are there any scars or protruding organs? Does the patient look pregnant? Look at the abdomen for any pulsating. If there is no pulsating, apply slight pressure to each of the abdominal quadrants (Fig. 8-10), avoiding any areas where the patient had indicated pain.

Fig. 8-9: Examine the chest, looking for deformities or signs that the patient is having difficulty breathing.

Fig. 8-10: Examine the abdomen for tenderness, rigidity, discoloration, open wounds, swelling or pulsating masses.

Pelvis

Check the hips, asking the patient if there is any pain. Place your hands on both sides of the pelvis, push in on the sides and then push down on the hips. Check for instability and any reaction to pain.

Extremities

Check only one extremity at a time. Look at and feel each leg for any deformity. If there is no apparent sign of injury, ask the patient to move the toes, foot and leg. Repeat this procedure on the other leg. Finally, determine if the patient has any pain in the arms or hands. Feel the arms for any deformity. Check limbs for symmetry and check the pulse. Look at color. If there is no apparent sign of injury, ask the patient to move the fingers, hand and arm. Repeat this procedure on the other arm. Check for distal circulation and sensation in both arms and legs. Check capillary refill.

Back

Examine the back for any injuries by palpating equally along the spine from the neck downward, with your fingertips. Check for any reaction to pain. Look for discoloration, open wounds and any signs of bleeding. Your exam should be methodical and purposeful so that you do not overlook any details (Fig. 8-11).

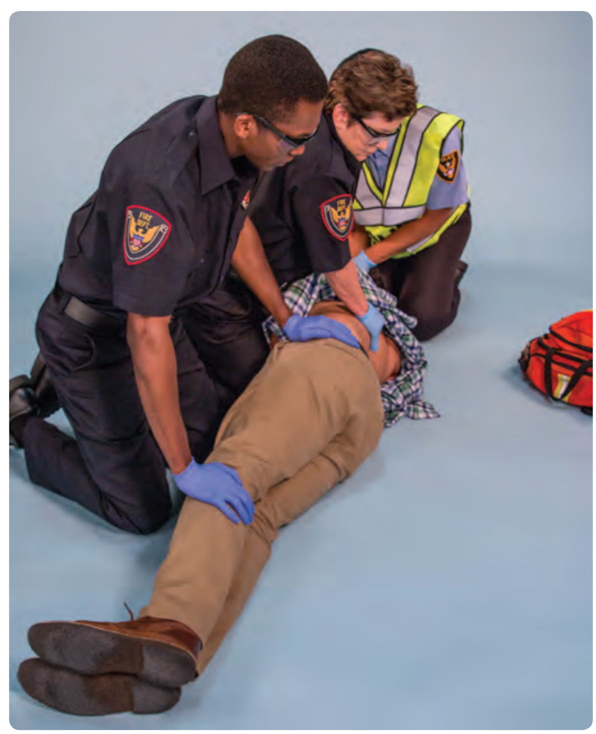


Fig. 8-11: Examine the back methodically, looking for discoloration, open wounds, bleeding or reactions to pain.

If the patient can move all body parts without pain or discomfort and there are no other apparent signs or symptoms of injury, have the patient attempt to rest for a few minutes in a sitting position. If more advanced help is not needed, continue to check the signs and symptoms and monitor the patient's condition.

Take note of the information you find during the physical exam. Sometimes you may need to have a partner fill out the form with the information you gather. This will help you when it is time to give a verbal report to the next level of care as you transfer the patient. Immediately treat any life-threatening problems found in the detailed physical exam by delegating care to another responder if one is available. It is important to complete the entire exam so that nothing is missed.

OBTAINING BASELINE VITAL SIGNS

The initial set of vital signs provides a starting point for establishing a baseline to determine the status of your patient. The vital signs can tell you how the body is responding to injury or illness. Look for changes in vital signs as you provide care and note anything unusual (see Skill Sheet 8-5).

Vital signs are taken after managing life-threatening problems found during the primary assessment. They are normally taken after the rapid assessment is complete; however, if several responders are on scene, they may be taken simultaneously. Note that absolute values are not as important as trends.

There are three major vital sign measures to be taken:

- Respiratory rate
- Pulse
- BP

You may also measure skin characteristics (color, temperature and moisture) and pupils at this stage.

Respiratory Rate

A healthy person breathes regularly, quietly and effortlessly. The normal ***respiratory rate*** for an adult is between 12 and 20 breaths per minute. However, some people breathe slightly slower or faster.

Excitement, fear and exercise cause breathing to increase and become deeper. Certain injuries or illnesses can also cause both the rate and quality of breathing to change.

As you assess the patient, watch and listen for any changes in breathing. Abnormal breathing may indicate a potential problem. The signs and symptoms of abnormal breathing include:

- Gasping for air.
- Noisy breathing, including whistling sounds, wheezing, crowing, gurgling or snoring.
- Excessively fast or slow breathing.
- Painful breathing.

Pediatric Considerations

Respiratory rates in children and infants vary by age. The following are the normal respiratory rates by age category:

- Newborns: 30 to 50 breaths per minute
- Infants (0 to 5 months): 25 to 40 breaths per minute
- Infants (6 to 12 months): 20 to 30 breaths per minute
- Toddlers (1 to 3 years): 20 to 30 breaths per minute
- Preschoolers (3 to 5 years): 20 to 30 breaths per minute
- School age (6 to 10 years): 15 to 30 breaths per minute
- Adolescents (11 to 14 years): 12 to 20 breaths per minute

In the primary assessment, the goal is to determine whether a patient is breathing at all, whereas in the secondary assessment, you are concerned with the rate, rhythm and quality of breathing. Look, listen and feel again for breathing (Fig. 8-12). Look for the rise and fall of the patient's chest or abdomen. Listen for sounds as the patient inhales and exhales. Count the number of times a patient breathes (inhales and exhales) in 30 seconds and multiply that number by 2, or

CRITICAL FACTS

When obtaining baseline vital signs, the respiratory rate, pulse and BP are essential. Skin characteristics and pupils can be assessed as well.

Fig. 8-12: Take note of rate, rhythm and quality when evaluating breathing in the secondary assessment. *Photo: courtesy of Terry Georgia.*

in 15 seconds and multiply that number by 4. This is the number of breaths per minute. As you check for the rate and quality of breathing, try to do it without the patient's knowledge. If the patient realizes you are checking breathing, this may cause a change in breathing pattern without the patient being aware of it. Maintain the same position you would when you are checking the pulse for a responsive patient.

Refer to Chapter 7 for more information on breathing rate and quality.

Lung sounds, or breath sounds, are the noises produced by the lungs during breathing. Some are normal and others are abnormal. The most common abnormal breath sounds are crackles, rhonchi, stridor and wheezing. Crackles, also called rales, are small popping, rattling or bubbly sounds that are produced when closed spaces pop open. They can be described as fine or coarse. Rhonchi are low-pitched snoring sounds caused by the narrowing of the airway and the presence of secretions in the airway. Stridor is a harsh, high-pitched sound due to constriction in the upper airways. Wheezing is a high-pitched whistling sound created by air flowing through narrow airways; it can be heard on exhalation and inhalation.

Absent or decreased normal sounds on one or both sides of the chest can also be an indication of problems with breathing, for example, because of air or fluid around the lungs or reduced air flow to part of the lungs.

Pulse

With every heartbeat, a wave of blood moves through the blood vessels. This creates a beat called the pulse. You can feel it with your fingertips in arteries near the surface of the skin. In the primary assessment, the goal is to determine whether a pulse is present. To determine this, you check the carotid arteries. In the secondary assessment, you are trying to determine pulse rate, rhythm and quality. This is most often done by checking the radial pulse located on the thumb side of the patient's wrist.

When the heart is healthy, it beats with a steady rhythm. This beat creates a regular pulse. A normal pulse for an adult is between 60 and 100 beats per minute. A well-conditioned athlete may have a pulse of 50 beats per minute or lower. Refer to Chapter 7, Table 7-5 for average pulse rates by age. If the heartbeat changes, so does the pulse. An abnormal pulse may be a sign of a potential problem. These signs include:

- An irregular pulse.
- A weak and hard-to-find pulse.
- An excessively fast or slow pulse.

When severely injured or unhealthy, the heart may beat unevenly, producing an irregular pulse. The rate at which the heart beats can also change. The pulse speeds up when a patient is excited, anxious, in pain, losing blood or under stress. It slows down when a patient is relaxed. Some heart conditions can also speed up or slow down the pulse rate. Sometimes changes may be subtle and difficult to detect. The most important change to note is a pulse that changes from being present to no pulse at all.

Checking a pulse is a simple procedure. Place two fingers on top of a major artery where it is located close to the skin's surface and over a bony structure. Pulse points that are easy to locate include the carotid arteries in the neck, the radial artery in the wrist, the femoral arteries in the groin and, for infants, the brachial artery in the inside of the upper arm (Fig. 8-13). To check the pulse rate, count the number of beats in 30 seconds and multiply that number by 2, or the number of beats in 15 seconds and multiply that number by 4. The result is the number of heartbeats per minute. If you find the pulse is irregular, you may need to check it for more than 30 seconds.

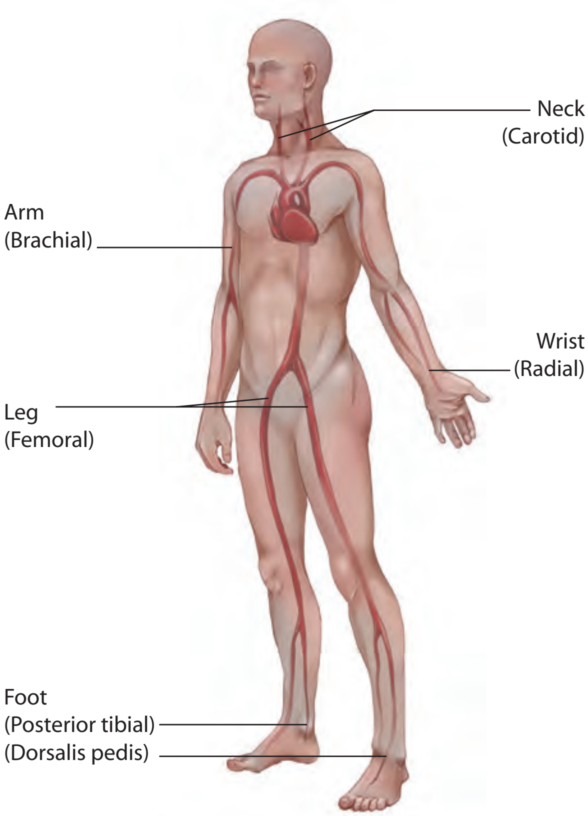


Fig. 8-13: Easily located pulse sites.

An injured or ill patient's pulse may be hard to find. Remember, if a patient is breathing normally, the heart is also beating. However, there may be a loss in circulation to the injured area, causing a loss of pulse. If you cannot find the pulse in one place, check it in another location, such as in the other wrist.

Pediatric Considerations

When measuring the pulse in an infant, use the brachial artery rather than the radial artery, as in adults. Pulse measurement in children and infants varies by age:

- Newborns: 120 to 160 beats per minute (bpm)
- Infants (0 to 5 months): 90 to 140 bpm
- Infants (6 to 12 months): 80 to 140 bpm
- Toddlers (1 to 3 years): 80 to 130 bpm
- Preschoolers (3 to 5 years): 80 to 120 bpm
- School age (6 to 10 years): 70 to 110 bpm
- Adolescents (11 to 14 years): 60 to 105 bpm

Blood Pressure

Another vital sign used to assess a patient's condition is ***blood pressure (BP)***. BP measures the force of blood against the walls of the artery as it travels through the body. It is a good indicator of how the circulatory system is functioning.

Because a patient's BP can vary greatly, it is only one of several factors that give you an overall picture of a patient's condition. Stress, excitement, injury and illness can affect BP.

When a person is injured or ill, a single BP measurement is often of little value. A more accurate picture of a patient's condition immediately after an injury or the onset of an illness is whether BP changes over time while you provide care. For example, a patient's initial BP reading could be uncommonly high as a result of the stress of the emergency. It can also be temporarily elevated just because the patient is in the presence of a medical professional, a phenomenon called "white coat hypertension." Providing care, however, usually relieves some of the fear, and BP may return to within a normal range. At other times, BP will remain unusually high or low. For example, an injury resulting in a severe loss of blood may cause BP to remain unusually low. You should be concerned about unusually high or low BP or a large change in BP whenever signs and symptoms of injury or illness are present.

Fig. 8-14, A–B: Equipment needed to measure blood pressure includes **(A)** a blood pressure cuff and **(B)** a stethoscope.

Equipment for Measuring Blood Pressure

To measure BP, you need two pieces of equipment: a ***sphygmomanometer*** (BP cuff) and a ***stethoscope*** (Fig. 8-14, A–B).

A sphygmomanometer is made up of two main parts: an inflatable cuff that is wrapped around the patient's arm (or leg) and a manometer. The cuff is made of fabric and comes in several sizes. It has a rubber bladder inside, which is connected at the end to a hose with a rubber ball, called a bulb. A valve in the bulb opens and closes to control the flow of air into the bladder. The valve is controlled by a screw. If you turn the screw to the left, it opens the valve and lets the air escape from the bladder. If you turn the screw to the right, it closes the valve so that when you pump air into the bladder with the bulb, the valve keeps the air inside the bladder, making the cuff tight.

When you pump air into the cuff, the bladder pressure increases until it is strong enough to stop the blood flow through the brachial artery. At this point, you do not hear anything through the stethoscope. As you turn the valve to slowly release pressure on the brachial artery, the cuff pressure eventually matches and then drops below the systolic blood pressure. When the cuff pressure reaches this point, you begin to hear the pulse sounds. As the cuff pressure drops to equal the diastolic blood pressure in the artery, the sounds change or fade away.

The second part to the sphygmomanometer is the manometer, a gauge that measures systolic and diastolic pressure. The numbers on the gauge show the pressure in millimeters; the higher the number, the greater the pressure. There are three types of manometers: mercury, aneroid and electronic.

The aneroid manometer shows the pressure readings on a round dial with an arrow that points to the numbers (Fig. 8-15, A). Although there is no mercury column, the numbers on the dial are equal to millimeters of mercury (mmHg). The arrow moves from zero to the higher numbers as you inflate the cuff.

CRITICAL FACTS

To measure BP, you need two pieces of equipment: a sphygmomanometer (BP cuff) and a stethoscope.

The electronic manometer (Fig. 8-15, B) eliminates the need for using a stethoscope and listening for the pulse sounds, because it takes the BP readings for you and displays them on a digital screen like the one on an electronic thermometer.

The stethoscope is used together with the sphygmomanometer to allow you to hear the BP sounds. It consists of two pieces of tubing that are connected at one end to a flat disk called a diaphragm. The earpieces, which are connected to the other end of the tubing, fit into your ears and allow you to hear sounds. Some stethoscopes have a bell-shaped end in addition to the diaphragm. Before taking a person's BP, check the tubing and diaphragm for cracks and holes that could make it difficult to hear and could cause you to make an error in the BP reading. To prevent the spread of infection, use alcohol to clean the diaphragm after each contact with a person. If you use a stethoscope that is used by other caregivers and is used on a regular basis, clean the earpieces with alcohol before putting them in your ears.

A

B

Fig. 8-15, A–B: (A) An aneroid manometer. **(B)** An electronic manometer.

Measuring Blood Pressure

BP is measured in millimeters of mercury, or mmHg. It is reported as two numbers, systolic BP over diastolic blood pressure (Table 8-1). ***Systolic blood pressure*** is the force exerted against the arteries when the heart is contracting. An average adult systolic blood pressure is 120 mmHg. ***Diastolic blood pressure*** is the force exerted against the arteries when the heart is between contractions, with an average adult reading of 80 mmHg.

An accurate reading can be acquired through auscultation (listening) or by palpation (feeling); see Skill Sheets 8-6 and 8-7.

To measure BP by auscultation, use the BP cuff together with the stethoscope as follows:

- Have the patient sit or lie down in a comfortable position. Make sure the forearm is on a supported surface in front or to the side of the patient and not hanging down or raised above the level of the heart.
- Select an appropriately sized cuff for the patient. The cuff should cover approximately two-thirds of the patient's upper arm. Place the cuff so that the bladder is centered over the brachial artery and the bottom edge of the cuff is about 1 inch above the crease of the elbow.

CRITICAL FACTS

BP is measured in millimeters of mercury, or mmHg. It is reported as two numbers, systolic blood pressure over diastolic blood pressure. Systolic blood pressure is the force exerted against the arteries when the heart is contracting. Diastolic blood pressure is the force exerted against the arteries when the heart is between contractions.

Table 8-1:

Categories for Blood Pressure Levels in Adults in Millimeters of Mercury (mmHg)[1]

CATEGORY	SYSTOLIC (Top number)	DIASTOLIC (Bottom number)
Normal	Less than 120	Less than 80
Prehypertensive	120–139	80–89
High blood pressure		
Stage 1	140–159	90–99
Stage 2	160 or higher	100 or higher

[1]For adults 18 and older who are not on medication for high blood pressure, are not having a short-term serious illness and do not have other conditions, such as diabetes or kidney disease. When systolic and diastolic blood pressures fall into different categories, the higher category should be used to classify blood pressure level. For example, 160/80 mmHg would be stage 2 high blood pressure. *Source: www.nhlbi.nih.gov/health/dci/Diseases/Hbp/HBP_WhatIs.html.*

Fig. 8-16: When measuring blood pressure by auscultation, center the diaphragm of the stethoscope firmly over the brachial artery.

Fig. 8-17: Estimating a systolic blood pressure requires you to feel for the radial pulse.

- Place the stethoscope earpieces in your ears, with the earpieces facing forward. Center the diaphragm of the stethoscope firmly over the brachial artery, about 1 inch above the crease of the elbow (Fig. 8-16).
- Close the thumb valve by rotating the knob *clockwise* and then squeeze the rubber bulb to inflate the cuff. This compresses the brachial artery, momentarily stopping the blood flow. Stop inflating when you can no longer hear the pulse.
- Next, slowly release the air in the cuff at approximately 2 to 4 mmHg per second by turning the valve *counterclockwise* and listen with the stethoscope. Watch the pressure gauge and note the number, recorded in even numbers, when you first hear the pulse again. This is the systolic pressure, or the pressure of the blood when the heart beats.
- Continue to release the air from the bulb and watch the manometer. Once you hear the last sound, record the reading on the gauge. This is the diastolic pressure, or the pressure between heartbeats.

Palpation can prove particularly helpful and recommended in noisy environments where auscultation may prove difficult or potentially inaccurate. Measuring BP by palpation requires you to feel the radial artery as you inflate the BP cuff (Fig. 8-17).

- Have the patient sit or lie down in a comfortable position. Make sure the forearm is on a supported surface in front or to the side of the patient and not hanging down or raised above the level of the heart.

Fig. 8-18: Blood pressure cuffs come in sizes for small, average and large arms.

- Select an appropriately sized cuff for the patient (Fig. 8-18). The cuff should cover approximately two-thirds of the patient's upper arm. Place the cuff so that the bladder is centered over the brachial artery and the bottom edge of the cuff is about an inch above the crease of the elbow.
- Locate the patient's radial pulse, then close the thumb valve by rotating the knob *clockwise* and then squeeze the rubber bulb to inflate the cuff. This compresses the brachial artery which in turn compresses the radial artery, momentarily stopping the blood flow. Stop inflating when you can no longer feel the radial pulse. Record the reading on the manometer.
- Continue to inflate the cuff for another 20 mmHg beyond this point. Release the pressure slowly by turning the regulating valve *counterclockwise*, and allow it to deflate at about 2 to 4 mmHg per second. Continue to feel for the radial pulse as the cuff deflates. The point at which the pulse returns is the approximate systolic blood pressure. This BP reading should be shown with an even number followed by the letter P to indicate palpation, for example, 130/P. It is important to note whether the patient was lying or sitting when the reading was taken.

When the proper equipment is not available, you can approximate the systolic blood pressure in certain pulse locations. For example, the radial artery, located at the wrist, indicates a systolic pressure of about 80 mmHg. The femoral artery indicates a systolic pressure of about 70 mmHg. The carotid artery in the neck indicates a systolic pressure of about 60 mmHg. Two options for approximating the systolic blood pressure include asking the patient what their normal BP is or inflating the cuff to 160 mmHg. For precautions to be aware of when taking blood pressure, see Table 8-2.

Pediatric Considerations

It is difficult to obtain an accurate BP reading on a child. First, the cuff must fit correctly, and it is difficult to have the correct size for a wide range of children. However, determining BP in children is not as important as it is with adults. In general, children under 3 years of age do not have their BP taken. What is more important in assessing children is adequate airway management. Children's BP may not drop until there has been a significant loss of blood. Therefore, provide care for shock if the MOI calls for it, regardless of BP.

BP may be estimated in children. The formula for the average BP for a child is 90 + (2 × the age of the child in years). This formula can be used for children up to the age of 12.

BP numbers in children and infants vary by age (see Table 8-3).

- Infants (1 to 12 months): systolic 70 mmHg (lower limit of normal); diastolic 2/3 of systolic pressure. Ranges for newborns vary depending on birth weight and whether the newborn is full term or premature.
- Children (1 to 12 years):
  - Lower limit of normal: systolic 70 mmHg + (2 × age in years); diastolic 2/3 of systolic pressure
  - Upper limit of normal: systolic 90 mmHg + (2 × age in years); diastolic 2/3 of systolic pressure
- Adolescents: systolic 90 mmHg (lower limit of normal); diastolic 2/3 of systolic pressure

For other pediatric considerations, see Chapter 25.

Table 8-2:
Precautions for Taking a Patient's Blood Pressure

PRECAUTION	REASON
Place the cuff on the patient's bare arm or lightly clothed arm.	Heavy clothing may give an incorrect reading. When the diaphragm is placed on heavy clothing, it creates noises that make it difficult to hear pulse sounds.
Select the correct cuff size: adult-size for most adults, extra-large for some adults and child-size for small people.	Using the correct size results in an accurate reading.
Wrap the cuff smoothly and snugly.	A smooth wrap gives an accurate reading.
Position the cuff correctly, with the center of the bladder over the brachial artery.	Correct positioning gives an accurate reading.
Do not place the cuff on a cast.	The cuff cannot compress the cast, which results in no reading.
Do not place the cuff on an arm with an IV in place.	The pressure from the cuff could stop the flow of fluid and possibly cause the needle to clog or dislodge from the vein.
Do not place the cuff on the weak arm of a patient who has had a stroke or on a patient's paralyzed arm. For a woman who has had a mastectomy, do not place the cuff on the arm that is on the same side as the mastectomy.	Circulation in these conditions is impaired, resulting in an inaccurate reading. Also, an inflated cuff decreases circulation in the arm and may cause some damage.
Do not place the cuff on an arm that has an AV fistula that is used for hemodialysis.	Placing and inflating the blood pressure cuff over this site can cause low blood flow, blood clot formation within the fistula as well as collapse of the fistula, making the site unusable. This could lead to surgical intervention for the patient.

Table 8-3:
Normal Blood Pressure Ranges in Children and Infants

AGE	SYSTOLIC	DIASTOLIC
Children (1 to 12 years old)	90 + (2 × age in years) mmHg	2/3 of systolic pressure
Infants (1 to 12 months)	70 + (2 × age in years) mmHg	2/3 of systolic pressure
Newborns (ages 1 to 28 days)	> 60 mmHg (varies depending on birth weight and gestation)	> 14 mmHg (varies depending on birth weight and gestation)

ONGOING ASSESSMENT

Once you have completed the secondary assessment and provided care for any injuries and illnesses, provide ***ongoing assessment*** and care while you wait for more advanced medical care to arrive. The purpose of the ongoing assessment is to identify and treat any changes in the patient's condition in a timely manner and to monitor the effectiveness of interventions or care provided. Record additional findings and turn this information over to the next level of care.

The patient's condition can gradually worsen, or a life-threatening condition, such as respiratory or cardiac arrest, can occur suddenly. Do not assume that the patient is out of danger just because there were no serious problems at first. Reassess the patient at regular intervals. Patients who are unstable should be reassessed at least every 5 minutes or more often if indicated by the patient's condition. Reassess stable patients every 15 minutes, or as deemed appropriate by the patient's condition.

The physical exam and history do not need to be repeated unless there is a specific reason to do so. If any life-threatening conditions develop, stop whatever you are doing and provide appropriate care immediately.

Reassessment includes the:

- Primary assessment.
- Vital signs.
- Chief complaint.
- Interventions, or care provided.

Reassess Primary Assessment

Reassess each aspect of the primary assessment and compare to the patient's baseline status. For LOC, is the patient maintaining the same level of responsiveness or becoming more or less alert? Recheck the airway to ensure it is open and clear. Reassess the adequacy of breathing by monitoring breathing rate, depth and effort. Auscultate breath sounds to determine if there has been a change. Reassess the adequacy of circulation by checking both carotid and radial pulses. Recheck skin characteristics (color, temperature and moisture).

Reassess Vital Signs

Repeat vital signs as necessary each time you reassess the patient. Repeat BP, pulse and respiration (see Table 8-4).

Reassess Chief Complaint

Constantly reassess the patient's chief complaint or major injury. Determine if the pain or discomfort is remaining the same, getting worse or getting better. Ask the patient whether there are any new or previously undisclosed complaints.

Table 8-4:
Vital Signs by Age

ADULTS (About 12 years and older)	
Pulse	60 to 100 beats per minute
Blood pressure	90–140 mmHg systolic 60–90 mmHg diastolic
Respirations	12 to 20 breaths per minute
CHILDREN (Age 1 to about 12 years)	
Pulse	80 to 100 beats per minute
Blood pressure	80–110 mmHg systolic
Respirations	15 to 30 breaths per minute
INFANTS (Age 1 to 12 months)	
Pulse	100 to 140 beats per minute
Blood pressure	70–95 mmHg systolic
Respirations	25 to 50 breaths per minute
NEONATAL/NEWBORN (Full term to 28 days)	
Pulse	120 to 160 beats per minute
Blood pressure	> 60 mmHg systolic
Respirations	40 to 60 breaths per minute

CRITICAL FACTS

Ongoing assessment should be done after the secondary assessment. Its purpose is to identify and care for any changes in the patient's condition and to monitor the effectiveness of care provided.

Reassess Interventions

Reassess the effectiveness of each intervention performed. Consider the need for new interventions or modifications to care already being provided.

THE NEED FOR MORE ADVANCED MEDICAL PERSONNEL

While waiting for more advanced medical care (Table 8-5), help the injured or ill patient stay calm and as comfortable as possible. These conditions are by no means a complete list. It is impossible to describe every possible condition since there are always exceptions. Trust your instincts. If you think there is an emergency, there probably is. It is better to call for more advanced medical care than to wait.

PUTTING IT ALL TOGETHER

Once you have sized up the scene and performed a primary assessment, you are ready to move on to the secondary assessment. This requires you to perform a physical exam to find and care for any other problems that are not an immediate threat to life but might become serious if you do not recognize them and provide care. This head-to-toe physical exam involves looking at and feeling the body for abnormalities. Use the mnemonic DOTS as you perform the physical exam. For many patients, this will be a rapid medical or trauma assessment.

Obtain pertinent history from the patient. This is especially important if the patient is suffering from an illness that has already been diagnosed and is being cared for by a healthcare provider. Whether you obtain the history before, after or during the physical exam depends on the MOI or nature of illness and whether the patient is responsive or unresponsive. Use the mnemonic SAMPLE to gather all of the necessary information. For some patients, if there is time and the patient's condition warrants it, you will go back and complete a detailed physical exam.

Once the assessment is complete, perform ongoing assessments until more advanced personnel take over. Reassess at least every 5 minutes for unstable patients and every 15 minutes for stable ones, or as dictated by the patient's condition.

Although this plan of action can help you decide what care to provide in any emergency, providing care is not an exact science. Because each emergency and each patient are unique, an emergency may not occur exactly as it did in a classroom setting. The care needed may change from one moment to the next. For example, the primary assessment may indicate the patient is conscious, has no severe, life-threatening bleeding, is breathing and has a pulse. However, during your physical exam, you may notice that the patient begins to experience difficulty breathing. At this point, there is a need to summon more advanced medical personnel, if this has not already been done, and provide appropriate care. Provide necessary information about the patient's condition once more advanced medical personnel arrive.

Many variables exist when dealing with emergencies. You do not need to "diagnose" what is wrong with the patient to provide appropriate care. Treat the conditions you find, always caring for life-threatening conditions first. Perform the primary and secondary assessments as a guideline to help you assess the patient's condition.

As you read the remaining chapters, remember the steps of the assessments. They form the basis for providing care in any emergency.

You Are the Emergency Medical Responder

The injured woman accompanies you to a separate area so you can assess her for injuries. She is still clutching her arm. What steps would you take to identify any injuries or conditions that may need medical care? After assessing this patient, you find no life-threatening conditions. How often would you reassess her and why?

Table 8-5:
When to Call for More Advanced Medical Personnel

CONDITION	SIGNS AND SYMPTOMS
Unconscious or decreased level of consciousness	▪ Patient does not respond to tapping, loud voices or other attempts to awaken.
Trouble breathing	▪ Breathing is noisy (sounds such as wheezing or gasping). ▪ Patient feels short of breath. ▪ Skin has a flushed, pale or bluish appearance.
No breathing	▪ You cannot see the patient's chest rise and fall. ▪ You cannot hear and feel air escaping from the nose and/or mouth.
No pulse	▪ You cannot feel the carotid pulse in the neck or the pulses in other pulse points.
Severe bleeding	▪ Patient has bleeding that spurts or gushes steadily from the wound.
Persistent pain or pressure in the chest	▪ There is 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 pain or pressure in the abdomen	▪ Patient has persistent pain or pressure in the abdomen that is not relieved by resting or changing positions.
Vomiting blood or passing blood	▪ You can see blood in vomit, urine or feces.
Severe (critical) burns	▪ Patient has burns that cover a large surface area; cover more than one body part; involve the head, neck, mouth or nose; or affect the airway. ▪ Patient has burns other than localized superficial burns to a small child or older adult patient; those affecting the hands, feet or genitals; or those resulting from chemicals, explosions or electricity.
Suspected poisoning	▪ Patient shows evidence of swallowed, inhaled, absorbed or injected poison, such as presence of drugs, medications, cleaning agents, or hypodermic needles and syringes. ▪ Mouth or lips may be burned.
Sudden illness requiring assistance	▪ Patient has seizures, severe headaches, slurred speech or changes in the level of consciousness; unusually high or low blood pressure; or a known diabetic condition.
Stroke	▪ Patient has 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.
Head, neck or back (spinal) injuries	▪ Consider how the injury happened: for example, a fall, severe blow or collision suggests a head injury. ▪ Patient complains of severe headaches or neck or back pain. ▪ Patient is unconscious. ▪ Blood or clear fluid is detected in the ears, mouth or nose. ▪ There is bleeding or deformity of the scalp, face or neck.
Possible broken bones	▪ Consider how the injury happened: for example, a fall, severe blow or collision suggests a fracture. ▪ There is evidence of damage to blood vessels or nerves: for example, slow capillary refill, no pulse below the injury or loss of sensation in the affected part. ▪ Patient is unable to move the body part without pain or discomfort. ▪ There is a swollen or deformed limb. ▪ Fractures are associated with open wounds.

Skill Sheet 8-1

How to Obtain a SAMPLE History

NOTE: Always follow standard precautions when providing care.

STEP 1

Using the mnemonic SAMPLE, determine the following six items for the patient history:

1. Signs and symptoms: Signs include seeing bleeding; hearing breathing distress; and feeling cool, moist skin. Symptoms include pain, nausea, headache and difficulty breathing.
2. Allergies: Determine if the patient is allergic to any medications, food, or environmental elements, such as pollen or bees.
3. Medications: Determine if the patient is presently using any medications, prescription or nonprescription.
4. Pertinent medical history: Determine if the patient is under a healthcare provider's care for any condition or if the patient has had a similar problem in the past or been recently hospitalized.
5. Last oral intake: This intake includes solids or liquids and can include food, fluid and medication.
6. Events leading up to the incident: Determine what the patient was doing before and at the time of the incident.

Skill Sheet 8-2

How to Perform a Secondary Assessment for a Responsive Trauma Patient

NOTE: Always follow standard precautions when providing care.

STEP 1

Obtain a SAMPLE history (see Skill Sheet 8-1).

STEP 2

Assess the patient's complaints (use the mnemonic OPQRST—onset, provoke, quality, region/radiate, severity and time).

STEP 3

Perform a focused trauma assessment unless signs and symptoms make the focus unclear, in which case you would perform a rapid trauma assessment (head to toe).

STEP 4

Assess baseline vital signs.

STEP 5

Perform components of the detailed physical exam, as needed.

STEP 6

Provide emergency care.

NOTE: Consider the need for additional resources, including basic life support or advanced life support, and the need for transport (e.g., for life-threatening conditions, such as anaphylaxis).

If the trauma patient is unresponsive, consider the patient as critical, requiring that you begin with a rapid trauma assessment, to gain as much information as possible on the nature of illness.

Skill Sheet 8-3

How to Perform a Secondary Assessment for an Unresponsive Patient Who Is Breathing Normally

NOTE: Always follow standard precautions when providing care.

STEP 1

Consider the need for additional resources, including advanced life support, and the need for transport (e.g., for life-threatening conditions, such as a heart attack).

STEP 2

Perform a rapid medical or trauma assessment (head to toe).

STEP 3

Assess baseline vital signs.

STEP 4

Position a patient who is unresponsive but breathing normally with no suspected head, neck, spinal or hip injuries, in a side-lying recovery position and ensure protection of their airway.

STEP 5

Obtain a SAMPLE history (see Skill Sheet 8-1) from the family or any bystanders, if available.

STEP 6

Provide emergency care.

Skill Sheet 8-4

Physical Exam

NOTE: Always follow standard precautions when providing care.

STEP 1

Perform physical exam beginning with the head and neck.

STEP 2

Check the shoulders and chest.

STEP 3

Check the abdomen.

(Continued)

Skill Sheet 8-4

Physical Exam *Continued*

STEP 4

Check the pelvis.

STEP 5

Check the legs and feet.

STEP 6

Check the arms and hands, including capillary refill.

STEP 7

Check the patient's back.

Skill Sheet 8-5

How to Obtain Baseline Vital Signs

***NOTE:** Always follow standard precautions when providing care. When assessing breathing, look for a stoma or other signs of a neck breather.*

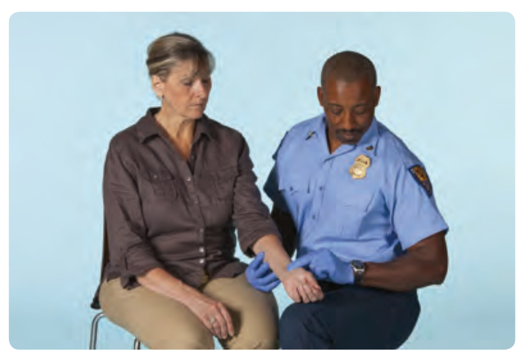
STEP 1

Check respirations for rate, rhythm and quality of breathing.

- Look, listen and feel for breathing.
  - Look for the rise and fall of the patient's chest or abdomen.
  - Listen for sounds as the patient inhales and exhales.
- Count the number of times a patient breathes in 30 seconds.
  - Multiply that number by 2 (or in 15 seconds by 4). This is the number of breaths per minute.
- Record your findings.

***NOTE:** As you check for the rate and quality of breathing, try to do it without the patient's knowledge. If the patient realizes you are checking breathing, this may cause a change in breathing pattern without the patient being aware of it. Maintain the same position you would when you are checking the pulse for a responsive patient.*

STEP 2



Check for a pulse.

- Place two fingers on top of a major artery near the skin's surface and over a bony structure.
  - Pulse points include the carotid arteries in the neck, the radial artery in the wrist and, for infants, the brachial artery in the inside of the upper arm.
  - To check the pulse rate, count the number of beats in 30 seconds and multiply that number by 2 (or in 15 seconds by 4).
- Record your findings.

***NOTE:** An injured or ill patient's pulse may be hard to find. If a patient is breathing, the heart is also beating. There may be a loss in circulation to the injured area, causing a loss of pulse. If you cannot find the pulse in one place, check it in another, such as in the other wrist.*

(*Continued*)

Skill Sheet 8-5

How to Obtain Baseline Vital Signs *Continued*

STEP 3

Check skin characteristics and pupils.

NOTE: Checking the skin characteristics requires you to look at and feel the skin. You may need to partially remove a disposable glove in order to determine skin moisture and temperature. Be careful not to come in contact with any blood or open wounds.

- To check skin characteristics look or feel for:
  - Color. Is it pale and ashen, or flushed and pink?
  - Temperature. Is it hot or cold?
  - Moisture. Is it moist or dry?
  - Capillary refill. Is it normal or slow?
- Record your findings.

Skill Sheet 8-6

Taking and Recording a Patient's Blood Pressure (by Auscultation)

NOTE: Always follow standard precautions when providing care.

STEP 1

Approximate systolic blood pressure.

- Either ask the patient what their BP is or use **160** mmHg as an alternative.

NOTE: The radial artery, located at the wrist, indicates a systolic pressure of about 80 mmHg. The femoral artery in the leg indicates a systolic pressure of about 70 mmHg. The carotid artery in the neck indicates a systolic pressure of about 60 mmHg.

STEP 2

Select an appropriately sized cuff for the patient.

STEP 3

Position the cuff.

STEP 4

Locate brachial pulse.

(Continued)

Skill Sheet 8-6

Taking and Recording a Patient's Blood Pressure (by Auscultation) *Continued*

STEP 5

Position the diaphragm of the stethoscope over the pulse point.

NOTE: Hold the diaphragm in place with your fingers, not your thumb, because you may hear the pulse in your thumb instead of the patient's brachial pulse.

STEP 6

Inflate cuff. Stop inflating when you can no longer hear the pulse.

STEP 7

Deflate cuff slowly until pulse is heard.

(*Continued*)

Skill Sheet 8-6

Taking and Recording a Patient's Blood Pressure (by Auscultation) *Continued*

STEP 8

Continue deflating cuff until the pulse is no longer heard.

STEP 9

Quickly deflate cuff by opening the valve.

STEP 10

Record findings.

- Watch the pressure gauge and note the number, recorded in even numbers, when you first hear the pulse again (systolic pressure).
- Continue to release the air from the bulb and watch the manometer. Once you hear the last sound, record the reading on the gauge (diastolic pressure).

Skill Sheet 8-7

Taking and Recording a Patient's Blood Pressure (by Palpation)

NOTE: Always follow standard precautions when providing care.

STEP 1

Select an appropriately sized cuff for the patient's arm and position the cuff.

STEP 2

Locate the radial pulse.

STEP 3

Inflate the cuff beyond where pulse disappears.

(*Continued*)

Skill Sheet 8-7

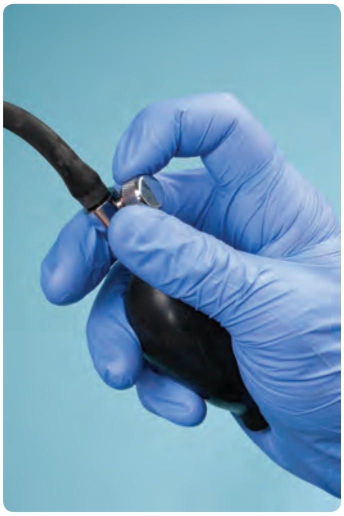
Taking and Recording a Patient's Blood Pressure (by Palpation) *Continued*

STEP 4

Deflate the cuff slowly until pulse returns; the point where the pulse returns is the approximate systolic blood pressure.

STEP 5

Quickly deflate the cuff by opening the valve.



STEP 6

Record the approximate systolic blood pressure with a "P" for palpation method (e.g., 130/P).

ENRICHMENT

Pulse Oximetry

Purpose

Pulse oximetry is used to measure the percentage of oxygen saturation in the blood. The reading is taken by a pulse oximeter (Fig. 8-19) and appears as a percentage of hemoglobin saturated with oxygen. Normal saturation is approximately 95 to 99 percent. The reading is recorded as 95 to 99 percent SpO_2 (Table 8-6).

Pulse oximetry also is used to assess the adequacy of oxygen delivery during positive pressure ventilation and the impact of other medical care provided.

When monitoring a conscious patient's oxygen saturation levels using a pulse oximeter, you may reduce the flow of oxygen and change to a lower-flowing delivery device if the oxygen level of the patient reaches over 94 percent.

The percent of oxygen saturation always should be documented whenever vital signs are recorded and in response to therapy to correct hypoxia. A reading below 94 percent may indicate hypoxia. Pulse oximetry should be used as an added tool for patient evaluation, as it is possible for patients to show a normal reading but have trouble breathing, or have a low reading but appear to be breathing. When treating the patient, all symptoms should be assessed, along with the data provided by the device. The pulse oximeter reading never should be used to withhold oxygen from a patient who appears to be in respiratory distress or when it is the standard of care to apply oxygen despite good pulse oximetry readings, such as in a patient with chest pain.

Indications

Pulse oximetry should be applied whenever a patient's oxygenation is a concern and for the following situations:

- All patients with neurologic, respiratory or cardiovascular complaints
- All patients with abnormal vital signs
- All patients who receive respiratory depressants (morphine, diazepam, midazolam)
- Critical trauma patients

Pulse oximetry should be taken and recorded with vital signs for stable patients every 15 minutes, and reassessed and recorded at least every 5 minutes for unstable patients.

Fig. 8-19: A pulse oximeter measures the oxygen saturation level in a patient's blood.

Continued on next page

ENRICHMENT

Pulse Oximetry *CONTINUED*

Table 8-6:
Pulse Oximetry

RANGE	VALUE	TREATMENT
Normal	95 to 100 percent	None
Mild hypoxia	91 to 94 percent	Administer supplemental oxygen using a nasal cannula or resuscitation mask, based on local protocols.
Moderate hypoxia	86 to 90 percent	Administer supplemental oxygen using a non-rebreather mask or bag-valve-mask resuscitator, based on local protocols.
Severe hypoxia	≤ 85 percent	Administer supplemental oxygen using a non-rebreather mask or bag-valve-mask resuscitator with positive pressure, based on local protocols.

Procedure

When using a pulse oximeter, refer to the manufacturer's directions to ensure proper use. In general, the procedure for measuring pulse oximetry is the same.

Once the machine is turned on, allow for self-tests. If the patient is wearing nail polish, remove it using an acetone wipe, as it can interfere with the reading. Then apply the probe to the patient's finger. The manufacturer also may recommend alternative measuring sites, such as the finger and then the earlobe on the next measurement.

Pediatric Considerations

The manufacturer may recommend alternative measuring sites for pulse oximetry in infants, such as the foot.

The machine will register the oxygen saturation level. Once it begins to register, record the time and the initial saturation percent, if possible, on the prehospital care report. Verify the patient's pulse rate on the oximeter with the actual pulse of the patient. Be sure to monitor critical patients continuously until more advanced medical personnel are available. If you are recording a one-time reading, be sure to monitor the patient for a few minutes, as oxygen saturation can vary. As mentioned above, document the percent of oxygen saturation whenever vital signs are recorded and in response to therapy to correct hypoxia.

Limitations

Some factors may reduce the reliability of the pulse oximetry reading, including:

- Hypoperfusion, poor perfusion (shock).
- Cardiac arrest (absent perfusion to fingers).
- Excessive motion of the patient during the reading.
- Fingernail polish.
- Carbon monoxide poisoning (carbon monoxide saturates hemoglobin).
- Hypothermia or other cold-related illness.
- Sickle cell disease or anemia.
- Cigarette smokers (due to carbon monoxide).
- Edema (swelling).
- Time lag in detection of respiratory insufficiency. (The pulse oximeter could warn too late of a decrease in respiratory function based on the amount of oxygen in circulation.)

9

COMMUNICATION AND DOCUMENTATION

You Are the Emergency Medical Responder

As the closest responders in the area, your police unit is called to the scene where an older woman has collapsed in front of her home. When you arrive, a neighbor tells you that the woman suddenly collapsed and tripped on the concrete step in the walkway in front of her home. She is now conscious but a little dazed, and you find that she is also very frightened and apprehensive. What can you do to try to ease the woman's fears and reduce her anxiety as you assess her for injuries?

KEY TERMS

Closed-loop communication: A communication technique in which the listener repeats orders word for word to ensure the message was heard and understood accurately.

Communications center (dispatch): The point of contact between the public and responders (also known as a public safety answering point, or PSAP); responsible for taking basic information from callers and dispatching the appropriate personnel; in some communities may also provide prearrival instructions to the 9-1-1 caller.

Medical control: Direction given to emergency medical responders (EMRs) by a physician when EMRs are providing care at the scene of an emergency or are en route to the receiving facility; may be provided either directly via radio or indirectly by pre-established local medical treatment protocols; also called standing orders.

Minimum data set: A standardized set of data points about the response and care for patients; this information is included in the prehospital care report (PCR).

Patient narrative: A section on the prehospital care report where the assessment and care provided to the patient are described.

Prehospital care report (PCR): A document filled out for all emergency calls; used to keep medical personnel informed so they can provide appropriate continuity of care; also serves as a record for legal and billing purposes; may be written or electronic; if electronic, it is then an E-PCR.

Run data: A section on the PCR where information about the incident is documented.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Recognize the importance of effective communication within the emergency medical services (EMS) system.
- Recognize the need for compassion and empathy when caring for a patient's physical and mental needs.
- Communicate willingly and with sensitivity in the care of all patients.
- Identify the components of the prehospital care report (PCR).
- Describe the fundamental components of documentation and related issues.
- Explain the importance of maintaining confidentiality about the condition, circumstances and care of the patient.
- Describe the elements of a verbal report given during the transfer of care.

INTRODUCTION

When you arrive on the scene to assist injured or ill persons, what you think you see and what has actually happened may not be the same thing. It is easy to make judgments that may turn out to be incorrect. Communication may be difficult in times of stress, particularly if there are other factors involved, such as language barriers or fear. For this reason, the emergency medical responder (EMR) must be able to assess the situation and work out the best methods of obtaining the needed information. Other factors such as background noise may also inhibit communication between the EMR and other members of the team or patient. Effective communication with the patient and bystanders is of utmost importance to understand what took place. By using various techniques to gain the trust and confidence of the public, an EMR can discover details of the injury or illness that may otherwise go undiscovered.

Communication among response team members is also a major part of responding to a medical or trauma emergency. Communication is important for EMRs, as they may need to call for additional resources to transfer patient care to other responders or to the receiving facility. Communication is also important as it facilitates interaction within the team structure. By using the appropriate communication techniques, and understanding the equipment used and the type of information that needs to be relayed, the EMR improves the quality of care provided to the patient.

The final element of emergency care is documentation. Records of all that has occurred, from the beginning of the call for help to the point at which the patient has been transported to the receiving facility or to a higher level of care, are extremely important. Proper and thorough documentation will assist more advanced medical personnel in continuing care and can help in any associated legal proceedings.

COMMUNICATING WITHIN THE EMERGENCY COMMUNICATIONS SYSTEM

For an emergency medical services (EMS) system to run properly, constant communication must be a priority among its key components, which include:

- The communications center (dispatch), which is responsible for taking basic information from callers and dispatching the appropriate personnel. In some communities, the communications center may also provide prearrival instructions to the 9-1-1 caller.
- The medical director and receiving facility, often a hospital.
- The EMS personnel in the field.

To work efficiently, the EMS system must have a communications system geared toward its particular needs. Often, this involves a radio communication system and/or a mobile phone system for communication among members of its network.

Radio Communication

System Components

Radio communication for an EMS system is composed of four key components, including the base station, mobile radios, portable radios and repeaters. All radios in the United States, including those used by EMS personnel, are regulated and licensed by the Federal Communications Commission (FCC).

The base station is the hub of communications and should be situated in the best possible location for sending and receiving signals. It must have access to power and an antenna for maximum quality reception.

Mobile radios are mounted in emergency vehicles. Their ability to send and receive messages varies and is affected by terrain and objects, such as tall buildings, which may be in the vicinity.

Portable radios are handheld radios that are particularly useful when you must be out of your vehicle. Their range is limited but can be boosted by use of a repeater, a device that receives a low-powered radio signal and rebroadcasts it at a higher power. Repeaters increase the amount of territory you can access through radio communication.

Digital equipment uses an encoder and a decoder, which allow emergency personnel to communicate more easily, without overutilizing bandwidth. A mobile data terminal uses data rather than voice instructions. The terminal is situated in the emergency vehicle, and information is relayed from the base to the terminal (Fig. 9-1). The information is then displayed in text, to be read off the screen. To respond, emergency personnel can transmit in the same manner or push a button to switch to voice mode.

Rules for Radio Communication

The FCC regulates the use of radio communication systems. Therefore, those who use these systems must follow FCC rules. Ground rules for use of an EMS radio communication system help ensure that information is communicated as completely and accurately as possible. (The FCC website can be found at fcc.gov.)

Here are some important FCC rules to follow when using an EMS radio communication system:

- Use assigned or licensed EMS frequencies only for EMS-related communication.
- Before speaking, listen to make sure the channel you are using is clear.

CRITICAL FACTS

For an EMS system to run properly, constant communication among the communication center, the medical director, the receiving facility and EMS personnel must be a priority.

Radio communication for an EMS system is composed of four key components, including the base station, mobile radios, portable radios and repeaters.

Fig. 9-1: A mobile data terminal is situated in the emergency vehicle and displays information in text that has been relayed from the base.

- Close your vehicle windows to avoid distortions.
- To communicate, press the push-to-talk (PTT) button and wait 1 second before speaking.
- Speak slowly, with your lips about 2–3 inches from the microphone.
- Address the unit you are calling by its name and number, and then identify yourself by your unit name and number.
- Wait for the unit to let you know they are ready to receive your communication.
- Use concise, clear and plain language in your communications. Because of a lack of uniformity across jurisdictions and the need for rapid and clear communications from different responding agencies in a major crisis, the 10 code system (operational/brevity codes) is being phased out in favor of plain language as required by the Department of Homeland Security (DHS) and in support of the National Incident Management System (NIMS).
- Keep transmissions brief, organized and to the point. Omit courtesy terms like "please" and "thank you."
- When saying numbers that might be confused with other numbers, say the number, then the individual digits (e.g., to avoid confusing 15 with 50, say "fifteen," then "one-five").
- Give only objective, verifiable information and remember that others can listen in on radio communications. Do not use patients' names or other identifying information in your communications.
- Use "affirmative" and "negative" rather than "yes" and "no."

Communicating with Dispatch

The ***communications center (dispatch)*** is also known as a public safety answering point (PSAP). The role of dispatch is to receive emergency calls and send the appropriate team to respond. Dispatch is the point of contact between the public and responders (Fig. 9-2). In the 9-1-1 system, emergency medical dispatchers (EMDs) must decide which emergency service resources are required. Most EMS dispatch centers use a validated system to determine the appropriate response based on information received from the caller. These systems can be computer based but they are often a physical flip card-type system.

CRITICAL FACTS

Ground rules for use of a radio communication system, as set forth by the FCC, help ensure that information is communicated completely and accurately throughout the EMS system.

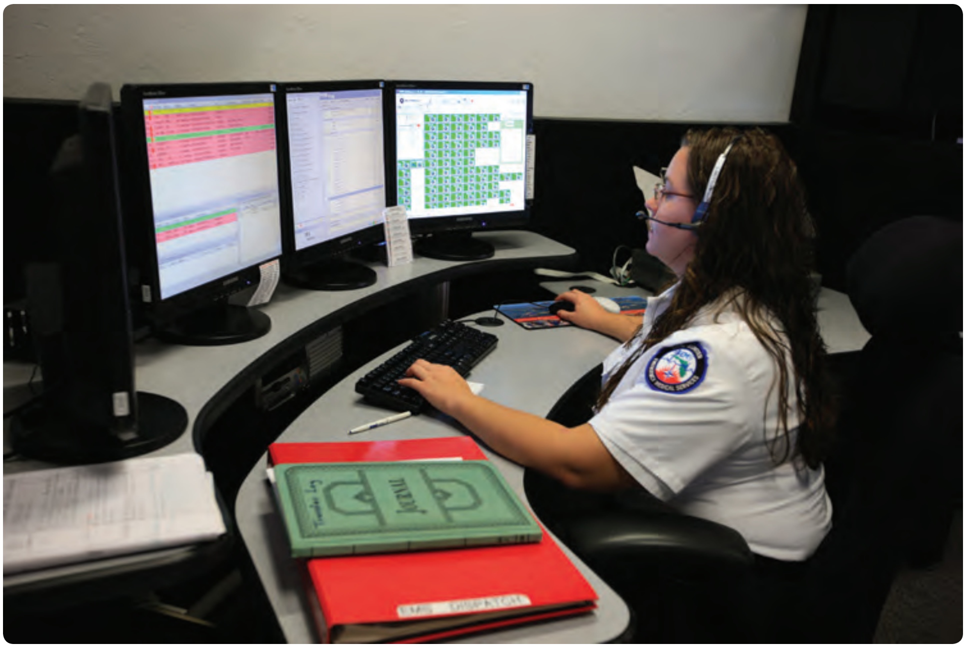


Fig. 9-2: Dispatch serves as a liaison between the public and emergency response personnel.

EMDs (and the call takers who assist them) must gather as much information as possible regarding the emergency. They also may advise callers about what the callers may be able to do while awaiting your arrival. Dispatchers note the time the call was received and the time they dispatched emergency services. Also, they usually record all conversations and radio dispatches, in order to have an indisputable record of the events. (For more information on EMDs, refer to Chapter 27.)

As an EMR and depending on the work setting, you are responsible for:

- Receiving instructions from dispatch and acknowledging receipt.
- Providing an estimated time of arrival (ETA) to dispatch, if requested, and reporting any delays along the route that may change the ETA.
- Announcing your arrival at the scene to dispatch, and providing your assessment of whether additional resources should be sent or if assigned resources can be released.
- Informing dispatch when you leave for transport to the hospital or when your role is finished, if you have been relieved by more advanced medical personnel. When relaying information about transport, you must inform dispatch of how many patients you have, the name of the receiving facility and your ETA.
- On arrival, notifying dispatch that you have arrived at the hospital or other designated location such as a helicopter landing zone.
- When the patient transfer is complete and you are able to leave the hospital, letting dispatch know you are once again available for service. You may have to contact dispatch again once you return to your station or home base.

Communicating with Medical Control

Depending on your EMS system, ***medical control*** may or may not be located at the receiving facility. There may be times when you must speak to medical control while you are on scene. This would most likely be in a situation in which standing orders or protocols would not be sufficient and you have questions about the care provided to the patient. Communications with medical control must be thorough but brief.

CRITICAL FACTS

When communicating with medical control, always identify yourself and give all relevant information on the patient and the care provided.

Successful interpersonal communication with patients and their families means being empathetic, having awareness of cultural differences, showing sensitivity to an individual's emotions and listening effectively.

When communicating with medical control, provide the following information:

- Who you are (unit, level of service and your role)
- Patient characteristics (age, gender, chief complaint)
- The patient's mental status
- SAMPLE (**s**igns and symptoms, **a**llergies, **m**edications, **p**ertinent medical history, **l**ast oral intake, **e**vents leading up to the incident) history
- Relevant information about past illnesses
- Vital signs and results of your physical assessment
- Any care you provided and the patient's response to the care
- Your questions

Ask whether you should perform any further actions, and estimate when you will arrive at the receiving facility. Whenever you receive medical direction, repeat the order *word for word*. This is called ***closed-loop communication***. Write down important or lengthy medical instructions.

Communicating with Medical Personnel

When other EMS personnel arrive on the scene, identify yourself and give a verbal report. Interact within the team structure, communicating any information concerning the patient and the scene to law enforcement and other responders (Fig. 9-3).

Communicating with the Receiving Facility

As soon as possible, the transport crew should notify the receiving facility about the patient, any special alerts concerning the patient's condition and the ETA. The receiving facility (medical control) or operator is informed if there are any changes in the patient and the ETA, and communicates any changes in the patient's condition.

When communicating with the receiving facility, give the following information:

- Who you are (unit and role)
- How many patients will be arriving
- Patient characteristics (age, gender, chief complaint)
- Immediate history (events leading to the injury or illness)
- Any care you provided and the patient's response to the care
- Any vital information, such as the need for isolation or specialized services (e.g., a trauma team)
- ETA

At the receiving facility, crew members will provide additional information about the scene and the patient(s). They will also complete whatever documentation is necessary to meet local or state standards and their organization's protocols.

Fig. 9-3: Communicate any information regarding the patient and the scene to other EMS personnel who arrive, working within the team structure. *Photo: courtesy of Terry Georgia.*

Mobile Phone Communication

Mobile phones are becoming more popular in some EMS districts. They can be useful for covering longer distances than radio communication, and their sound clarity in communication is usually superior. Since mobile phones are fairly maintenance-free and provide the ability for direct communication between parties, they are also often used as backup sources of communication should the radio system fail. However, there are drawbacks to mobile phones. For example, in cases of emergencies that involve multiple people, mobile phone service can be compromised due to system overload and it often cannot be recorded to assist in creating a record of events and orders received. Mobile phones are also impractical for multiunit coordination.

INTERPERSONAL COMMUNICATION

Every person deserves equal care, dignity and respect for their differences including age, language, ethnicity, culture or socioeconomic status. To be empathetic means to understand, to be sensitive to cultural differences and to the thoughts, feelings and experiences of another person. In order to listen effectively to what is being said to you, it is important that you have empathy for the people involved.

Communicate with patients in a way that achieves a positive relationship. Before doing anything, unless it is a life-threatening situation, introduce yourself to the patient and family members, if present. Tell the patient what your role is and what you will do. Introducing the other members of your team is also important.

Medical and trauma emergencies can be frightening to those involved. When speaking to an injured or ill person and family members, be sure to speak slowly and clearly (Fig. 9-4). Avoid using medical terms and abbreviations, and speak in words that are easily understandable.

If possible, try to adapt the physical environment to facilitate communication by making sure there is adequate lighting and that you have minimized distractions such as noises, interference from others and noisy equipment nearby. Get down to the patient's eye level to avoid appearing threatening. Make eye contact and use body language that shows you are open and interested in what people have to say, for example, standing with arms at your sides instead of crossed, and with hands open rather than in closed fists.

One way to put people at ease is to address them by name, whenever possible. Note, however, that if the patients are older adults, as a matter of showing respect, you should not call them by

Fig. 9-4: Medical or trauma emergencies can be frightening. Speak clearly and slowly. *Photo: courtesy of Ted Crites.*

their first names unless invited to do so. A general rule of thumb is to address individuals in the way that they introduce themselves to you. For example, if the patient and family member introduce themselves as Mr. and Mrs. Smith, you should address them as such.

If possible, have the patient tell you their name and what problems they are having. It may be instinctive for family members or friends to do so, but it is best if you can have the patient speak, so you can observe the patient's ability to communicate, level of consciousness (LOC) and mental status. You can also learn a lot about physical problems just by observing people while they are talking. If someone can only speak a few words before needing to take a breath, for example, that may mean there is a respiratory emergency. Someone clutching the stomach or chest may be doing so without being aware of it, and this can give you information. Someone who winces with pain should be asked about the pain. If the patient cannot speak or is unable to give you information, then ask bystanders for the information.

Listen carefully to what the injured or ill person is telling or trying to tell you. Observe the patient as you listen (Fig. 9-5). Provide reassurance if there seems to be some reluctance to speak about a topic. Mention that any information you are told about the problem may be important and will remain confidential, even if it is upsetting to talk about. Attempt to gather patient information in a private setting that is away from bystanders. Individuals may feel uncomfortable giving information about the situation in front of others.

Because of the stressful nature of the situation, it is always best to ask one question at a time so the person answering can concentrate while giving the answers. Also, the answer to one question may lead you to another related one. Asking more than one question at a time may provide confused responses. Avoid interruptions as much as possible. Allow the patient to finish a thought. If you need clarification, ask questions at the end of the patient's statement.

Fig. 9-5: Making eye contact with a patient helps them feel more comfortable.

Depending on the type of information you are trying to find out, you may want to ask closed or direct questions, to which patients should be able to give you a "Yes" or "No" answer or a short answer. For example, you might ask, "Did you have something to eat?" or "What time was it when you last ate?" For more detailed information, you may need to ask more open-ended questions, which allow for more detailed answers. This type of question may be a little more difficult for patients to answer but can provide answers with greater depth. A typical open-ended question might be, "How are you feeling right now?"

From the patient's perspective, not being listened to can be frustrating. Consider the last time you had to repeat information to someone several times; it is not a pleasant experience. Listening lets people know you believe they are important. If you ask a question, listen for the answer. Make notes, if necessary, so you do not forget what was said. If you forget too often, the patient may stop answering your questions.

As you interview the patient or bystanders, be careful to avoid the pitfalls of interviewing. For example, be sure to word questions so that you do not provide false assurance or reassurance. Avoid giving advice or asking leading or biased questions. Try to let the person you are interviewing do most of the talking, and do not interrupt. Avoid asking "Why" questions, which can be perceived as judgmental; in most circumstances you do not need to know why something happened, only *what* happened.

Listen to what bystanders tell you; they may have seen or heard something that will help you determine how to care for the patient. But, after they have provided the information you require, you must consider the patient's privacy while you continue to assess the situation and provide care. Often, bystanders want to stay and watch. Be firm but reasonable with bystanders. Ask them to move away for the safety and comfort of everyone. If a crowd appears that could become hostile, explaining your role may set the crowd at ease. If, however, the crowd appears to be threatening, call for backup from the appropriate service.

It is important not to make judgments about a patient on the basis of cultural or other differences, such as the patient's physical appearance. Instead, be more mindful of your own physical appearance. By being neat and well groomed, you help give both patients and their family members a sense of confidence in you.

If you are providing care for someone who speaks a language you do not understand, call for someone who can translate. A family member or neighbor, for example, may be able to speak both your language and that of the patient. Some dispatch centers and hospitals also offer language line services, which may be useful.

Watch the patient's body language, whether your language is spoken or not. Nonverbal clues can help determine what is wrong. Be sensitive to cultural differences; in some cultures, it may be inappropriate to make eye contact or for someone of the opposite gender to help the patient. There are also cultural differences that relate to the appropriate distance to stand apart from another person. Respect these differences and do what you can to help.

THE IMPORTANCE OF DOCUMENTATION

Documentation procedures are established by state regulations or local policy and may vary from state to state and one EMS system to another. Documenting your care is as important as the care provided. Your record will help more advanced medical personnel to assess the patient and continue care. It is important to write the record as soon as possible after the emergency, while the information is fresh. Because a patient's condition may change before arriving at the receiving facility, a record of the condition immediately after the emergency will provide useful information for responders and emergency department staff. They can compare the current condition with what you recorded earlier.

Your record is a legal document and is important if legal action occurs. Should you be called to court for any reason, your record will support what you saw, heard and did at the emergency scene.

Documentation of injuries and illnesses is also useful when analyzing current response practices and protocols and planning preventative action for the future. Records are also used for quality assurance (QA) and quality improvement (QI) practices within a department.

PREHOSPITAL CARE REPORT

Description and Uses of the Prehospital Care Report

A ***prehospital care report (PCR)***, also called a run report or trip sheet, is the essential documentation for each emergency call (Fig. 9-6). The primary function of this report is to ensure high-quality patient care. Hospital and other more advanced medical personnel need to know what transpired during a call in order to provide the patient with appropriate continuity of care. This information allows medical personnel to determine what treatment the patient needs and which complaints must be addressed first. The PCR can also be used to evaluate care provided and identify areas where quality of care requires improvement in future scenarios. Keeping good records allows EMRs to learn from both successes and failures.

The PCR has multiple functions. As mentioned before, the PCR also serves as a legal document, particularly if the responder was present at the scene of a crime or if the incident leads to legal proceedings. It is not uncommon to be called to testify in court years after the response. In addition, the PCR is a valuable educational and research tool. The information may be used in research projects on a variety of issues, including studies on the safety and efficacy of certain interventions, the cost-effective implementation of patient care or the typical presentation of certain injuries or illnesses. The PCR also has an administrative function—serving as an important part of the patient's medical record. It may be used for billing, insurance reimbursement or maintaining statistics on hospital emergency services.

Given the importance and multiple functions of the PCR, it is crucial that the PCR is filled out accurately, completely and correctly. Some PCRs

CRITICAL FACTS

A PCR is the essential document of every emergency call. Not only does it serve as a patient's medical record, it also fulfills important legal, educational and administrative functions. Documentation procedures and regulations are set forth locally or through the state.

PREHOSPITAL CARE REPORT PCR# ________

Call Date	Provider Number	Unit Number	Incident Number	Interfacility Transfer Number	Call Disposition
___/___/___					

Response	Transport Code	Time of Call	Time Enroute	Time First ALS on Scene	Time Arrived on Scene	Time Left Scn / Call Canceled	Time Arrived at Destination	Contact Made with:	Time of Contact
☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	:	:	:	:	:	:	☐ Base Hospital ☐ Receiving Facility ☐ Control Facility ☐ None	:

Patient Name (Last, First, Mi)	Patient Address	Incident Location

Patient Age	Patient DOB	Patient Gender	Est. Patient Weight	County	Map Zone	No. Pts. At Scene
Mos Yrs	___/___/___	☐ Male ☐ Female	kg			

Chief Complaint ________________ Pain Level: ___

Allergies ________________

Medical History ________________

Medications ________________

Initial Physical Examination

	Unremarkable	
Head	☐	
Neck	☐	
Chest	☐	
Abdomen	☐	
Back	☐	
Pelvis	☐	
Limbs	☐	
Neuro	☐	
Skin Signs	☐	

GCS

Eye	Verbal	Motor
4 spont	5 oriented	6 obeys
3 voice	4 confused	5 localizes
2 pain	3 inapprop	4 withdrwl
1 none	2 incompr	3 flexion
	1 none	2 extensn
		1 none

Time	E	V	M	Total
:	___+	___+	___ =	
:	___+	___+	___ =	
:	___+	___+	___ =	

Mechanism of Injury

Types of Illness/Injury

Field Clinical Impression:

Care Giver FD/PD/BS/PH	Time	Procedure / Medication (with dose, route) CODE	DESCRIPTION	Response / Comments / ECG (MD Signature: Base Order)	Resp Rate	Blood Pressure	Pulse Rate	Pain Level
	:					/		
	:					/		
	:					/		
	:					/		
	:					/		
	:					/		
	:					/		
	:					/		
	:					/		
	:					/		
	:					/		
	:					/		

☐ Medication Wasted: Time: Signature: Witness Signature:

Special Scene Conditions:
☐ ALS w/o base contact ☐ MCI
☐ Complicated extrication ☐ Multiple EMS providers
☐ DNR ☐ Possible provider exposure
☐ Drug use suspected ☐ Unsafe scene
☐ ETOH use suspected ☐ Other:
☐ Hazardous materials

Safety Eq Used:
☐ Lap Restraint
☐ Lap/Shoulder restraint
☐ Child Safety seat
☐ Airbag
☐ Helmet
☐ Protective Clothing

MVA Conditions:
☐ Bent steering wheel
☐ Death in same vehicle
☐ Ejection
☐ Passenger comptmnt intrusn
☐ Rollover

Destination Decision Reason
☐ Nearest Rec. Facility ☐ Triage to trauma center
☐ MCI/DCF ☐ Triage to other specialty center
☐ Physician request ☐ Other
☐ Pt/Family request ________

Receiving Hosp

Base Hospital

Tier I Trauma Triage:
☐ GCS Motor Score < 5
☐ Systolic BP < 85
☐ Penetrating Trauma: Head, Neck, Chest, Torso
☐ Paramedic Judgement

Tier II Trauma Triage
☐ Flail Chest ☐ Open/depress, skull fx
☐ Combo Burn/Trauma ☐ Paralysis
☐ 2 or more long bone fx. ☐ Amput. Prox. wrist/ankle
☐ Pelvic fracture ☐ Fall > 20 ft.
☐ pedestrian thrown/run over ☐ Pregnancy
☐ Judgement of the paramedic or flight nurse

Pediatric Trauma Triage
☐ Glasgow Coma Score Motor Component < 5 AND
☐ BP < 80 if patient over age 6; < 70 if under 6
☐ Advanced airway or continuous support of airway
☐ Penetrating trauma: head, neck, chest, torso or proximal to elbow/knee with vascular compromise
☐ Flail Chest ☐ Pelvis Fracture
☐ Amput. Prox. wrist/ankle ☐ Traumatic paralysis

Base MD ________

MICN ________

Care Transferred To		Cert. Number	Name (print)	Signature
Agency	Time :	A)		
		B)		
Name		C)		

☐ Continuation form used

Fig. 9-6: The PCR is essential for proper documentation of an emergency.

Fig. 9-7: PCRs should be filled out accurately, completely and correctly, regardless of whether they are written or electronic. *Photo: courtesy of Captain Phil Kleinberg, EMT-P.*

are completed with pen and paper, while many others are filled out electronically and called an E-PCR (Fig. 9-7).

Sections of the PCR

Typically, the four sections of a PCR include:

1. Run data. The ***run data*** section contains administrative information, including the time the incident was reported, when the unit was notified, when the unit arrived and left the scene, when the unit arrived at its destination and when the transfer of care was made. It also includes such information as the EMS unit number, names of the EMS crew members, and their levels of certification and the address to which the unit was dispatched.
2. Patient data. The patient data section contains all the background information on the patient, including legal name, age, gender, birth date, home address, Social Security Number (where required), and billing and insurance information. It also contains the time the incident occurred, address where the patient was picked up and any care the patient received before EMS personnel arrived.
3. Check boxes. The check boxes section, as the name implies, contains a series of boxes that are checked in accordance with the patient's condition. The check boxes refer to information about the patient, including vital signs (often more than one set must be taken), chief complaint, level of consciousness, appearance and respiration rate. In an E-PCR, these often appear as drop-down menus.
4. Patient narrative. The ***patient narrative*** section is an open-ended portion of the PCR in which a description of the assessment and care is provided. The goal is to provide a complete and thorough picture of what went on and what the patient's condition is. This section must include the SAMPLE history, the patient's chief complaint (in the patient's own words, if possible), how the chief complaint began and how it progressed, and the mechanism of the injury or nature of illness. It should also include relevant details of the patient's medical history. It is important to remain objective in this section: that is, describe what happened but do not draw any conclusions about the situation.

Minimum Data Set

The ***minimum data set*** refers to all the information that must be included in the PCR. It consists of the following:

- Patient information gathered by the EMR
  - Time of events
  - Assessment findings, including the following:
    - Chief complaint
    - LOC
    - Systolic and diastolic blood pressure
    - Skin perfusion (capillary refill)
    - Skin color and temperature
    - Pulse rate
    - Respiratory rate and effort

- Emergency medical care provided
- Patient demographics, such as age and gender
- Changes in the patient after care and who the patient was turned over to
- Observations at the scene
- Disposition (e.g., whether the patient refused care or was transported to a hospital)

■ Administrative information

- Time the incident was reported
- Time the unit was notified
- Time unit en route to the call
- Time the unit arrived at the scene
- Time the unit left the scene
- Time of arrival at the receiving facility
- Time of transfer of care
- Time unit available for next call

Note that it is important to use accurate and synchronous clocks to allow all involved to gather accurate medical information. For example, it is important to know details such as how long the patient was in cardiac arrest. The National EMS Information System (NEMSIS), which is a system to gather data on the local and state level of EMS systems and prehospital care, can be a helpful tool for tracking data in the local area and benchmarking services, regions and states for system and patient care improvement opportunities.

Confidentiality

Control of the contents of a PCR falls within the Health Insurance Portability and Accountability Act (HIPAA). HIPAA has strict rules about how patient information is used and distributed. Violation of HIPAA rules can have severe penalties. The contents of the PCR must be kept confidential, as it contains personal and potentially sensitive information about the patient. While in your care, it is your responsibility to ensure that the PCR is in appropriate hands. (For more information on HIPAA and confidentiality, refer to Chapter 3.)

Refusal of Treatment

While any competent adult has the right to refuse treatment, questions may come up later as to whether the patient was truly competent at the time of refusing treatment. Therefore, it is important to perform as complete an assessment of the patient as is possible, given the situation. For a patient who refuses treatment, record on the PCR exactly what care you recommended providing to the patient, and make one last effort to convince the patient to accept this care before leaving the scene. Be sure to include in the PCR that the patient received a complete explanation of the possible consequences of refusing care, including the risk of death if this is appropriate. Offer the patient alternative methods of obtaining care, such as visiting the patient's family healthcare provider. Tell patients that you or another EMS team is willing to return to the scene should they change their decision. Make sure this is all documented in the PCR and is signed by the patient and a witness, if available. Always follow local protocols for refusal of care as they may differ from state to state. (For more information on refusal of treatment, see Chapter 3.)

Falsification

The PCR must be a thorough and accurate record of what occurred during a call. Any error of omission or commission in care must be highlighted in the PCR, along with any steps that were made to correct the situation. Only document the facts on the PCR. Do not leave anything out and do not add anything that was not done.

Be aware that falsification of a PCR is a serious offense. It can lead to revocation of your certification or license and even to criminal charges. More seriously, it can significantly compromise patient care.

Parts of the PCR that are most frequently falsified are vital signs and treatment. EMRs who forget to measure vital signs have been known to make them up, or those who forget certain crucial treatments, such as administering supplemental oxygen to a patient with chest pain, may fail to mention this error. Be honest; it is far better for you and the patient if you own up to your mistakes up front.

TRANSFER OF CARE

When more advanced medical personnel arrive on the scene, you will need to give a verbal report on the number of patients involved, their conditions and the emergency situation. If a multipart PCR is available, the copy should be transferred with the patient. This relieves the transferring provider from having to collect redundant information, thus saving time.

CRITICAL FACTS

Control of the contents of a PCR falls within HIPAA.

Specifically, you will need to provide the following information about the patient(s):

- Current condition
- Age and gender
- Chief complaint
- Brief, pertinent history of what happened
- How you found the patient(s)
- Major past injuries or illnesses
- Vital signs
- Pertinent findings of the physical exam(s)
- Emergency care provided and the response to care

SPECIAL SITUATIONS

Documentation of the emergency situation and the care you provided is not only important for the patient, but also may prove essential for local authorities when legal matters are involved. It is particularly important to report any abuse, exposure to dangerous situations or injuries.

Once your report is complete, it should be submitted to the proper authorities in the proper time frame and should include the names of all agencies, people and facilities involved in the emergency response.

As always when writing these legal documents, be objective. Write only the facts and your observations; do not write your own subjective comments or opinions and do not draw any of your own conclusions. The only subjective comments or opinions should be those of the patient. Be sure to sign and date the document. Always keep a copy for your own records while making copies to distribute to the proper authorities based on local protocols. Your region or location will have its own standards and procedures, which will indicate which authorities are authorized to receive this documentation.

PUTTING IT ALL TOGETHER

Communication and documentation are a major part of providing emergency care. It is important for everyone on the team to understand what is going on and what happened before they arrived on the scene. This is only possible through good communication with patients, bystanders and colleagues.

Although emergency situations may make it difficult for some patients to effectively communicate, the EMS team, by showing confidence and encouragement, can successfully elicit the required information. Effective communication within the response team is based on understanding the modes of communication (radios, phones), factors for effective communication (speaking clearly, using correct terminology) and speed of communication. By following the rules and protocols of your region, miscommunication should be kept to a minimum.

Documentation is the final step in providing emergency care. State laws and regulations require that documentation be done as accurately and as soon as possible following the emergency situation. In the midst of the emergency, it is possible to forget instructions or answers to questions, so it is best to take notes when asking questions of patients and bystanders, and also when receiving instructions from medical control.

Always remember to be objective in your reports as these documents may be used for legal purposes or for evaluating procedures. Finally, keep a copy of all records for yourself based on local protocols; this will allow you to have access to the information should it be needed.

You Are the Emergency Medical Responder

As you assess the older adult patient, you learn that her chief complaint is that she "blacked out" momentarily and fell. The patient is afraid that she has broken her hip. She has pain in her pelvis and is unable to move her left leg. You give a verbal update to the EMS personnel who have just arrived to take over medical care and transport the patient.

Why is it important for communications to be brief and concise? What are some examples of effective interpersonal communication? Why is it important to thoroughly document your call, observations and actions?

UNIT 3

Airway

10 AIRWAY AND VENTILATION

You Are the Emergency Medical Responder

Your medical emergency response team has been called to the fitness center by building security, on a report of an employee who complained of having difficulty breathing. You and your partner arrive and find the employee conscious with a chief complaint of difficulty breathing. The patient says he just "overdid it" on the treadmill. He appears to be out of breath and is having trouble speaking in full sentences. You begin a primary assessment and determine that the patient is in respiratory distress. What should you do? What can you do to assist the patient with his breathing?

KEY TERMS

Apnea: A condition that causes breathing to stop periodically or be significantly reduced.

Artificial ventilation: A mechanical means used to assist breathing, such as with a bag-valve-mask (BVM) resuscitator or resuscitation mask.

Aspiration: To take, suck or 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.

Asthma attack: The sudden worsening of asthma signs and symptoms, caused by inflammation of the airways and the tightening of muscles around the airways of a person with asthma, making breathing difficult.

Asthma trigger: Anything that sets off an asthma attack, such as animal dander, dust, smoke, exercise, stress or medications.

Bag-valve-mask (BVM) resuscitator: A handheld breathing device consisting of a self-inflating bag, a one-way valve and a face mask; can be used with or without supplemental oxygen.

Breathing emergency: An emergency in which breathing is impaired; can become life threatening; also called a respiratory emergency.

Chronic obstructive pulmonary disease (COPD): A progressive lung disease in which the patient has difficulty breathing because of damage to the lungs; airways become obstructed and the alveolar sacs lose their ability to fill with air.

Crackles: An abnormal fine, crackling breath sound on inhalation that may be a sign of fluid in the lungs; also known as rales.

Cricoid: A solid ring of cartilage just below and behind the thyroid cartilage.

Cyanosis: A condition in which the patient's skin, nail beds and mucous membranes appear a bluish or greyish color because of insufficient levels of oxygen in the blood.

Deadspace: The areas within the respiratory system between the pharynx and the alveoli that contain a small amount of air that does not reach the alveoli.

Emphysema: A chronic, degenerative lung disease in which there is damage to the alveoli.

Finger sweep: A method of clearing the mouth of foreign material that presents a risk of blocking the airway or being aspirated into the lungs.

Foreign body airway obstruction (FBAO): The presence of foreign matter, such as food, that obstructs the airway.

Hyperventilation: Rapid, deep or shallow breathing; usually caused by panic or anxiety.

Hypoxia: A condition in which insufficient oxygen is delivered to the body's cells.

Midaxillary line: An imaginary line that passes vertically down the body starting at the axilla (armpit); used to locate one of the areas for listening to breath sounds.

Midclavicular line: An imaginary line that passes through the midpoint of the clavicle (collarbone) on the ventral surface of the body; used to locate one of the areas for listening to breath sounds.

Midscapular line: An imaginary line that passes through the midpoint of the scapula (shoulder blade) on the dorsal surface of the body; used to locate one of the areas for listening to breath sounds.

Overventilation: Blowing too much air into the patient, which can enter the stomach, causing gastric distention and likely vomiting. Overventilation can also increase the amount of pressure in the chest, which compresses the blood vessels returning to the heart, thus limiting effective circulation.

Oxygenation: The addition of oxygen to the body; also, the treatment of a patient with oxygen.

Paradoxical breathing: An abnormal type of breathing that can occur with a chest injury (e.g., flail chest); one area of the chest moves in the opposite direction to the rest of the chest.

Pathophysiology: The study of the abnormal changes in mechanical, physical and biochemical functions caused by an injury or illness.

Pneumonia: A lung infection caused by a virus or bacterium that results in a cough, fever and difficulty breathing.

Positive pressure ventilation: An artificial means of forcing air or oxygen into the lungs of a person who has stopped breathing or has inadequate breathing.

(*Continued*)

KEY TERMS continued

Pulmonary embolism: Sudden blockage of an artery in the lung; can be fatal.

Rales: An abnormal breath sound; a popping, clicking, bubbling or rattling sound, also known as crackles.

Respiratory failure: Condition in which the respiratory system fails in oxygenation and/or carbon dioxide elimination; the respiratory system is beginning to shut down; the person may alternate between being agitated and sleepy.

Resuscitation mask: A pliable, dome-shaped breathing device that fits over the mouth and nose; used to provide artificial ventilations and administer supplemental oxygen.

Rhonchi: An abnormal breath sound when breathing that can often be heard without a stethoscope; a snoring or coarse, dry rale sound.

Stridor: An abnormal, high-pitched breath sound caused by a blockage in the throat or larynx; usually heard on inhalation.

Suctioning: The process of removing foreign matter, such as blood, other liquids or food particles, by means of a mechanical or manual suctioning device.

Tidal volume: The normal amount of air breathed at rest.

Ventilation: The exchange of air between the lungs and the atmosphere; allows for an exchange of oxygen and carbon dioxide in the lungs.

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.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Describe the structure and function of the respiratory system.
- List the signs of inadequate breathing.
- Describe how to care for a patient experiencing respiratory distress.
- Relate the maneuver used to open the airway to the mechanism of injury.
- Explain why basic airway management and ventilation skills take priority over many other basic life-support skills.
- Describe how to perform mouth-to-mouth, mouth-to-nose and mouth-to-stoma ventilations.

SKILL OBJECTIVES

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

- Demonstrate how to give ventilations using a resuscitation mask.
- Demonstrate how to give ventilations using a bag-valve-mask (BVM) resuscitator.
- Demonstrate how to give ventilations if a head, neck or spinal injury is suspected.
- Demonstrate how to assist a patient with an asthma inhaler *(Enrichment skill).*

INTRODUCTION

Because oxygen is vital to life, always ensure that the patient has an open airway and is breathing. Ensuring an open airway is one of the most important steps you can take for any patient. Without an open airway, a person cannot breathe and will die.

The airway is the pathway from the mouth and nose to the lungs. A person who can speak or cry is conscious, has an open airway, is breathing and has a pulse. It is more difficult to tell if an unconscious person has an open airway. You will have to take into consideration possible injury or illness.

Once you have an open airway, you may need to clear any obstructions and then assess breathing. If the person is experiencing a breathing emergency, you may need to provide artificial ventilations.

A ***breathing emergency*** is often detected during the primary assessment. In a breathing emergency, a person's breathing can become so impaired that life is threatened. There are two types of respiratory emergencies: respiratory distress, a condition in which breathing becomes difficult; and respiratory arrest, a condition in which breathing stops.

This chapter will address the causes, signs and symptoms of respiratory emergencies. Some of these emergencies are caused by chronic conditions such as chronic obstructive pulmonary disease (COPD), and others are caused by acute emergencies such as asthma and pulmonary embolism.

THE RESPIRATORY SYSTEM

Anatomy

The respiratory system is divided into the upper and lower airway tracts. The upper airway tract begins where air enters the respiratory system, through the mouth and nose. Air that is inhaled through the nose is warmed and humidified. Air may also be inhaled through the mouth and over the tongue, within the oral cavity. The mouth provides an airway, especially during an emergency.

Once air is inhaled, it passes through the throat, or pharynx. The pharynx is divided into three parts, from superior to inferior: the nasopharynx, the oropharynx and the laryngopharynx. The nasopharynx lies behind the nasal cavity. The oropharynx lies behind the oral cavity and is the shared passageway for both food and air.

Below the oropharynx is the laryngopharynx, the lowest part of the throat, which divides into two passageways. In the posterior (back) portion is the entrance to the esophagus, the passageway for food. In the anterior (front) is the larynx, which is the continuation of the respiratory system. Above the larynx is the epiglottis, a flap of cartilage that folds down over the larynx to close off the entrance to the trachea during swallowing, so that food cannot enter. This airway protection does not occur if a person is unconscious.

Once air has traveled through the pharynx, it passes through the larynx. At the top of this structure, made mostly of cartilage, muscle and membranes, is the hyoid bone—a horseshoe-shaped bone that supports the structures of the larynx below and attaches to the tongue and other oral structures above. Below the hyoid bone are the thyroid and ***cricoid*** cartilages, which form the larynx. Within the larynx lie the vocal cords, narrow muscles that stretch horizontally across from anterior to posterior.

The lower airway tract begins below the level of the vocal cords, and consists of the trachea, bronchi and lungs. The trachea, or windpipe, is a hollow tube, supported by rings of cartilage. It extends downward until it divides into two branches called bronchi, one of which travels into each lung. The two bronchi are hollow tubes, also supported by cartilage, that further divide into lower airways called bronchioles.

Bronchioles are thin hollow tubes that lead to the alveoli, and that remain open through smooth muscle tone. The millions of alveoli are small sacs that form the end of the airway. Each one has a thin walled sac that shares a wall with the capillary blood vessels in contact with it. It is at this site, where the one-celled walls of the alveoli and capillaries come into contact, where external respiration—the exchange of oxygen and carbon dioxide between the respiratory and circulatory system—takes place.

The circulatory system then transports the oxygen-rich blood to the brain, organs, muscles and other parts of the body. Some body tissues, such as those in the brain, are very sensitive to oxygen deprivation. Other vital organs can be adversely affected unless oxygen supplies are restored quickly. The brain is the control center for breathing. It adjusts the rate and depth of breaths according to the oxygen and carbon dioxide levels in the body. Breathing requires that the respiratory, circulatory, nervous and musculoskeletal systems work together. Injuries or illnesses that affect any of these systems may cause breathing emergencies.

CRITICAL FACTS

Ensuring an open airway is one of the most important steps you can take in caring for a patient, because a person cannot breathe without an open airway. A patient who can speak or cry is conscious, has an open airway, is breathing and has a pulse.

Pathophysiology

Normal breathing occurs in ambient (surrounding) air, which contains all the necessary gases for normal respiration. Patients may suffer breathing difficulties because of an inadequate amount of oxygen breathed in during respiration. Breathing difficulties may also occur as a result of breathing in a low-oxygen environment or when poisonous gases are in the air. Other causes of breathing difficulties include infection of the lungs; illnesses such as asthma, which narrows the airway and causes wheezing; excess fluid in the lungs or excess fluid between the lungs and blood vessels; traumatic injuries to the lungs that cause bruising (lung contusion); and poor circulation.

Breathing difficulties may also develop due to upper airway problems caused by swelling, obstruction or trauma. Swelling of the upper airway can occur due to anaphylaxis (severe allergic reaction) or asthma. Choking, caused by airway obstruction, is one of the most common causes of breathing emergencies, and can occur due to anatomical or mechanical obstruction. Trauma can occur due to a blow to the upper chest, a puncture or a crush injury.

Breathing problems may develop because of ineffective circulation. This can be the result of shock—an acute condition in which the circulatory system fails to adequately circulate oxygen-rich blood to all cells of the body—or cardiac arrest, when the heart stops functioning as a pump.

Sometimes the rate or depth of breathing is inadequate, leading to an insufficient volume of air moving into and out of the lungs. Respiration may be ineffective due to unconsciousness, altered level of consciousness, injury to the chest, poisoning, overdose, or diseases such as COPD or emphysema.

Oxygenation refers to the amount of oxygen in the bloodstream. Oxygen is exchanged between the alveoli of the lungs and the capillaries, and at the cellular level between the capillaries and the cells. If an insufficient amount of oxygen is delivered to the cells, this is referred to as ***hypoxia***, and may result from an obstructed airway, shock, inadequate breathing, drowning, strangulation, choking, suffocation, cardiac arrest, chest or head trauma, carbon monoxide poisoning or complications of general anesthesia.

RESPIRATORY EMERGENCIES

A respiratory emergency occurs when air cannot travel freely and easily into the lungs, and can be life threatening because it greatly cuts down on the oxygen the body receives or because it cuts off the oxygen entirely. This can stop the heart and prevent blood from reaching other vital organs. Unless the brain receives oxygen within 4 to 6 minutes, brain damage is possible. Within 6 to 10 minutes, brain damage is likely, and after 10 minutes, brain damage is certain (Fig. 10-1).

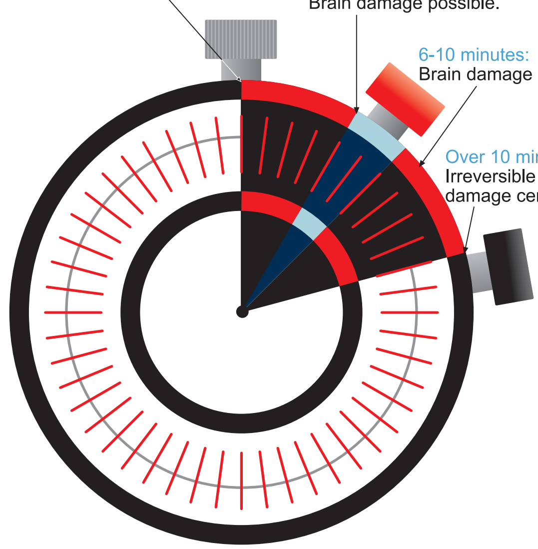


Fig. 10-1: Time is critical in respiratory emergencies.

! CRITICAL FACTS

There are many reasons why a person may have difficulty breathing. Reasons include an inadequate amount of oxygen being taken in, a low-oxygen environment, the presence of poisonous gases, infection, trauma, poor circulation or other health-related issues.

Oxygenation refers to the amount of oxygen in the bloodstream. Hypoxia is the term used to describe an insufficient amount of oxygen delivered to the cells.

There are two types of respiratory emergencies: respiratory distress, a condition in which breathing becomes difficult, and respiratory arrest, a condition in which breathing stops.

Respiratory distress can be caused by:

- A partially obstructed airway.
- Illness.
- Chronic conditions such as asthma.
- Electrocution, including lightning strikes.
- Heart attack.
- Injury to the head, chest, lungs or abdomen.
- Allergic reactions.
- Drugs.
- Poisoning.
- Emotional distress.

Trouble breathing can be the first sign of a more serious emergency such as a heart problem. Recognizing the signs of breathing problems and providing care are often the keys to preventing these problems from becoming emergencies that are more serious.

If you encounter someone with a breathing problem, the patient will most likely be conscious. Breathing problems can be identified by watching and listening to the patient's breathing and by asking how the patient feels. Although breathing problems have many causes, you do not have to know the exact cause of a breathing emergency to care for it.

Signs and symptoms of respiratory emergencies include:

- Slow or rapid breathing.
- Unusually deep or shallow breathing.
- Gasping for breath.
- Wheezing, gurgling or high-pitched noises.
- Unusually moist or cool skin.
- Flushed, pale, ashen or bluish skin color.
- Shortness of breath.
- Dizziness or light-headedness.
- Pain in the chest or tingling in the hands, feet or lips.
- Apprehensive or fearful feelings.

Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease (COPD) is a progressive lung disease in which the patient has difficulty breathing because of damage to the lungs. In a patient with COPD, the airways become partly obstructed and the alveolar sacs lose their ability to fill with air, making it difficult for air to be inhaled and exhaled.

The most common cause of COPD is cigarette smoking, but it may also be caused by inhaling other types of lung irritants, pollution, dust or chemicals over a long period of time. It is usually diagnosed when patients are middle aged or older. Combined with asthma, COPD is the third-ranking cause of death in the United States and a major cause of illness.

Signs and symptoms include the following:

- Coughing up a great deal of mucus
- A tendency to tire easily
- Loss of appetite
- Bent posture with shoulders elevated and lips pursed to make breathing easier
- A fast pulse
- Round, barrel-shaped chest
- Confusion (caused by lack of oxygen to the brain)

Patients with COPD require help focusing on breathing, as deep breaths help fill the lungs with air and maintain flexibility in the chest wall. Patients can learn special breathing exercises to help them relax and breathe slowly, which increases the flow of oxygen to the lungs.

Asthma

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

The Centers for Disease Control and Prevention (CDC) estimates that approximately 24 million Americans are diagnosed with asthma in their lifetimes. Asthma is more common in children and young adults than in older adults, but its frequency and severity are increasing in all age groups (Fig. 10-2). Asthma results in about 1.6 million visits to emergency departments annually in the United States.

You can often tell when a person is having an asthma attack by the hoarse whistling sound the person makes while inhaling and/or exhaling. This sound, known as ***wheezing***, occurs because air becomes trapped in the lungs. Coughing that

Fig. 10-2: Asthma is more common in children than in adults.

occurs after exercise, crying or laughing is another sign that an asthma attack is taking place.

Signs and symptoms of an asthma attack include:

- Coughing or wheezing noises.
- Difficulty breathing.
- Shortness of breath.
- Rapid, shallow breathing.
- Sweating.
- Tightness in the chest.
- Inability to speak in complete sentences.
- Bent posture with shoulders elevated and lips pursed to make breathing easier.
- Feelings of fear or confusion.

Usually, people diagnosed with asthma control their attacks by controlling environmental variables and through medication and other forms of treatment. The medications stop the muscle spasms and open the airway, which makes breathing easier. Controlling the environmental variables, whenever possible, helps reduce the triggers that can lead to the start of an asthma attack.

A trigger is anything that sets off or starts an asthma attack. A trigger for one person is not necessarily a trigger for another. Some asthma triggers are:

- Dust, smoke and air pollution.
- Exercise.
- Plants and molds.
- Perfume.
- Medications, such as aspirin.
- Animal dander.
- Temperature extremes and changes in the weather.
- Strong emotions, such as anger, fear or anxiety.
- Infections, such as colds or other respiratory infections.

Some anti-inflammatory medications prescribed for the long-term control of asthma are taken daily. Other medications are prescribed for quick relief and are taken only when a person is experiencing the signs and symptoms of an asthma attack (Fig. 10-3). These medications help relieve the sudden swelling and are called bronchodilators.

Pneumonia

Pneumonia is an infection that causes inflammation of the lungs. Because of the inflammation, the air sacs

Fig. 10-3: Medications used to treat asthma attacks stop the muscle spasms and open the airway, which makes breathing easier.

in the lungs begin to fill with fluid, and oxygen has trouble reaching the bloodstream. Pneumonia can be a serious illness in older adults because of normal age-related changes such as a weakened cough reflex and impaired mobility, and can even result in death.

Pneumonia can be caused by viruses (often a complication of the flu), bacteria, fungi or other organisms. Symptoms include high fever, chills, chest pain and shortness of breath. In addition to these symptoms, older patients commonly exhibit other symptoms including increased respiration rate, breathing difficulty and congestion. Altered mental status may also present in older patients. Older adults may also develop aspiration pneumonia. Residents who are in a coma or using feeding tubes are especially at risk for developing pneumonia. Bacterial pneumonia is treated with antibiotics. Administering supplemental oxygen may help relieve some of the symptoms of pneumonia.

Acute Pulmonary Edema

Pulmonary edema is an abnormal build-up of fluid in the lungs that can result in death if not properly treated. It is usually caused by inadequate heart pumping when the left ventricle starts to eject less blood than the right. This places excessive pressure on the lungs and allows fluid to leak into the alveoli and capillaries. Acute pulmonary edema causes severe respiratory distress, altered mental status and coughing, with some bloody sputum. Signs and symptoms of pulmonary edema include shortness of breath; difficulty breathing, including wheezing or gasping for breath; ***cyanosis*** (a bluish color of the skin and mucous membranes); frothy (foamy) pink sputum; pale skin; excessive sweating; restlessness, anxiety and a feeling of apprehension; a feeling of suffocating or drowning; and chest pain when the condition is caused by coronary artery disease. Gradual symptoms include difficulty breathing when lying flat, awakening at night with a feeling of breathlessness, unusual shortness of breath during physical activity and significant weight gain when the condition develops because of congestive heart failure. Administering supplemental oxygen is a primary step in the care of pulmonary edema.

Hyperventilation

Hyperventilation occurs when a person breathes faster and shallower or deeper than normal. When a patient is hyperventilating, carbon dioxide levels in the blood decrease, reducing blood flow to the brain. This causes fear, anxiety and confusion, as well as dizziness and a numb and tingly feeling in the fingers and toes.

Fear or anxiety is often the cause of hyperventilation but it can also result from a head injury, severe bleeding or conditions such as infection, heart failure and lung disease. Asthma and stress can also trigger hyperventilation.

Note that anxiety is only one cause of rapid breathing, and most patients experiencing this symptom are not hyperventilating. If you are certain the patient is not experiencing life-threatening symptoms, the most effective response is to calm the patient. Listen to the patient's concerns and try to reassure and encourage the patient to breathe slower or breathe through pursed lips. If the patient does not respond to this, administer supplemental oxygen, if it is available, based on local protocols.

Pulmonary Embolism

A ***pulmonary embolism*** is a blockage in the arteries of the lungs. Symptoms include a sudden onset of dyspnea (difficulty breathing; shortness of breath), chest pain that is localized and does not radiate, coughing, coughing up blood and fainting. The embolism usually has traveled from a blood clot in another part of the circulatory system (typically the legs), and then lodges somewhere in an artery in the lung.

With a pulmonary embolism, there is poor oxygen and carbon dioxide gas exchange in the alveoli, as the clot prevents blood from flowing through the capillaries; this inadequate exchange results in respiratory distress. The degree of distress depends on the size of the clot. Pulmonary embolism is more common in smokers, cancer patients, fracture patients, surgery patients, patients with cardiovascular disease, and those who have been on prolonged bed rest or suffered a trauma. It is also more common in older adults. Larger clots can cause death very quickly. Therefore, rapid recognition, care and transport of the patient to a hospital is crucial.

Emphysema

Emphysema is a chronic disease caused by damage to the air sacs in the lungs. It is also degenerative, in that it worsens over time. When the alveoli lose elasticity, they become distended (swollen and expanded) with trapped air and stop working properly. As the number of affected alveoli increases, breathing becomes increasingly difficult. The most common symptom of emphysema is shortness of breath. Exhaling is also extremely difficult. Other signs include cyanosis, barrel-shaped chest, fatigue, loss of appetite and weight loss, mild cough and breathing through pursed lips. The patient may feel restless, confused and weak.

In advanced cases of emphysema, the patient may even go into respiratory or cardiac arrest.

Pediatric Considerations

Respiratory Emergencies

It is very important to recognize breathing emergencies in children and infants and to act before the heart stops beating. When adult hearts stop beating, it is frequently due to disease. Children's and infants' hearts, however, are usually healthy. When a child's or an infant's heart stops, it is usually the result of a breathing emergency.

When attending to a child with respiratory problems, keep in mind that lower airway disease may be caused by birth problems or infections such as bronchiolitis, bronchospasms, pneumonia or croup.

Several of the illnesses and diseases that affect the respiratory system in children are preventable through vaccines. These include diphtheria; *Haemophilus influenzae* type b (Hib); measles, mumps and rubella (MMR); meningococcal; pertussis (whooping cough); pneumococcal disease; mycoplasma pneumonia (pneumonia-like illnesses); and varicella (chickenpox). Other diseases may not have respiratory symptoms but may be spread through respiratory transmission, such as mumps and rotavirus (severe diarrhea).

Considerations for Older Adults

Respiratory Emergencies

It is sometimes less obvious that older adult patients are suffering symptoms of a respiratory emergency, as they may be less sensitive to pain. You are more likely to encounter older patients who suffer from pneumonia or chronic, age-related breathing problems such as emphysema and pulmonary edema. Remember that older patients may present with different symptoms from those experienced by younger patients.

AIRWAY

Opening the Airway

As you learned in Chapter 7, there are two common methods used to open a patient's airway: the head-tilt/chin-lift maneuver and the jaw-thrust (without head extension) maneuver. The first is generally the preferred method *except* in cases where spinal injury is suspected. Both maneuvers lift the tongue from the back of the throat and allow air to move into and out of the lungs. Once the airway is open, it is important to maintain an open airway as you continue to provide care.

Signs of an Open Airway

If the airway is open and clear (patent), you will be able to see the rise and fall of the patient's chest, hear air coming out of the patient's mouth and nose, and feel air as the patient exhales. If the patient is able to speak in full sentences without distress, the airway is open and adequate. The ability to speak is a sign that air is moving past the vocal cords. The sound of the patient's voice is another indication of airway status. A patient who is speaking in normal tones has an adequate airway and is breathing effectively.

Signs of an Inadequate Airway

Patients with an inadequate airway need close attention and monitoring. They may be visibly unable to catch their breath or they may gasp for air and make grunting sounds. Some signs are subtle, but if you are not sure, play it safe and take steps to maintain an open airway at all times. Not every sign is present in every patient who has an inadequate airway.

If you observe any unusual sounds with breathing, take prompt action to open the airway, as they may be signs of an airway obstruction. ***Stridor*** is a harsh, high-pitched sound the person may make when inhaling possibly due to the larynx being swollen and blocking the upper airway. If the patient is snoring, the tongue or other tissues in the mouth may be relaxed and blocking the upper airway.

CRITICAL FACTS

A patient who is awake and alert but unable to speak, can only speak a few words or has a hoarse-sounding voice may be having severe difficulty breathing. Inadequate breathing may also be caused by swelling due to trauma, infection or an allergic reaction.

Foreign body airway obstruction (FBAO) is an emergency situation that needs immediate attention. The most common cause of an FBAO is a solid object, such as food.

A patient who is awake and alert but unable to speak, can only speak a few words or has a hoarse-sounding voice may be having severe difficulty breathing. Inadequate breathing may also be caused by swelling due to trauma, infection or an allergic reaction.

If there is no air movement, the patient is experiencing ***apnea***, which is the complete absence of breathing. In this situation, the chest will not rise and fall and you will not be able to hear or feel any air coming out of the patient's mouth and nose. The patient needs artificial ventilation, and if apnea is not corrected in a timely manner, there will be significant consequences.

Sometimes there may be no detectable air movement because of an airway obstruction. In an unconscious patient, if efforts to open the airway are unsuccessful and ventilations do not make the chest begin to rise, immediately provide CPR, starting with compressions. Before attempting ventilations, check the airway for an obstruction. Look inside the mouth for liquid, food, teeth, dentures, blood, vomit or other foreign objects that may be blocking the airway, such as a small toy. If you see the obstruction, remove it and continue CPR until there is an obvious sign of life. CPR is discussed in detail in Chapter 13.

Causes of Airway Obstruction

There are two types of airway obstruction: mechanical and anatomical. Any foreign body lodged in the airway is a mechanical obstruction and an emergency situation that needs immediate attention. The most common cause of ***foreign body airway obstruction (FBAO)*** in adults is a solid object, such as food. Fluids such as saliva, blood or vomit can also block the airway. Other causes of airway obstruction include loose or broken dentures. In the case of small children under age 4, large chunks of food and small objects such as toy parts and balloons commonly cause airway obstruction.

In an unconscious patient, the most common cause of airway obstruction is the tongue. This is known as an anatomical obstruction. An unconscious patient loses muscle tone, which may cause the tongue to fall back and block the airway. As the patient tries to breathe, the tongue moves further into the throat.

Other conditions that can block the airway anatomically include swelling due to trauma, infection, asthma, emphysema or anaphylaxis. An obstruction may also be caused by trauma to the neck. See Chapter 11 for more information on airway obstruction.

Clearing the Airway

Techniques to Clear an Airway Obstruction

More than one method exists to clear the airway in conscious patients. Protocols may vary but abdominal thrusts, back blows and chest thrusts each have been proven to effectively clear an obstructed airway in conscious patients. Frequently, a combination of more than one technique may be needed to expel an object and clear the airway. See Chapter 11 for more information on airway obstruction.

Techniques to Remove Foreign Matter from the Upper Airway

Two techniques can be used to remove visible foreign matter and fluids from the upper airway of an unconscious patient: finger sweeps and suctioning. The particular technique you choose will depend on the patient's condition and the foreign matter, and may require the use of both skills.

- ***Finger sweeps***. Finger sweeps involve removing an object or other foreign matter from a patient's mouth with a finger. They are *only* performed on an unconscious patient and *only* when you can see foreign matter in the patient's mouth. *Always* wear disposable latex-free gloves when performing a finger sweep.
- ***Suctioning***. The purpose of suctioning is to remove blood, fluids or food particles from the airway. Some suctioning devices *cannot* remove solid objects such as teeth, foreign bodies or food.

See Chapter 11 for more information on how to perform a finger sweep and how to use a suctioning device.

Recovery Positions

In some cases, the person may be unresponsive but breathing normally. For patients who are unresponsive, but breathing normally with no suspected head, neck, spinal, hip or pelvic injury, move the patient into a side-lying recovery position after completing your assessment and gathering a patient history, based on local protocols. Patients with a suspected head, neck, spinal, hip or pelvic injury should not be placed in a recovery position unless you are unable to manage the airway effectively or you are alone and need to leave the patient to call for additional resources. Placing a person in a recovery position will help keep the airway open and clear (Fig. 10-4). Refer to Chapter 5 for the steps for a recovery position.

Fig. 10-4: Place an unresponsive patient who is breathing normally with no suspected head, neck, spinal, hip or pelvic injury into a side-lying recovery position.

ASSESSING BREATHING

Determining the Presence of Breathing

To determine whether or not the patient is breathing, look for the rise and fall of the chest, listen for the sounds of breathing, and feel for movement as air escapes from the patient's mouth and nose as you simultaneously check for a pulse. Adequate breathing requires both sufficient rate and depth.

Signs of Adequate Breathing, Oxygenation and Ventilation

Breathing is considered adequate when respiratory rate, depth and effort are normal. The following are normal rates, although some people naturally breathe at slightly slower or faster rates:

- Adults—12 to 20 breaths per minute
- Children—15 to 30 breaths per minute
- Infants—25 to 50 breaths per minute

The depth of respiration is as important as the rate. Breathing must be deep enough to bring oxygen into the lungs and from there to the bloodstream. The normal rise and fall of the patient's chest indicates adequate depth.

A healthy adult should breathe regularly, quietly and effortlessly. No muscles in the neck or shoulders are involved, and there is not excessive use of the abdominal muscles. There are no unusual sounds, such as wheezing or whistling.

Oxygenation

Oxygenation happens naturally with ***ventilation***, the mechanical process of moving air in and out of the lungs. A healthy person with adequate oxygenation is clear thinking and calm and has normal skin color.

Signs of Inadequate Breathing

Inadequate breathing needs careful monitoring. You may not notice all of the signs and symptoms at once, and some can be hard to spot. If you see any of them, be prepared to give assisted ventilation.

Ventilation

Any of the following signs suggests that the patient is expending too much effort to breathe and that breathing is inadequate:

- Muscles between the ribs pull in on inhalation: As the patient breathes in, you may notice the muscles pulling inward between the ribs, above the collarbone, around the muscles of the neck and below the rib cage.
- Pursed lips breathing: The patient exhales through pursed lips (much like a whistling); this maneuver helps control the patient's breathing pattern.
- Nasal flaring: Flaring out of the nostrils on inhalation is a sign of inadequate breathing in children and infants.
- Fatigue: Apparent signs of fatigue are also an indication of the work of breathing.

CRITICAL FACTS

The normal rate of breathing for adults is 12 to 20 breaths per minute. For children, it is 15 to 30 breaths per minute, and for infants, it is 25 to 50 per minute. Adequate breathing means that respiratory rate, depth and effort are normal.

Any of the following signs suggests that breathing is inadequate: muscles between the ribs pull in on inhalation, pursed lips breathing, nasal flaring, fatigue, excessive use of abdominal muscles to breathe, sweating and deviated trachea.

- Excessive use of abdominal muscles to breathe: This means the patient is using the abdominal muscles to force air out of the lungs.
- Sweating: A patient who is sweating and anxious may be in severe respiratory distress.
- Sitting upright and learning forward (tripod position): A patient who is sitting upright and leaning forward with hands on knees is struggling to breathe.
- Deviated trachea: If you observe pendulum motions of the trachea while the patient is breathing in, this may be the result of chest trauma resulting in a lung injury. The trachea will move to the side of the uninjured lung. This is typically a very late sign of a life-threatening situation.

Abnormal breath sounds are also a sign of inadequate breathing. Listen for abnormal sounds such as stridor, wheezing or crackles/rales. Wheezing or whistling sounds indicate restricted air flow and are common with conditions such as asthma, allergic reactions or emphysema. ***Crackles/rales*** have a fine cracking sound on inhalation (much like the sound of Velcro® being pulled apart) and may indicate fluid in the lungs.

Inadequate depth of breathing may also indicate problems with ventilation. Shallow breathing, even if it is rapid, often means that the patient is not getting enough oxygen. Markedly increased breathing that is unusually deep is also a sign of inadequate respiration. If the person is struggling to breathe, the depth is not adequate.

Rate provides additional information about the adequacy of breathing. A very slow breathing rate—less than 8 breaths per minute for adults, less than 10 breaths per minute for children and less than 20 breaths per minute for infants—is a sign of inadequate breathing. Breathing that is too fast is often shallow and inadequate.

Unusual or irregular movement of the chest wall may indicate inadequate breathing. A chest injury needs immediate attention because it can cause rapid and severe deterioration of the person's breathing. Chest wall trauma may cause a few different problems. In ***paradoxical breathing***, an area of the chest moves in the opposite direction to the rest of the chest, i.e., moving in while the patient is breathing in (inspiration), and out while the patient is breathing out (expiration). This is often seen when the patient has flail chest. A patient with an injury to the chest wall or ribs will often place an arm over the area to protect and "splint" it. (For further information on chest wall movement, see Chapter 21.)

A penetrating wound to the chest can cause rapid deterioration in breathing as well. An injury to one side of the chest wall will cause unequal movement; one side will remain hyper-inflated and not move with the other side during breathing.

Irregular respiratory patterns may also be a sign of inadequate breathing, particularly when associated with a slow or rapid heart rate. These signs typically occur together in children.

Inadequate Oxygenation

Problems with inadequate oxygenation may occur for a variety of reasons and can cause headaches, increased breathing rate, nausea and vomiting, altered mental status and, ultimately, death. The ambient air may be abnormal, for example in an enclosed space or at a high altitude, or there may be poisonous gas or carbon monoxide present. Breathing in poison has an almost immediate impact, destroying lung tissue and causing respiratory distress or ***respiratory failure***. Carbon monoxide is a colorless, odorless and tasteless gas with a severe impact because the gas blocks the ability of the red blood cells to carry oxygen throughout the body.

A reduction of oxygen in the body causes headaches, increased breathing rate, nausea and vomiting, altered mental status and, ultimately, death.

One of the signs of inadequate oxygenation may be cyanosis, an abnormal blue or grey discoloration of the skin, mucous membranes or nail beds of the fingers and toes. Cyanosis is a serious sign that the body is not receiving enough oxygen. Pale, cool, clammy skin is an early and frequent sign of severe breathing difficulties resulting in falling oxygen levels. Mottling, another sign of inadequate oxygenation, is a blotchy pattern of skin discoloration, often caused by shock (Fig. 10-5). Without enough oxygen, patients also experience an altered mental state, becoming restless, agitated, confused or anxious.

Fig. 10-5: Cyanosis and mottling are some of the visible signs of inadequate oxygenation.

Minute Volume

A patient may appear to be breathing adequately but not be getting enough air to sustain life. One way of determining the adequacy of breathing is by measuring the minute volume. Minute volume is the amount of air breathed in per minute, and it depends on both the rate and depth of breathing. (Both rate and depth must be sufficient for breathing to be considered adequate.) Minute volume is calculated by multiplying these two factors: rate × volume per breath = minute volume.

The amount of air breathed in at each breath, the depth, is also referred to as the ***tidal volume***. Normally, a single breath contains approximately 500 milliliters (mL) of air. Tidal volume is best assessed by watching for adequate chest movement (rise and fall), and listening and feeling for air movement from the mouth and nose during inhalation and exhalation.

For example, a patient who is breathing 12 times per minute and taking in 500 mL of air per breath has a minute volume of 6000 mL (500 × 12 = 6000 mL of air per minute). While most of that 6000 mL of air reaches the alveoli, a small amount, approximately 150 mL, remains in the area between the pharynx and the alveoli. This area is referred to as the ***deadspace***. This amount must be taken into consideration, as it reduces the volume of each breath. In this example, 150 × 12 breaths = 1800 mL that never reaches the alveoli within a minute. For a patient who is breathing quickly, it may seem that breathing is adequate when it is not. Remember to reduce the calculated minute volume taking deadspace into consideration.

ARTIFICIAL VENTILATION

Artificial ventilation refers to the various mechanical ways that can be used to help a patient "breathe." When assisting a patient with artificial ventilations, make sure the force of air is consistent and just strong enough to cause the chest to begin to rise during each breath.

Mouth-to-Mask Ventilation

Resuscitation Mask

Using a ***resuscitation mask*** allows you to breathe expired air (with or without supplemental oxygen) into a patient without making mouth-to-mouth contact (Fig. 10-6). Use of the mask reduces the risk of disease transmission while providing enough oxygen (about 16 percent oxygen in your exhaled breath) to sustain life.

Flexible and shaped to fit over the patient's mouth and nose, resuscitation masks:

- Help get air quickly to the patient through both the mouth and nose.
- Create a seal over the patient's mouth and nose.
- Can be connected to supplemental oxygen, if equipped with an oxygen inlet.
- Protect against disease transmission.
- Are more effective for delivering ventilations when only one responder is present.

Resuscitation masks should be easy to assemble and use, and made of a transparent, pliable material that allows you to make a tight seal over the patient's mouth and nose. They have a one-way valve for releasing exhaled air and a standard 15-mm or 22-mm coupling assembly (the size of the opening for the one-way valve). Resuscitation masks work well under different environmental conditions, such as extreme heat or cold.

Fig. 10-6: Use of a resuscitation mask reduces the risk of disease transmission.

Mouth-to-Mouth Ventilation

As an emergency medical responder (EMR), you should follow standard precautions whenever providing ventilations. However, there may be circumstances when you do not have immediate access to a resuscitation mask or BVM. The risk of contracting a disease from mouth-to-mouth ventilations is low. Although protocols may vary, you may decide to give mouth-to-mouth ventilations without a barrier.

To provide ventilations to a patient *without* a mask:

1. Use the head-tilt/chin-lift maneuver to open the airway, provided you do not suspect an injury to the head, neck or spine.
2. Gently pinch the patient's nose shut with the thumb and index finger of your hand that is on the patient's forehead.
3. Make a tight seal around the patient's mouth with your mouth. For an infant, seal your mouth over the mouth and nose, instead of pinching the nose shut.
4. Blow into the patient's mouth until you see the chest begin to rise.

Each breath should last about 1 second, with a brief pause between breaths to let the air flow back out. Watch that the patient's chest rises each time you blow in, to ensure that your breaths are effective.

A limitation of the resuscitation mask is that, without use of a BVM or supplemental oxygen, it only delivers 16 percent oxygen through the responder's exhaled breath (50 percent with supplemental oxygen), which is considerably less than what is delivered using a BVM with supplemental oxygen.

When serious injury or sudden illness occurs, the body does not function properly, and supplemental oxygen can help meet the increased demand for oxygen for all body tissues. If the patient requires a higher concentration of oxygen than normal and the resuscitation mask has an oxygen inlet, connect it to supplemental oxygen. Normal concentration of oxygen in the air is 21 percent. Your exhaled breath (expired air) contains about 16 percent. A resuscitation mask can deliver approximately 35 to 55 percent oxygen to a person when the oxygen is delivered at 6 to 15 liters per minute (LPM). For more information on administration of oxygen, see Chapter 12. For step-by-step instructions on giving ventilations to adults, children and infants, see Skill Sheets 10-1 and 10-2.

Fig. 10-7: Infant and child resuscitation masks are available and should be used to care for children and infants.

Pediatric Considerations

Resuscitation Masks

Infant and child resuscitation masks are available and should be used to care for infants and children (Fig. 10-7). Adult resuscitation masks should not be used in an emergency situation unless a pediatric resuscitation mask is not available and medical control advises you to do so. Always use the appropriate equipment matched to the size of the patient.

Special Considerations

Air in the Stomach

When providing ventilations, blow slowly, with just enough air to make the patient's chest begin to rise. If you blow too much air into the patient (***overventilation***), it may enter the stomach, causing gastric distention. The patient will then likely vomit, which can obstruct the airway and complicate resuscitation efforts.

Vomiting

When you provide ventilations, the patient may vomit. If this occurs, quickly turn the patient onto the side to keep the vomit from blocking the airway and entering the lungs. Support the head and neck and turn the body as a unit toward you.

After vomiting stops, clear the patient's airway by wiping the patient's mouth out using a finger sweep and suction if necessary, turn the patient onto the back and continue with ventilations.

Mask-to-Nose Breathing

If the patient's mouth is injured, you may need to provide ventilations through the nose. To perform mask-to-nose breathing using a resuscitation mask:

- Open the airway using the head-tilt/chin-lift maneuver.
- Place the resuscitation mask over the patient's mouth and nose.
- Use both hands to keep the patient's mouth closed.
- Seal the resuscitation mask with both hands.
- Provide ventilations.

Mask-to-Stoma Breathing

On rare occasions, you may see an opening in a patient's neck as you tilt the head back to check for breathing. If the patient has a stoma and needs artificial ventilation, follow the same steps for mouth-to-mask breathing, except:

- Look, listen and feel for breathing with your ear over the stoma.
- Maintain the airway in a neutral position. (This ensures the patient's airway is neither flexed nor extended, as the stoma provides access to the lower airway.)
- Use a pediatric resuscitation mask over the patient's stoma.
- If possible, pinch the nose and close the mouth, as some patients with a stoma may still have a passage for air that reaches the mouth and nose in addition to the stoma.
- Provide ventilations (Fig. 10-8).

Patients with Dentures

Leave dentures in place unless they become loose and block the airway. Dentures help support the patient's mouth and cheeks, making it easier to seal the resuscitation mask during ventilation.

Fig. 10-8: If the patient has a stoma, provide ventilations through a round pediatric resuscitation mask placed over the stoma.

Patients with Suspected Head, Neck or Spinal injuries

If you suspect a patient has sustained an injury to the head, neck or spine, there are special considerations you must keep in mind. You may not always know if a patient has sustained this kind of injury and may have to rely on bystander information or mechanism of injury (MOI). Suspect an injury to the head, neck or spine if the patient:

- Was involved in a motor-vehicle, motorcycle or bicycle crash as an occupant, rider or pedestrian.
- Was injured as a result of a fall from greater than standing height.
- Complains of neck or back pain, tingling in the extremities or weakness.
- Is not fully alert.
- Appears to be intoxicated.
- Appears frail or over 65 years of age.
- Has an obvious head or neck injury.

Check for the following signs and symptoms of a possible head, neck or spinal injury before you attempt to provide care:

- Changes in the level of consciousness (LOC)
- Severe pain or pressure in the head, neck or back
- Loss of balance

CRITICAL FACTS

Suspect an injury to the head, neck or spine if the patient was involved in a motor-vehicle, motorcycle or bicycle crash as an occupant, rider or pedestrian; was injured as a result of a fall from greater than standing height; complains of neck or back pain, tingling in the extremities or weakness; is not fully alert; appears to be intoxicated; appears frail or over 65 years of age; or has an obvious head or neck injury.

- Partial or complete loss of movement of any body part
- Tingling or loss of sensation in the hands, fingers, feet or toes
- Persistent headache
- Unusual bumps, bruises or depressions on the head, neck or back
- Seizures
- Blood or other fluids in the ears or nose
- External bleeding of the head, neck or back
- Impaired breathing or vision as a result of injury
- Nausea or vomiting
- Bruising of the head, especially around the eyes and behind the ears

If you suspect an unconscious patient may have an injury to the head, neck or spine, remember to first take care of severe, life-threatening bleeding, the airway and breathing. Try to open the airway using the jaw-thrust (without head extension) maneuver first (see Skill Sheet 10-3). If the jaw-thrust (without head extension) maneuver does not open the airway, use the head-tilt/chin-lift maneuver.

Bag-Valve-Mask Resuscitator Ventilations

Bag-Valve-Mask Resuscitator

A ***bag-valve-mask (BVM) resuscitator*** is a handheld device used to ventilate patients and administer higher concentrations of oxygen than a pocket mask (Fig. 10-9, A). BVMs are used by either one responder responsible for managing the airway and delivering ventilations or two responders in a multiple-responder situation. A BVM has three parts: a bag, a valve and a mask. By placing the mask on the patient's face and squeezing the bag, you open the one-way valve, forcing air into the patient's lungs. When you release the bag, the valve closes and air from the surrounding environment refills the bag. BVMs have several advantages. They:

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

Pediatric Considerations

Pediatric BVMs

Infant and child BVMs are available and should be used for infants and children (Fig. 10-9, B). Using an adult BVM on an infant has the potential to cause harm and should *not* be used unless a pediatric BVM is not available *and* medical control advises you to do so. Always use the appropriate equipment matched to the size of the patient.

To use a BVM with one responder:

1. Assemble the BVM as needed.
2. Open the airway past a neutral position (for an adult) while positioned at the top of the patient's head (cephalic position).
3. Use an E-C hand position:
   - Place one hand around the mask, forming an E with the last three fingers and a C with the thumb and index finger around the mask.
   - Seal the mask completely around the patient's mouth and nose by lifting the jaw into the mask while maintaining an open airway.

Fig. 10-9, A–B: BVMs come in a variety of sizes for use with **(A)** adults, **(B)** children and infants.

4. Provide ventilations:
   - With the other hand, depress the bag about halfway to deliver between 400 to 700 milliliters of volume to make the chest begin to rise.
   - Give smooth and effortless ventilations that last about 1 second.

While a BVM is often used by a single responder (see Skill Sheet 10-4), evidence shows that two responders are needed to most effectively operate a BVM. One responder opens and maintains the airway and ensures the BVM mask seal, while the second responder delivers ventilations by squeezing the bag slowly with both hands at the correct intervals to the point of creating chest rise (see Skill Sheet 10-5).

To use a BVM with two responders:

1. Assemble the BVM as needed.
2. Open the airway past a neutral position (for an adult) while positioned at the top of the patient's head (cephalic position).
3. Use an E-C hand position (first responder):
   - Place both hands around the mask, forming an E with the last three fingers on each hand and a C with the thumb and index finger around both sides of the mask.
   - Seal the mask completely around the patient's mouth and nose by lifting the jaw into the mask while maintaining an open airway.
4. Provide ventilations (second responder):
   - Depress the bag about halfway to deliver between 400 to 700 milliliters of volume to make the chest begin to rise.
   - Give smooth and effortless ventilations that last about 1 second.

Providing Controlled Ventilation

Knowing the recommended ventilation rates for use with a BVM will ensure that you provide patients with adequate oxygen without causing harm. For example, too many breaths (hyperventilation) or too much volume of air (overventilation) can result in air going into the stomach, which can cause vomiting.

Ventilation rates vary with the age of the patient. Adequate ventilation rates are:

- 30–60 ventilations per minute at about 1 second each for a newborn (0 to 1 month).
- 20 ventilations per minute at 1 second each for a child or an infant.
- 10–12 ventilations per minute at 1 second each for an adult.

You can determine whether ventilation is adequate by watching the chest rise and fall. Ventilating a patient at rates that are too fast or with too much volume can be dangerous.

Overventilation and Hyperventilation

In any resuscitation situation, it is essential not to overventilate or hyperventilate the patient. With each ventilation provided, intrathoracic pressure (i.e., pressure in the chest cavity) increases, causing the blood vessels returning to the heart to be compressed. This decreases the amount of blood filling the heart and the coronary blood flow.

Overventilation and hyperventilation further increase the intrathoracic pressure, which in turn further decreases the amount of blood filling the heart and the coronary blood flow. The reduction of blood flowing back into the heart significantly limits effective circulation to the brain and other vital organs. Overventilation and hyperventilation should be avoided to improve patient outcomes. Responders should hyperventilate a patient only if directed by a specific protocol.

Science Note: Hyperventilation most commonly occurs when patients are being ventilated when they are in respiratory arrest or when an advanced airway is placed during cardiac arrest. It is critical to avoid hyperventilation of the patient because it leads to increased intrathoracic pressure and a subsequent decrease in coronary filling and coronary perfusion pressures by putting pressure on the vena cava.

CRITICAL FACTS

BVMs can hold more than 1000 milliliters of volume and should never be completely deflated when providing ventilations. Doing so could lead to overventilation and hyperventilation. Also, pay close attention to any increasing difficulty when providing BVM ventilation. This difficulty may indicate an increase in intrathoracic pressure, inadequate airway opening or other complications. Be sure to share this information with the team for corrective actions.

Normal Ventilation Versus Positive Pressure Ventilation

There are several differences between normal ventilation and ***positive pressure ventilation***. First, in normal ventilation, the movement of the diaphragm dropping creates negative pressure inside the chest, which causes air to be sucked into the lungs. During positive pressure ventilation using a resuscitation mask or BVM, the movement of air is created by the responder pushing the air artificially into the lungs.

A second difference is in how the blood moves within the body during normal versus positive pressure ventilation. In normal ventilation, the blood returns to the heart from the body and is pulled back to the heart as a part of breathing. During positive pressure ventilation, there is a decreased volume of blood returning to the heart when the lungs are inflated. Also, the amount of blood pumped out of the heart is reduced.

Esophageal opening pressure is also different in the two kinds of ventilation. During normal ventilation, the esophagus remains closed, and no air enters the stomach. During positive pressure ventilation, air is pushed into the stomach during ventilation. If there is excess air in the stomach, this may lead to vomiting and ***aspiration***.

Finally, positive pressure ventilation has the added risk of harming the patient due to excess rate or depth of ventilation. Ventilating the patient too quickly or too deeply may cause low blood pressure, vomiting or a decrease in blood flow when the chest is compressed during CPR.

Assisted Ventilation During Respiratory Distress

Assisted ventilation improves both oxygenation and ventilation. A patient in respiratory distress cannot breathe easily. Without adequate breathing, not enough oxygen reaches the cells, resulting in hypoxia. The patient becomes agitated and aggressive.

Assisted ventilation is given when the patient shows signs and symptoms of inadequate breathing, including:

- Breathing and heart rates that are too fast or too slow.
- Cyanosis.
- Inadequate chest wall motion.
- Changes in consciousness.
- Restlessness.
- Chest pain.

Procedure

When providing assisted ventilation to a patient during respiratory distress:

- Explain the procedure if the patient is conscious. A patient who is not breathing properly can become anxious or panic. Calming the patient may make them more receptive to your assistance.
- Place the mask over the patient's mouth and nose.
- Initially assist at the rate at which the patient has been breathing. Squeeze the bag each time the patient begins or tries to inhale.
- Adjust the rate as the patient's breathing begins to return to normal.

If breathing is slower than usual, provide extra ventilations in between the patient's own breaths. If breathing is rapid and shallow, provide ventilations when the patient inhales. If the patient has adequate breathing, administer oxygen at 15 LPM based on local protocols. Keep checking for signs of inadequate breathing.

Limitations

Patients who are hypoxic may become combative. A patient with this kind of altered mental status may

CRITICAL FACTS

Assisted ventilation is given when the patient shows signs and symptoms of inadequate breathing, including breathing and heart rates that are too fast or too slow, cyanosis, inadequate chest wall motion, changes in consciousness, restlessness and chest pain.

deteriorate quickly and become unable to breathe adequately. Maintain the airway and monitor the patient closely.

Make sure the mask fits tightly around the patient's mouth and nose. If there is not a good seal, an insufficient volume of air will be delivered to the patient.

Ventilation of an Apneic Patient with a Pulse

Absence of breathing (apnea) is a life-threatening condition that requires urgent care. Begin artificial ventilation at once using a resuscitation mask or BVM. Ventilation is provided for an apneic (nonbreathing) patient if the chest wall is not moving and there is no air moving in and out of the mouth and nose, or if occasional gasping breathing is noted. Continue to monitor the patient's condition. Ensure you have the proper size equipment for the apneic patient when providing artificial ventilation.

PUTTING IT ALL TOGETHER

Ensuring that a patient's airway is open and clear is an important step in providing care. A patient whose airway is blocked for any reason may die unless immediate steps are taken to open the airway.

Once the patient's airway is clear, you can begin to assess breathing. Inadequate breathing causes problems with inadequate ventilation and oxygenation. Breathing abnormalities can be assessed by observing physical signs and breath sounds, and by measuring the rate and depth of breathing.

A breathing emergency can become life threatening and should be detected during the primary assessment. Knowing the signs and symptoms of respiratory distress and respiratory arrest will help you determine the appropriate care for each condition.

For a patient with a pulse who is not breathing, provide artificial ventilation by using a resuscitation mask or BVM. Under specific circumstances, artificial ventilation can be provided mask-to-nose or mask-to-stoma. When using a resuscitation mask, be careful not to breathe too much air into the patient, as this may cause air to enter the stomach and cause vomiting. Also, special considerations must be made for children, patients with dentures and patients suspected of having a head, neck or spinal injury.

You Are the Emergency Medical Responder

While waiting for emergency medical services (EMS) personnel to arrive, you complete a SAMPLE history and secondary assessment. You have helped the patient into a position of comfort for breathing when he loses consciousness and stops breathing. He has a pulse. What care should you provide now?

Skill Sheet 10-1

Giving Ventilations—Adult and Child

NOTE: Always follow standard precautions when providing care. Size up the scene for safety and then perform a primary assessment. Always select the properly sized mask for the patient.

If there is a pulse but *no* breathing:

STEP 1

Assemble the resuscitation mask as necessary, and position the mask.

STEP 2

Seal the mask.

STEP 3

Open the airway by tilting the head back and lifting the chin.

(Continued)

Skill Sheet 10-1

Giving Ventilations—Adult and Child *Continued*

STEP 4

Blow into the mask.

- For an adult, give **1** ventilation about every **5–6** seconds.
- For a child, give **1** ventilation about every **3** seconds.
- Each ventilation should last about **1** second and make the chest begin to rise. The chest should fall before the next ventilation is given.

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

STEP 5

Recheck for breathing and a pulse about every **2** minutes:

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

If the chest does *not* begin to rise:

- Retilt the head, and then give another ventilation.
- Provide care based on the conditions found.

Skill Sheet 10-2

Giving Ventilations—Infant

NOTE: Always follow standard precautions when providing care. Size up the scene for safety and then perform a primary assessment. Always select the properly sized mask for the patient.

If there is a pulse but *no* breathing:

STEP 1

Assemble the resuscitation mask as necessary, and position the resuscitation mask.

STEP 2

Seal the mask.

STEP 3

Open the airway by tilting the head to a neutral position and lifting the chin.

(Continued)

Skill Sheet 10-2

Giving Ventilations—Infant *Continued*

STEP 4

Blow into the mask.

- Give 1 ventilation about every 3 seconds.
- Each ventilation should last about 1 second and make the chest begin to rise. The chest should fall before the next ventilation is given.

STEP 5

Recheck for breathing and a pulse about every 2 minutes:

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

If the chest does *not* begin to rise:

- Retilt the head, and then give another ventilation.
- Provide care based on the conditions found.

Skill Sheet 10-3

Giving Ventilations—Head, Neck or Spinal Injury Suspected: Jaw-Thrust (Without Head Extension) Maneuver—Adult and Child

NOTE: Always follow standard precautions when providing care. Size up the scene for safety and then perform a primary assessment. Always select the properly sized mask for the patient.

If there is a pulse, but *no* breathing and a head, neck or spinal injury *is suspected*:

STEP 1

Assemble the resuscitation mask.

STEP 2

Position the mask.

- Kneel above the patient's head.
- Place the mask over their mouth and nose, starting from the bridge of the nose.
- Place the bottom of the mask below the mouth but not past the chin.

STEP 3

Seal the mask.

- Slide the fingers into position under the angles of the patient's jawbone without moving the head or neck.

(Continued)

Skill Sheet 10-3

Giving Ventilations—Head, Neck or Spinal Injury Suspected: Jaw-Thrust (Without Head Extension) Maneuver—Adult and Child *Continued*

STEP 4

Open the airway.

- Thrust the jaw upward without moving the head or neck to lift the jaw and open the airway.

STEP 5

Blow into the mask.

- For an adult, give 1 ventilation about every 5–6 seconds
- For a child, give 1 ventilation about every 3 seconds.
- Each ventilation should last about 1 second and make the chest begin to rise. The chest should fall before the next ventilation is given.

STEP 6

Reassess for breathing and a pulse about every 2 minutes:

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

Skill Sheet 10-4

Giving Ventilations Using a Bag-Valve-Mask Resuscitator—One Responder

NOTE: Always follow standard precautions when providing care. Size up the scene for safety and then perform a primary assessment. Always select the properly sized mask for the patient. Assemble the BVM if necessary.

STEP 1

Assemble the BVM as needed.

STEP 2

Open the airway past a neutral position (for an adult) while positioned at the top of the patient's head (cephalic position).

STEP 3

Use an E-C hand position:

- Place one hand around the mask, forming an E with the last three fingers and a C with the thumb and index finger around the mask.
- Seal the mask completely around the patient's mouth and nose by lifting the jaw into the mask while maintaining an open airway.

STEP 4

Provide ventilations:

- With the other hand, depress the bag about halfway to deliver between 400 to 700 milliliters of volume to make the chest begin to rise.
- Give smooth and effortless ventilations that last about 1 second.

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

Skill Sheet 10-5

Giving Ventilations Using a Bag-Valve-Mask Resuscitator—Two Responders

NOTE: Always follow standard precautions when providing care. Size up the scene for safety and then perform a primary assessment. Always select the properly sized mask for the patient. Assemble the BVM if necessary.

STEP 1

Assemble the BVM as needed.

STEP 2

Open the airway past a neutral position (for an adult) while positioned at the top of the patient's head (cephalic position).

STEP 3

Use an E-C hand position (first responder):

- Place both hands around the mask, forming an E with the last three fingers on each hand and a C with the thumb and index finger around both sides of the mask.
- Seal the mask completely around the patient's mouth and nose by lifting the jaw into the mask while maintaining an open airway.

STEP 4

Provide ventilations (second responder):

- Depress the bag about halfway to deliver between 400 to 700 milliliters of volume to make the chest begin to rise.
- Give smooth and effortless ventilations that last about 1 second.

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

ENRICHMENT

Assessing Breath Sounds

Unobstructed airways are easy to identify with a stethoscope. You should hear air moving on inspiration (breathing in) and expiration (breathing out). If there are decreased lung sounds in a particular area of the lungs, you will hear no sound or a reduced sound compared with the other areas in the lungs.

To listen to the lungs in the front, you must identify the ***midclavicular lines*** and move down the chest. Place your stethoscope at the second intercostal space, usually just above the sternum line (Fig. 10-10, A). Do this on both the left and right sides to compare sounds.

To listen on the side, identify the ***midaxillary lines*** and place your stethoscope between the fourth and fifth intercostal space, approximately in line with the nipple (Fig. 10-10, B). Again, do this on both sides to be able to compare sounds.

Finally, listen in the back by identifying the ***midscapular lines*** and moving down the back (Fig. 10-10, C). Do this again on both sides.

When the airway becomes obstructed due to accumulation of fluid in the lungs or a blockage in the airway, you may hear other sounds, such as:

- Wheezing—a high-pitched whistling sound heard during inspiration but heard most loudly on expiration. Wheezing can often be heard without a stethoscope.
- Rales—a popping, clicking, bubbling or rattling sound.
- ***Rhonchi***—described as a snoring or coarse, dry rale sound.
- Stridor—a wheeze-like sound heard on inhalation and exhalation.

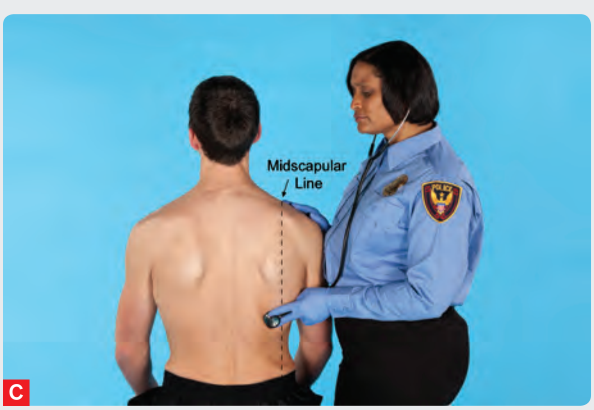


Fig. 10-10, A–C: To assess breath sounds: **(A)** Identify midclavicular lines and place your stethoscope at the second intercostal space; **(B)** identify the midaxillary lines and place your stethoscope between the fourth and fifth intercostal space; **(C)** identify the midscapular lines and move down below the scapula. Be sure to listen to and compare both sides for each step.

ENRICHMENT

Assisting the Patient with Asthma

As an EMR, you may find yourself in the position of needing to assist a patient with asthma in using an inhaler (see Skill Sheet 10-6). Having a basic knowledge of inhalers is of benefit to an EMR and to the patient with asthma to whom you may provide care.

Asthma Medication: Types, Indications and Contraindications

There are three types of medications used in the management of asthma, each with a different purpose:

- Long-term-control medications are used regularly to control chronic symptoms and prevent attacks.
- Quick-relief medications, also called rescue medications, are used as needed for relief of symptoms during an asthma attack.
- Medications for allergy-induced asthma are used to decrease sensitivity to a particular allergen and prevent the immune system from reacting to allergens.

Indications for asthma medication include recurrent wheezing, coughing, trouble breathing and chest tightness. Contraindications include increased risk of skin thinning and bruising. Asthma medication may also affect children's growth.

Delivery Systems for Asthma Medication

Metered-Dose Inhaler

A metered-dose inhaler is a small, handheld aerosol canister with a mouthpiece. It is designed to allow patients to inhale a specific amount of asthma medication into the lungs in one puff. A spacer, a tube attached to an inhaler that serves as a reservoir for the medication, may be present.

Dry Powder Inhaler

A dry powder inhaler (DPI) is similar to a metered-dose inhaler. A DPI is a handheld device that delivers a dry powder form of the medication inside a small capsule, disc or compartment inside the inhaler. Some dry powders may have no taste, while others are mixed with lactose to give them a sweet taste. The DPI is administered by breathing in quickly to activate the inhaler, so there is no depressing of the inhaler.

Small-Volume Nebulizer

A small-volume nebulizer is designed to administer aerosolized medication (mist) over a few minutes, ensuring the efficacy of drug delivery during treatment will not be jeopardized, even if the patient takes a single ineffective breath. Nebulizers are common for children under the age of 5, those who have difficulty using inhalers and those with severe asthma.

Other Delivery Systems for Asthma Medication

Asthma medication can also be taken in pill or liquid form. Most recently, asthma medication can be given through an injection just under the skin.

Peak Flowmeter

A peak flowmeter is a handheld asthma management tool that tracks a person's breathing. It assists in warning the person if their asthma is worsening, and helps show how they are responding to treatment. A peak flowmeter measures the person's ability to push air out of the lungs in one quick breath.

Continued on next page

ENRICHMENT

Assisting the Patient with Asthma *CONTINUED*

Assisting a Patient in the Use of an Inhaler

When assisting a patient in the use of an asthma inhaler, *always* obtain consent then follow these general guidelines, if local protocols allow:

1. If the patient has prescribed asthma medication, help the person take it first.
2. Shake the inhaler and then remove the cover from the mouthpiece. Position the spacer if you are using one.
3. Have the patient breathe out fully through the mouth and then place the lips tightly around the inhaler mouthpiece.
4. The patient should inhale deeply and slowly as you or the patient depresses the inhaler canister to release the medication, which is then inhaled into the lungs.
5. The patient should hold the breath for a count of 10. If using a spacer, the patient takes 5 to 6 deep breaths with the spacer still in the mouth, without holding the breath.
6. Reassess the patient's breathing.
7. Always wash your hands immediately after providing care.

Side Effects

Common side effects of asthma medication include:

- Increased heart rate.
- Palpitations.
- Nausea.
- Vomiting.
- Nervousness.
- Headache.
- Sleeplessness.
- Dry mouth.
- Cough.
- Hoarseness.
- Headache.
- Throat irritation.

Dose and Route

The effectiveness of treatment for asthma can vary based on the dose given to the patient, as well as the route by which it is administered. In severe cases, this is tracked by the patient's healthcare provider in order to find which is the most effective.

Medical Control Role

Any time you assist a patient with an inhaler, you need to obtain an order from medical direction. The order can be obtained through radio or phone contact with the medical director or through protocols and standing orders.

Always verify the order by restating the name of the medication. This helps reduce the chance of improper medication or inappropriate dose or route. Know and follow local protocols for administration of inhalers.

Skill Sheet 10-6

Assisting with an Asthma Inhaler

REMEMBER: Always obtain consent and wash your hands immediately after providing care. Read and follow all instructions printed on the inhaler prior to administering the medication to the patient. Always follow standard precautions when providing care.

If the person has medication for asthma, help them take it:

STEP 1

Help the patient sit up and rest in a position comfortable for breathing.

STEP 2

Ensure that the prescription is in the patient's name and is prescribed for "quick relief" or "acute" attacks.

- Ensure that the expiration date of the medication has *not* passed.

STEP 3

Shake the inhaler.

STEP 4

Remove the cover from the inhaler mouthpiece.

- If an extension tube (spacer) is available, attach and use it.

STEP 5

Tell the patient to breathe out as much as possible through the mouth.

(*Continued*)

Skill Sheet 10-6

Assisting with an Asthma Inhaler *Continued*

STEP 6

Have the patient place their lips tightly around the mouthpiece and take a long, slow breath.

- As the patient breathes in slowly, administer the medication by quickly pressing down on the inhaler canister, or the patient may self-administer the medication.
- The patient should continue a full, deep breath.
- Tell the patient to try to hold their breath for a count of **10**.
- When using an extension tube (spacer), have the patient take **5** to **6** deep breaths through the tube *without* holding their breath.

NOTE: The patient may use different techniques, such as holding the inhaler two-finger lengths away from the mouth.

STEP 7

Note the time of administration and any change in the patient's condition.

- The medication may be repeated once after **1** to **2** minutes.

NOTE: The medication may be repeated every 5 to 10 minutes thereafter, as needed, for emergency calls in areas with long EMS response times such as rural locations.

(*Continued*)

Skill Sheet 10-6

Assisting with an Asthma Inhaler *Continued*

STEP 8

Call for more advanced medical care if difficulty breathing does not improve quickly.

NOTE: These medications might take 5 to 15 minutes to reach full effectiveness.

11

AIRWAY MANAGEMENT

You Are the Emergency Medical Responder

As an emergency medical responder (EMR), you respond to a call at one of the docks for an unconscious adult who collapsed for no apparent reason. You size up the scene and notice that a middle-age male is lying face-up on the ground and not moving. The patient is unresponsive with no severe bleeding. He is not breathing but has a pulse. You discover that the patient's chest does not rise when you attempt ventilations. What would you do next? What do you think the problem is?

KEY TERMS

Airway adjunct: A mechanical device used to help keep the tongue from obstructing the airway; can be either nasal or oral.

Nasal (nasopharyngeal) airway (NPA): An airway adjunct inserted through the nostril and into the throat to help keep the tongue from obstructing the airway; may be used on a conscious or an unconscious patient.

Oral (oropharyngeal) airway (OPA): An airway adjunct inserted through the mouth and into the throat to help keep the tongue from obstructing the airway; used *only* with unconscious patients.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Explain the purposes and use of airway adjuncts.
- Describe the two types of suctioning devices and their use.
- List the circumstances when airway adjuncts should *not* be used.
- List some common causes of airway obstruction and describe appropriate care.
- Describe how to provide care for a choking adult, child and infant who becomes unconscious.

SKILL OBJECTIVES

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

- Demonstrate how to insert an oral airway.
- Demonstrate the techniques of suctioning.
- Demonstrate how to provide care for a choking adult, child and infant.
- Demonstrate how to insert a nasal airway *(Enrichment skill).*

INTRODUCTION

Although most of the care you provide will not require the use of breathing devices or ***airway adjuncts***, in some situations they can be used effectively as part of your care. Breathing devices and airway adjuncts can assist with:

- Helping maintain an open airway.
- Ventilating a patient.
- Administering supplemental oxygen.

In this chapter, you will learn the purpose and use of airway adjuncts, suctioning and how to handle situations involving foreign body airway obstructions (FBAOs).

SUCTIONING

Sometimes injury or sudden illness results in foreign matter, such as mucus, fluids or blood, collecting in a patient's airway. One method of clearing the airway is to roll the patient onto the side and sweep the mouth with a gloved finger. However, finger sweeps should *only* be performed on an *unconscious* patient and *only* when material is visible in the mouth. Another method of keeping the airway clear is to place an unresponsive patient who is breathing in a recovery position. But a more effective method is to suction the airway clear. Suctioning is the process of removing foreign matter from the upper airway by means of a mechanical or manual device.

Suctioning is an important step, when fluids or foreign matter are present or suspected, because the airway must be open and clear in order for the patient to breathe or for any CPR breathing barrier to be effective. Ensure that you always have a suction device at the patient's side when providing care.

Suctioning Equipment

There are two types of suction devices: mechanical and manual (Fig. 11-1, A–B). A variety of mechanical and manual devices are used to

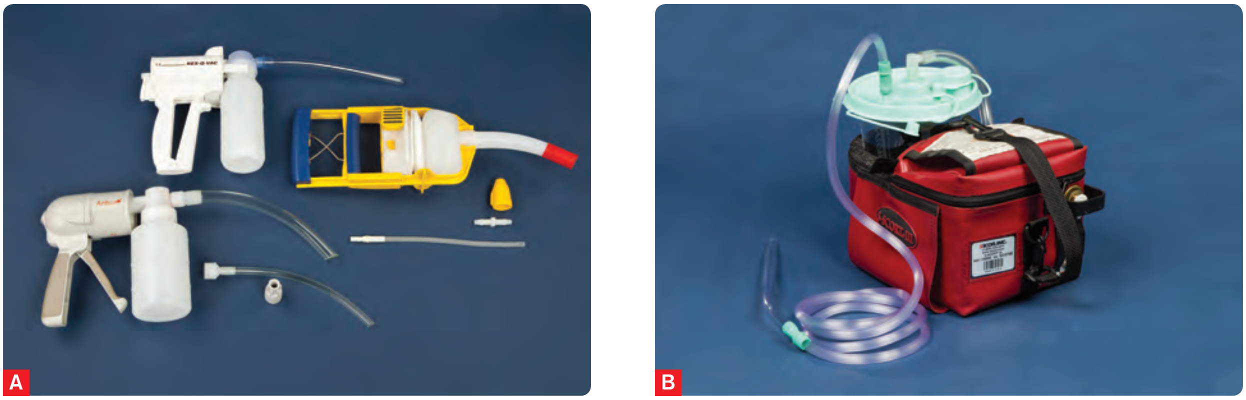


Fig. 11-1, A–B: (A) Mechanical suctioning equipment; **(B)** manual suctioning equipment.

suction the airway. Not all suction units are able to remove solid objects like teeth, foreign bodies and food. Always follow standard precautions when using a suctioning device.

Mechanical suction units are electrically powered. They produce a vacuum that is powerful enough to suction substances from the throat (see Skill Sheet 11-1). Mechanical units operate on batteries, which must be checked to ensure they are fully charged, unless the units are of a type with batteries that can be constantly charged. Otherwise, there may be insufficient vacuum to operate the unit effectively and for a sufficient amount of time. Mechanical suction devices are normally found on ambulances or other transport vehicles and use either battery-powered pumps or oxygen-powered aspirators.

Manual suction units, as the term implies, are operated by hand (see Skill Sheet 11-2). They are lightweight, compact and relatively inexpensive. Because they do not require an energy source, they avoid some of the problems associated with mechanical units and are easily taken to the side of the patient in case they are needed.

For either type of unit, several sizes of sterile suction catheters should be kept on hand for use, depending on the size of the patient. An installed suction unit should be powerful enough to provide an airflow of > 40 liters per minute (LPM) at the end of the delivery tube and, when clamped, a vacuum of > 300 mmHg.

How to Suction

To use a *mechanical* suctioning device:

1. Position the patient on the side with the mouth open. If the patient has an obvious sign of injury, suction them in the position found, as appropriate.
2. Remove any visible large debris from the mouth with a gloved finger if the patient is unconscious.
3. Measure and check the suction tip.
4. Turn on the machine and test it.
5. Suction the mouth of an adult for *no more than 15 seconds at a time as you withdraw the catheter using a sweeping motion*. Suctioning for longer periods can starve the patient of air. This can create an environment that is too low in oxygen to sustain life.

To use a *manual* suctioning device:

1. Position the patient on the side with the mouth open. If the patient has an obvious sign of injury, suction them in the position found, as appropriate.
2. Remove any visible large debris from the mouth with a gloved finger if the patient is unconscious.
3. Measure and check the suction tip.
4. Suction the mouth of an adult for *no more than 15 seconds at a time as you withdraw the catheter using a sweeping motion*.

CRITICAL FACTS

Suctioning is the process of removing foreign matter, such as mucus, fluids or blood, from a patient's upper airway. Suctioning can be done through mechanical or manual devices.

Pediatric Considerations

When using mechanical or manual suction on a child or an infant, suction for *no more than 10 seconds at a time for a child* and *5 seconds at a time for an infant.*

BREATHING DEVICES

Breathing devices allow the emergency medical responder (EMR) to provide positive pressure ventilations to patients in need of CPR, supplemental oxygen and/or artificial ventilations. These devices include CPR breathing barriers such as face shields and resuscitation masks, bag-valve-mask (BVM) resuscitators and oxygen equipment. CPR breathing barriers should have certain standard features such as a one-way valve to reduce the possibility of direct contact with, or exposure to, body fluids and a patient's exhaled breath. Such devices can help to deliver life-sustaining ventilations when a patient is unable to breathe on their own. See Chapter 10 for more information and how to use these devices.

AIRWAY ADJUNCTS

The tongue is the most common cause of airway obstruction in an unconscious person. Keeping the tongue from blocking the air passage is a high priority. Mechanical airway adjuncts known as ***oral (oropharyngeal) airways*** **(OPAs)** and ***nasal (nasopharyngeal) airways*** **(NPAs)** can help you accomplish this task. (For more information on NPAs, refer to the Enrichment at the end of this chapter.)

Airway adjuncts come in a variety of sizes (Fig. 11-2, A–B). The curved design fits the natural contour of the mouth and throat. Once you have positioned the device, you can use a resuscitation mask or BVM to ventilate a nonbreathing patient.

Oropharyngeal Airway

As the name implies, this type of airway is inserted into the mouth (see Skill Sheet 11-3). When properly positioned, the OPA keeps the tongue away from the back of the throat, thereby helping to maintain an open airway. An improperly placed airway device can compress the tongue into the back of the throat, further blocking the airway.

When preparing to insert an OPA, first be sure the patient is unconscious. OPAs are used *only* on unconscious patients with *no* gag reflex. If a patient begins to gag, remove the airway immediately. OPAs should not be used if the patient has suffered oral trauma, such as broken teeth, or has recently undergone oral surgery. Follow local protocols for the use of OPAs.

Next, select the proper size of airway. Measure the device on the patient to see that it extends from the angle of the jaw to the corner of the mouth (Fig. 11-3). To insert the airway, grasp the patient's lower jaw and tongue and lift upward. With the patient's jaw raised, insert the OPA with

Fig. 11-2, A–B: (A) Oropharyngeal airways (OPAs); **(B)** nasopharyngeal airways (NPAs).

CRITICAL FACTS

The tongue is the most common cause of airway obstruction in an unconscious person. Keeping the tongue from blocking the air passage is a high priority. Mechanical airway adjuncts known as OPAs and NPAs can help you accomplish this task.

Fig. 11-3: A properly sized OPA extends from the angle of the jaw to the corner of the mouth.

the curved end (tip) along the roof of the mouth (Fig. 11-4, A). As the tip of the device approaches the back of the throat, you will feel resistance. Rotate it a half turn to drop it into the back of the patient's throat (Fig. 11-4, B). The OPA should drop into the throat without resistance. The flange end should rest on the patient's lips (Fig. 11-4, C). If the patient begins gagging as the device is positioned in the back of the throat, remove the device. Suction the airway, ensuring all debris is removed from the airway. Thoroughly clean the device and reinsert into the airway only if the patient is still unconscious and does *not* have a gag reflex.

Pediatric Considerations

The airway of a child or infant is smaller than an adult's. The size can also vary according to the age of the child or infant, so it is important to use an appropriately sized OPA for pediatric patients. Additionally, the palate of a child and an infant is softer than that of an adult. It can be injured if an OPA is inserted with the tip pointing upward toward the roof of the mouth and rotated 180 degrees as is performed on an adult. Because of this risk of injury, when inserting an OPA in a child or an infant, the airway is inserted with the tip of the device either *sideways* then rotated *90 degrees* into position or, using a tongue depressor, inserted with the tip of the device pointing toward the back of the tongue and throat in the position it will rest after insertion (Fig. 11-5, A–B).

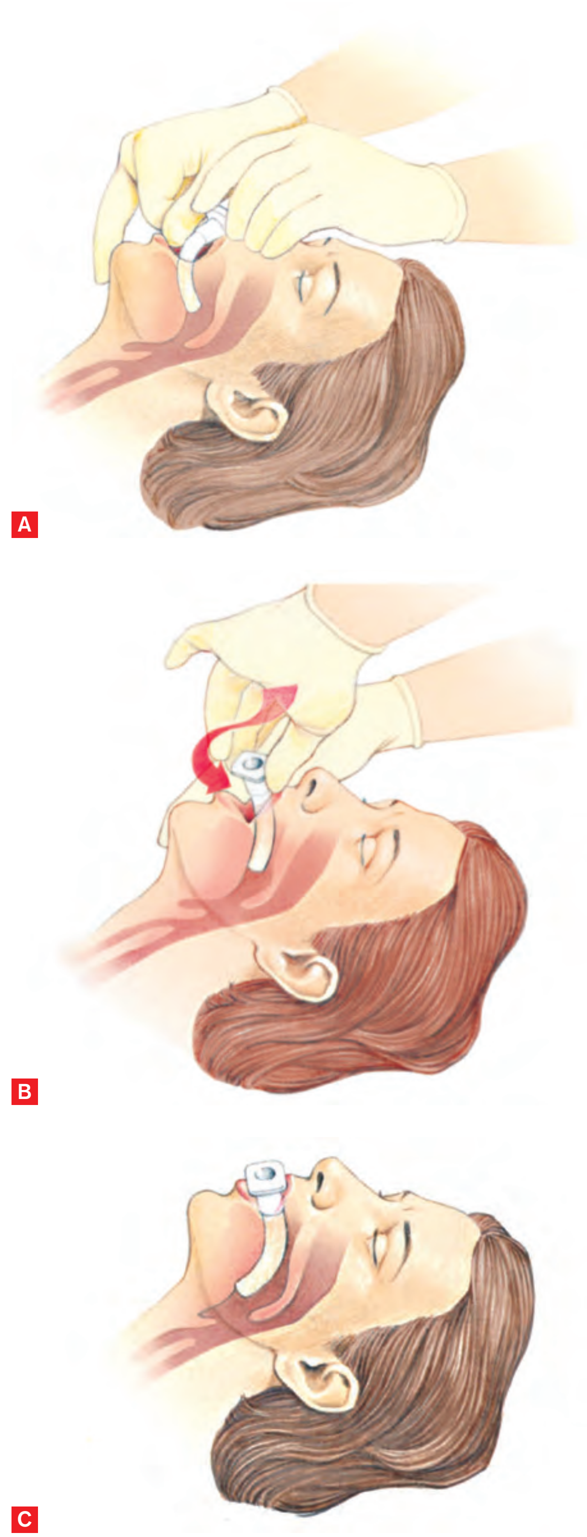
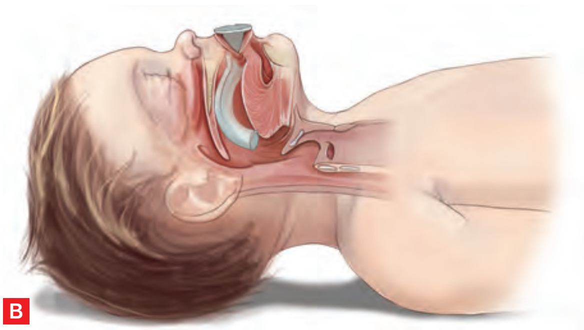


Fig. 11-4, A–C: (A) Insert an OPA with the curved tip along the roof of the mouth. **(B)** Rotate it to drop it into the back of the throat. **(C)** If inserted properly, the flange end should rest on the lips.

CRITICAL FACTS

When preparing to insert an OPA, first be sure the patient is unconscious. OPAs are used *only* on unconscious patients with *no* gag reflex.

A



B

Fig. 11-5, A–B: To insert an OPA in a pediatric patient: **(A)** Use a tongue depressor and insert the OPA, with the device pointing toward the back of the tongue; **(B)** ensure that the OPA rests in proper position.

AIRWAY OBSTRUCTION

Types of Airway Obstruction

There are two types of airway obstruction, anatomical and mechanical:

Anatomical obstruction occurs when an airway is blocked by an anatomical structure, such as the tongue or swollen tissues of the mouth or throat. The tongue is a common cause of airway obstruction in an unconscious patient because the tongue relaxes when the body is deprived of oxygen, causing the tongue to rest on the back of the throat, blocking the flow of air to the lungs.

Mechanical obstruction, also known as foreign body airway obstruction, occurs when foreign objects, such as food or toys, or fluids, such as vomit, block the airway.

Foreign Body Airway Obstruction

Foreign body airway obstruction (FBAO) causes choking and commonly occurs because of poorly chewed food; eating too fast; or laughing, talking, running or walking while eating. A conscious person who is clutching the throat is showing what is commonly called the "universal" sign of choking (Fig. 11-6). A person with a mild FBAO, or partial airway obstruction, can still move some air to and from the lungs, often while wheezing. As long

Fig. 11-6: A conscious person who is clutching the throat is showing what is commonly called the "universal" sign of choking.

CRITICAL FACTS

There are two types of airway obstruction: anatomical (e.g., swollen tongue) and mechanical (e.g., food, toys).

as the person can cough forcefully, encourage continued coughing but do not provide first aid care for choking. Severe airway obstruction is apparent when the person cannot cough, speak, cry or breathe and requires *immediate* action.

FBAO in an Adult

As an EMR, you must get consent before helping a choking adult.

When caring for a choking adult, several skills—abdominal thrusts, back blows and chest thrusts—have been shown to be effective at clearing an obstruction (see Skill Sheet 11-4). Generally, EMRs should provide abdominal thrusts to attempt to clear an obstruction, but they may perform a combination of skills such as back blows followed by abdominal thrusts based on local protocols (Fig. 11-7). Each abdominal thrust, back blow or chest thrust should be a distinct attempt to dislodge the object. Using more than one technique is often necessary to dislodge an object and clear a patient's airway. Continue performing abdominal thrusts or a combination of skills until the object is dislodged and the patient can cough forcefully, speak or breathe, or until the patient becomes unconscious.

Fig. 11-7: Proper hand placement for abdominal thrusts.

Abdominal thrusts may not be an effective method of care for choking adults in cases where you cannot reach far enough around the patient to give effective abdominal thrusts or if the patient is obviously pregnant or known to be pregnant. In these situations, you should give back blows followed by chest thrusts (Fig. 11-8, A–B).

To perform abdominal thrusts:

1. Stand behind the patient and use one or two fingers of one hand to find the navel.
2. Make a fist with your other hand and place the thumb side of your fist against the middle of the patient's abdomen, just above the navel.
3. Grab your fist with your other hand and give quick inward and upward thrusts.
4. Continue providing abdominal thrusts until the patient begins to cough forcefully, speak or breathe, or until the patient becomes unconscious.

To perform back blows:

1. Stand to the side and slightly behind the patient.
2. Place one arm diagonally across the patient's chest (to provide support) and bend the patient forward at the waist so their upper body is as close to parallel to the ground as possible.
3. Firmly strike the patient between the scapulae with the heel of your other hand.
4. Continue providing back blows until the patient begins to cough forcefully, speak or breathe, or until the patient becomes unconscious.

Fig. 11-8, A–B: If you cannot reach around the patient to give effective abdominal thrusts, or if the patient is pregnant, give **(A)** back blows followed by **(B)** chest thrusts.

To perform chest thrusts:

1. Stand behind the patient and make a fist with one hand.
2. Place the thumb side of your fist against the center of the patient's chest.
3. Grab your fist with your other hand and give quick inward thrusts.
4. Continue providing chest thrusts until the patient begins to cough forcefully, speak or breathe, or until the patient becomes unconscious.

If a patient who is choking becomes unconscious, carefully lower the patient to a firm, flat surface while protecting their head, send someone to get an AED, and summon additional resources if appropriate and you have not already done so. Immediately begin CPR, starting with chest compressions. (CPR will be discussed in detail in Chapter 13.)

As you open the airway to give ventilations, look in the patient's mouth for any visible object. If you can see an object, use a finger sweep motion to remove it (Fig. 11-9, A–C). If you don't see an object, do *not* perform a blind finger sweep, but continue CPR. Remember to never try more than 2 ventilations during one cycle of CPR, even if the chest doesn't rise.

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

Science Note: Evidence suggests that it may take more than one technique to relieve an airway obstruction in the conscious patient, and that abdominal thrusts, back blows and chest thrusts are all effective.

Science Note: Based upon local protocols or practice, it is permissible to provide a series of back blows in addition to abdominal thrusts to an adult or child who is choking. Always follow local protocols, practice or medical direction instructions.

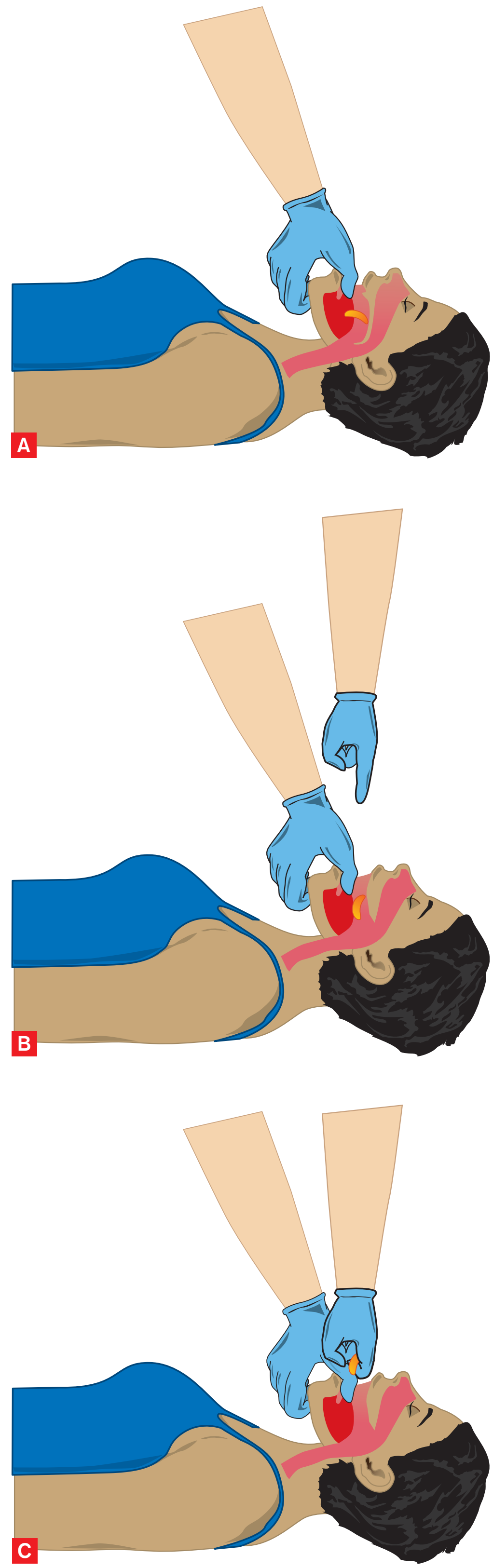


Fig. 11-9, A–C: As you open the airway to give ventilations, look in the patient's mouth for any visible object. If you can see an object, use a finger sweep motion to remove it.

Pediatric Considerations

Children are prone to choking on small objects as well as food. Choking hazards among children include small objects such as coins, buttons, small toys, and parts of toys and balloons, as well as certain food items. While hazardous for all children, these objects generally pose a larger threat to children under 4 years of age. Children under 4 do not have a full set of teeth and cannot chew as well as older children, so large chunks of foods may lodge in the throat and cause choking.

The American Academy of Pediatrics (AAP) recommends that children younger than 4 not be fed any round, firm food unless it is cut into small pieces no larger than one-half inch. It further recommends keeping the following foods away from children younger than 4:

- Hot dogs
- Nuts and seeds
- Chunks of meat or cheese
- Whole grapes
- Hard, gooey or sticky candy
- Popcorn
- Chunks of peanut butter
- Raw vegetables
- Raisins
- Chewing gum

While food items cause the most choking injuries in children, toys and household items can also be hazardous. Balloons, when not inflated or when broken, 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.

As an EMR, you must get consent from a parent or legal guardian, if present, before helping a choking child or infant.

For a conscious child, the process of relieving an obstructed airway is similar to that of an adult. However, responders should use less force when giving abdominal thrusts or back blows. Using too much force may cause internal injuries. Remember, you may need to kneel to provide care for an obstructed airway in a child. Continue care until the child can cough forcefully, speak, cry or breathe, or until the child becomes unconscious. If a child becomes unconscious, follow the same general steps as you would for an adult.

When an infant is choking and awake but unable to cough, cry or breathe, you'll need to perform a series of 5 back blows and 5 chest thrusts (see Skill Sheet 11-5). Start with back blows. Hold the infant face-down on one arm using your thigh for support. Make sure the infant's head is lower than their chest and that you are supporting the infant's head and neck. With your other arm, give firm back blows with the heel of your hand between the infant's scapulae.

After 5 back blows, start chest thrusts. Turn the infant over onto your other arm using your thigh for support. Make sure to support the head and neck as you move the infant. Place two fingers in the center of the infant's chest, just below the nipple line. Give 5 thrusts. Continue this cycle of 5 back blows and 5 chest thrusts until the object is forced out; the infant can cough, cry or breathe; or the infant becomes unconscious.

If an infant does become unconscious while choking, carefully lower the infant onto a firm, flat surface while protecting their head, send someone to get an AED, and summon additional resources if appropriate and you have not already done so. Immediately begin CPR, starting with chest compressions.

PUTTING IT ALL TOGETHER

As an EMR, you may need to know how to insert OPAs, use a suctioning device and care for a conscious or an unconscious patient who is choking. Breathing devices and airway adjuncts allow the EMR to help maintain an open airway, ventilate a patient and supply supplemental oxygen.

OPAs can help maintain an open airway by keeping the tongue away from the back of the throat. An OPA can be used on an unconscious patient who does *not* have a gag reflex and requires an airway adjunct. Suction equipment helps clear the upper airway of substances, such as fluids, blood, saliva or vomit. You should also know the difference between a mechanical and anatomical obstruction and the actions required to assist a patient who is choking as a result.

Special considerations must be given when caring for a child or an infant, including the size of equipment used. You may need to alter your positon based on the size of the child and use less force to clear an obstructed airway.

You Are the Emergency Medical Responder

You reposition the patient's airway and attempt another ventilation, but the chest still does not rise. How would you respond? After a few minutes of care, the patient's chest begins to rise and fall with the ventilations, but he is not breathing on his own. How would you continue to provide care for this patient?

Skill Sheet 11-1

Using a Mechanical Suctioning Device

NOTE: Size up the scene for safety, and follow standard precautions. If needed, assemble the device according to manufacturer's instructions.

STEP 1

Position the patient. If the patient has an obvious sign of injury, suction them in the position found, as appropriate.

- Roll the body as a unit onto one side.
- Open the mouth.

STEP 2

Remove any visible large debris from the mouth with a gloved finger if the patient is unconscious.

STEP 3

Measure and check the suction tip.

- Measure from the angle of the patient's jaw to the corner of the mouth.
- Note the distance to prevent inserting the suction tip too deeply.

(*Continued*)

Skill Sheet 11-1

Using a Mechanical Suctioning Device *Continued*

STEP 4

Turn on the machine and check that the suction is working according to the manufacturer's instructions.

STEP 5

Suction the mouth.

- Insert the suction tip into the back of the mouth.
- Apply suction as you withdraw the catheter using a sweeping motion, if possible.
- Suction for *no more than* **15** *seconds at a time for an adult*, **10** *seconds for a child* and **5** *seconds for an infant.*

Skill Sheet 11-2

Using a Manual Suctioning Device

NOTE: Size up the scene for safety, and follow standard precautions. If needed, assemble the device according to manufacturer's instructions.

STEP 1

Position the patient. If the patient has an obvious sign of injury, suction them in the position found, as appropriate.

- Roll the body as a unit onto one side.
- Open the mouth.

STEP 2

Remove any visible large debris from the mouth with a gloved finger if the patient is unconscious.

STEP 3

Measure and check the suction tip.

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

(Continued)

Skill Sheet 11-2

Using a Manual Suctioning Device *Continued*

STEP 4

Suction the mouth.

- Insert the suction tip into the back of the mouth.
- Squeeze the handle of the suction device repeatedly to provide suction.
- Apply suction as you withdraw the catheter using a sweeping motion, if possible.
- Suction for *no more than* **15** *seconds at a time for an adult,* **10** *seconds for a child* and **5** *seconds for an infant.*

Skill Sheet 11-3

Inserting an Oral Airway

NOTE: Size up the scene for safety, follow standard precautions and then perform a primary assessment. Before inserting an oral airway (OPA), be sure the patient is unconscious, has no oral trauma such as broken teeth and has not had recent oral surgery. If the patient gags, remove the airway immediately.

STEP 1

Select the proper size.

- Measure the OPA from the angle of the patient's jaw to the corner of the mouth.

STEP 2

Open the patient's mouth.

- Use the cross-finger technique to open the patient's mouth.

(Continued)

Skill Sheet 11-3

Inserting an Oral Airway *Continued*

STEP 3

Insert the OPA.

NOTE: When inserting an OPA in a child or an infant, the OPA is inserted using a tongue blade or a tongue depressor, then inserted with the tip of the device pointing toward the back of the tongue and throat in the position it will rest in after insertion.

- To insert the OPA, grasp the patient's lower jaw and tongue and lift upward.
- Insert the OPA with the curved end along the roof of the mouth.
- As the tip approaches the back of the mouth, rotate it one-half turn (180 degrees).
- Slide the OPA into the back of the throat.

NOTE: The alternative procedure for a child or an infant is to insert the OPA sideways and then rotate it 90 degrees.

STEP 4

Ensure correct placement.

- The flange should rest on the patient's lips.
- If the patient begins to gag, *immediately* remove the OPA.
- If the patient vomits, remove and suction the airway, ensuring all debris is removed from the airway. Thoroughly clean the device and reinsert into the airway *only* if the patient is still unconscious and does *not* have a gag reflex.

Skill Sheet 11-4

Choking—Adult and Child

NOTE: Obtain consent from a choking adult. If a child is choking, obtain consent from the parent or legal guardian if present. Tell the child's parent or legal guardian your level of training and the care you are going to provide. If the parent or legal guardian is not available, consent is implied. Always follow standard precautions when providing care.

STEP 1

Ask the patient, "Are you choking?"

- Identify yourself and ask if you can help.
- If the patient is coughing forcefully, encourage continued coughing.

STEP 2

If the patient cannot cough, speak or breathe, have someone else summon more advanced medical personnel.

(*Continued*)

Skill Sheet 11-4

Choking—Adult and Child *Continued*

STEP 3

Give abdominal thrusts.

- Stand behind the patient.
  - For a child, stand or kneel behind the child, depending on the child's size. Use *less force* on a child than you would on an adult.
- Use one or two fingers of one hand to find the navel.
- Make a fist with your other hand and place the thumb side of your fist against the middle of the patient's abdomen, just above the navel.
- Grab your fist with your other hand.
- Give quick inward and upward thrusts. Each thrust should be a distinct attempt to dislodge the object.

Continue providing abdominal thrusts until:

- The patient begins to cough forcefully, speak or breathe on their own.
- The patient becomes unconscious.

If the patient becomes unconscious:

- Carefully lower the patient to a firm, flat surface while protecting their head.
- Immediately begin CPR, starting with compressions.
  - After 30 compressions, open their mouth and look for an object. If you see an object, remove it with a finger sweep.
  - Attempt ventilations.
  - Continue CPR.

OPTION BASED ON LOCAL PROTOCOLS

Provide a combination of 5 back blows followed by 5 abdominal thrusts.

To perform back blows:

- Stand to the side and slightly behind the patient.
- Place one arm diagonally across the patient's chest (to provide support) and bend the patient forward at the waist so their upper body is as close to parallel to the ground as possible.
- Firmly strike the patient between the scapulae with the heel of your other hand.
- Continue providing back blows until the patient begins to cough forcefully, speak or breathe, or until the patient becomes unconscious.

NOTE: Some choking patients may need chest thrusts instead of abdominal thrusts.

Use chest thrusts if:

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

Skill Sheet 11-5

Choking—Infant

NOTE: If an infant is choking, obtain consent from the parent or legal guardian if present. Tell the infant's parent or legal guardian your level of training and the care you are going to provide. If the parent or legal guardian is not available, consent is implied. Always follow standard precautions when providing care.

STEP 1

If the infant cannot cough, cry or breathe, carefully position the infant face-down along your forearm.

- Support the infant's head and neck with your hand.
- Lower the infant onto your thigh, keeping the infant's head lower than their chest.

STEP 2

Give 5 firm back blows.

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

STEP 3

Position the infant face-up along your forearm.

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

(*Continued*)

Skill Sheet 11-5

Choking—Infant *Continued*

STEP 4

Give 5 chest thrusts.

- Put two fingers on the center of the chest, just below the nipple line.
- Compress the chest 5 times about 1½ inches.
- Each chest thrust should be a distinct attempt to dislodge the object.

Continue giving 5 back blows and 5 chest thrusts until:

- The infant begins to cough or breathe on their own.
- The infant becomes unconscious.

If the infant becomes unconscious:

Carefully lower the infant onto a firm, flat surface while protecting their head and immediately begin CPR, starting with compressions.

- After 30 compressions, open their mouth and look for an object. If you see an object, remove it with a finger sweep.
- Attempt ventilations.
- Continue CPR.

ENRICHMENT
Nasopharyngeal Airway

When properly positioned, the nasal (nasopharyngeal) airway (NPA) keeps the tongue out of the back of the throat, thereby keeping the airway open. An NPA may be used on a conscious, responsive patient *or* an unconscious patient. Unlike an oral airway, the NPA does not cause the patient to gag. NPAs *must not be used* on a patient with suspected head trauma or a suspected skull fracture.

When using an NPA, select the proper size (see Skill Sheet 11-6). Measure the device on the patient to see that it extends from the angle of the jaw to the tip of the nose. Also, make sure the diameter of the NPA is not larger than the internal diameter of the nostril. To insert the NPA, lubricate the airway and the opening of the nostril with a water-soluble lubricant. Insert the NPA into the right nostril, with the bevel *toward* the septum (the wall of tissue that separates the nostrils). Advance the NPA gently, straight in, not upward, until the flange rests on the nostril. If you feel even minor resistance, do not force the NPA. If you cannot get the NPA to pass easily, remove it and try the other nostril. If you use the left nostril, you need to ensure that the bevel is inserted toward the septum and the NPA is rotated as you advance it in, similar to the OPA.

Skill Sheet 11-6

Inserting a Nasal Airway

NOTE: Size up the scene for safety, follow standard precautions and then perform a primary assessment. NPAs must not be used on a patient with suspected head trauma or a suspected skull fracture.

STEP 1

Select the proper size.

- Measure the NPA from the angle of the patient's jaw to the tip of the nostril. Ensure that the diameter of the NPA is not larger than the internal diameter of the nostril.

STEP 2

Lubricate the NPA and the opening of the nostril.

- Use a water-soluble lubricant to lubricate the NPA prior to insertion.

STEP 3

Insert the NPA.

- Insert the NPA into the right nostril, with the bevel toward the septum (center of the nose).
- Advance the NPA gently, straight in, following the floor of the nose.
- If resistance is felt, do *not* force it.
- If you are experiencing problems, try the left nostril and ensure that you rotate the NPA as you insert it past the nasal structures.

(*Continued*)

Skill Sheet 11-6

Inserting a Nasal Airway *Continued*

STEP 4

Ensure correct placement.

- The flange should rest on the nostril.

12 SUPPLEMENTAL OXYGEN

You Are the Emergency Medical Responder

A 45-year-old man is experiencing chest pain. When he finally calls for assistance, he states that the pain started about 30 minutes ago as a mild, squeezing sensation. Now the pain is severe and he is gasping for breath. You, as the responding member of your company's emergency response team, recognize that these signs and symptoms suggest a serious cardiac condition. You complete a primary assessment, physical exam and SAMPLE history. The patient has no known history of hypertension or heart disease. While waiting for an ambulance or other transport vehicle to arrive, you help the patient get into the most comfortable position for breathing, keep him from getting chilled or overheated, and ask him to remain still. You open a nearby window to circulate fresh air into the stuffy room. What else can you do to help?

KEY TERMS

Flowmeter: A device used to regulate, in liters per minute (LPM), the amount of oxygen administered to a patient.

Hypoxia: A condition in which insufficient oxygen reaches the body's cells.

Nasal cannula: A device used to administer oxygen through the nostrils to a breathing person.

Non-rebreather mask: A type of oxygen mask used to administer high concentrations of oxygen to a breathing person.

"O-ring" gasket: Plastic, O-shaped ring that makes the seal of the pressure regulator on an oxygen cylinder tight; can be a built-in or an attachable piece.

Oxygen cylinder: A steel or alloy cylinder that contains 100 percent oxygen under high pressure.

Pressure regulator: A device on an oxygen cylinder that reduces the delivery pressure of the oxygen to a safe level.

Supplemental oxygen: Oxygen delivered to a patient from an oxygen cylinder through a delivery device; can be given to a nonbreathing or breathing patient who is not receiving adequate oxygen from the environment.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Identify when it is appropriate to administer supplemental oxygen.
- List the delivery devices for use in administering supplemental oxygen.
- Describe the steps required to administer supplemental oxygen.
- List precautions to take when using supplemental oxygen.

SKILL OBJECTIVES

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

- Demonstrate how to prepare the equipment and administer oxygen to breathing and nonbreathing patients using a nasal cannula, non-rebreather mask, resuscitation mask and bag-valve-mask (BVM) resuscitator.

INTRODUCTION

When someone has a breathing or cardiac emergency, supplying ***supplemental oxygen*** can be critical. During such an emergency, the amount of oxygen carried by the blood cells to the brain, heart and body is reduced, resulting in ***hypoxia***. If breathing stops (respiratory arrest), the brain and heart will soon be starved of oxygen, resulting in cardiac arrest and ultimately death if not managed quickly and appropriately.

The air you normally breathe contains about 21 percent oxygen. When you provide ventilations using a bag-valve-mask (BVM) resuscitator, you deliver that 21 percent oxygen to the patient. The expired air in your exhaled breath, however, contains about 16 percent oxygen, and this is the concentration delivered when using a resuscitation mask. Neither of these percentages of oxygen alone may be adequate for the patient. By administering supplemental oxygen, you can deliver a higher percentage of oxygen that an injured or ill person may need.

Supplemental oxygen can be given for many breathing and cardiac emergencies. It can be given to nonbreathing patients, sometimes in conjunction with an airway adjunct. If a patient is breathing but has no obvious signs or symptoms of injury or illness, oxygen may be considered for:

- An adult breathing fewer than 12 breaths or more than 20 breaths per minute.
- A child breathing fewer than 15 breaths or more than 30 breaths per minute.
- An infant breathing fewer than 25 breaths or more than 50 breaths per minute.

Administer oxygen based on local protocols to all patients with respiratory distress or respiratory failure with low oxygen saturation or signs and symptoms of hypoxia, as these conditions are usually caused by abnormal oxygen levels to the tissues. Always administer oxygen for suspected CO poisoning and all smoke-inhalation cases.

Oxygen should be delivered with properly sized equipment for the patient and appropriate flow rates for the delivery device. For step-by-step instructions on oxygen delivery, see Skill Sheet 12-1.

ADMINISTERING SUPPLEMENTAL OXYGEN

To deliver supplemental oxygen, you must have:

- An oxygen cylinder.
- A pressure regulator with flowmeter.
- A delivery device.

According to the U.S. Food and Drug Administration (FDA), oxygen units may be marketed without a prescription when used for emergency resuscitation and when administered by an individual who is authorized, certified or licensed by state authorities. Such units must deliver a minimum flow rate of 6 liters of oxygen per minute for a minimum of 15 minutes (90 liters). Labeling for emergency oxygen for OTC use may not contain references to any medical conditions, disorders or diseases. The filling and refilling of empty or spent oxygen cylinders is strictly controlled by state and local regulations. Local protocols must always be followed.

Variable-Flow-Rate Oxygen

Variable-flow-rate oxygen systems allow the responder to vary the flow of oxygen. Because of the large amount of oxygen emergency medical services (EMS) systems deliver and the variety of equipment and emergency situations they respond to, variable-flow-rate oxygen is practical. To deliver supplemental oxygen using a variable-flow-rate system, you must assemble the equipment.

Fixed-Flow-Rate Oxygen

Some supplemental oxygen systems have the regulator set at a fixed-flow rate. Most fixed-flow-rate tanks are set at 15 LPM; however, an emergency medical responder (EMR) may come across tanks set at 6 LPM, 12 LPM or another rate. In some cases, the fixed-flow-rate systems may have a dual (high/low) flow setting. Fixed-flow-rate oxygen systems typically come with the delivery device, regulator and cylinder already connected to each other (Fig. 12-1). This eliminates the need to assemble the equipment, which makes it quick and very simple to deliver oxygen. A drawback to using fixed-flow-rate oxygen systems is that you cannot adjust the flow rate to different levels. This limits both the type of delivery device you can use and the concentration of oxygen you can deliver. For example, a fixed-flow-rate unit with a preset flow of 6 LPM can only be used with a nasal cannula or resuscitation mask, while a preset flow rate of 12 LPM only allows the use of a resuscitation mask or non-rebreather mask.

Fig. 12-1: A fixed-flow-rate oxygen system.

Fig. 12-2: Oxygen cylinders are marked with a yellow diamond that says "Oxygen" and, in the United States, typically have green markings.

Fig. 12-3: A pressure regulator is attached to an oxygen cylinder to reduce the pressure of oxygen to a safe level.

Because of the simplicity of the preconnected fixed-flow-rate systems and the lifesaving benefits of oxygen, these systems are becoming increasingly popular in the workplace, schools and other places where EMRs may have to respond to on-site emergencies.

Oxygen Cylinders

Oxygen cylinders are made to be easily recognizable. These cylinders, made of steel or alloy, can hold between 350 and 625 liters of oxygen, and have internal pressures of approximately 2000 pounds per square inch (psi). Oxygen cylinders are labeled "U.S.P." and are marked with a yellow diamond that says "Oxygen" (Fig. 12-2). The U.S.P. stands for United States Pharmacopeia, which indicates the oxygen is medical grade. In the United States, oxygen cylinders typically have green markings, such as a green top; however, the color scheme is not regulated. Different manufacturers and other countries may use different color markings. Oxygen cylinders are under high pressure and must be handled carefully; *do not drop*. Ensure oxygen cylinders have proper hydrostatic testing and are marked appropriately.

Pressure Regulator and Flowmeter

The pressure inside an oxygen cylinder is far too great to allow you to open the cylinder and administer the oxygen. Therefore, a device called a ***pressure regulator*** is attached to the cylinder to reduce the delivery pressure of the oxygen to a safe level (Fig. 12-3). The pressure regulator reduces the pressure from approximately 2000 psi inside the cylinder to a safe pressure range of 30 to 70 psi. The amount of pressure inside the cylinder is indicated on a gauge. By checking the gauge, you can determine how full a cylinder is. A full cylinder will show 2000 psi, while a nearly empty cylinder will show about 200 psi. Always monitor the pressure in the oxygen cylinder to make sure it is above 200 psi. When the cylinder reaches 200 psi, replace the oxygen cylinder with a new tank.

CRITICAL FACTS

Oxygen cylinders have U.S.P. and yellow diamond labels that make them easy to recognize. In the United States, oxygen cylinders typically have green markings.

A pressure regulator typically has two metal prongs that fit into the valve at the top of the oxygen cylinder. This is called the pin index safety system. It is standard on any type of tank that has these pins; a different pin placement depending on the type of tank prevents unintentional use. To ensure a tight seal between the regulator and the tank, a gasket, commonly called an ***"O-ring" gasket,*** must be used (Fig. 12-4). Never lubricate any part of an oxygen system.

A ***flowmeter*** controls the amount of oxygen administered in LPM, with a normal delivery rate from 1–25 LPM.

Fig. 12-4: An O-ring gasket.

Oxygen Delivery Devices

An oxygen delivery device is the piece of equipment a patient breathes through when receiving oxygen. Tubing carries the oxygen from the regulator to the delivery device. When delivering oxygen, make sure the tubing does not get tangled or kinked so as to stop the flow of oxygen to the mask. These devices can include nasal cannulas, simple face masks, non-rebreather masks, BVMs and resuscitation masks (Table 12-1). Various sizes of these devices are available for adults, children and infants. Appropriate sizing is important to ensure adequate airway management.

Nasal Cannula

The ***nasal cannula*** is used *only* on breathing patients and delivers oxygen through the patient's nostrils (Fig. 12-5). A plastic tube is held in place over the patient's ears, and oxygen is delivered through two small prongs inserted into the nostrils. Nasal cannula use is limited, as it normally delivers oxygen at a flow rate of 1–6 LPM, which provides a peak oxygen concentration of approximately 44 percent. Flow rates above 4 LPM are not commonly used because of the tendency to quickly dry out mucous membranes and cause nosebleeds and headaches.

Fig. 12-5: A nasal cannula.

Table 12-1:

Oxygen Delivery Devices

DELIVERY DEVICE	COMMON FLOW RATE	OXYGEN CONCENTRATIONS	FUNCTION
Nasal cannula	1–6 LPM	24 to 44 percent	Breathing patients only
Resuscitation mask	6–15 LPM	25 to 55 percent	Breathing and nonbreathing patients
Non-rebreather mask	10–15 LPM	up to 90 percent	Breathing patients only
BVM	15+ LPM	90+ percent	Breathing and nonbreathing patients

Fig. 12-6: A resuscitation mask with oxygen inlet.

Because of these limitations, the nasal cannula is commonly used for patients with only minor breathing difficulty or for those who have a history of respiratory medical conditions. Patients experiencing a serious breathing emergency generally breathe through the mouth and need a device that can supply a greater concentration of oxygen. The nasal cannula can be ineffective for patients who have a nasal airway obstruction, nasal injury or a bad cold causing blocked sinus passages. It is useful for patients who cannot tolerate a mask over their face.

Resuscitation Mask with Oxygen Inlet

The resuscitation mask with an oxygen inlet can be used with supplemental oxygen to deliver oxygen to a nonbreathing patient (Fig. 12-6). It also can be used to deliver oxygen to someone who is breathing but still requires oxygen. Some resuscitation masks come with elastic straps to place over the patient's head to keep the mask in place. If the mask does not have a strap, you or the patient can hold it in place.

With a resuscitation mask, set the oxygen flow rate at 6–15 LPM. A resuscitation mask can deliver up to 55 percent oxygen to a breathing person, when delivered at 6 LPM or more. When used on a nonbreathing patient while you perform ventilations, it will deliver an oxygen concentration of approximately 35 percent. The oxygen concentration is reduced because oxygen mixes with your exhaled breath as you perform mouth-to-mask ventilations.

Non-Rebreather Mask

A ***non-rebreather mask*** is used to deliver high concentrations of oxygen to breathing patients (Fig. 12-7, A–B). It consists of a face mask with an attached oxygen reservoir bag and a one-way valve between the mask and bag to prevent the patient's

Fig. 12-7, A–B: A non-rebreather mask.

CRITICAL FACTS Oxygen devices, such as nasal cannulas, simple face masks, non-rebreather masks, BVMs and resuscitation masks, allow the patient to effectively receive supplemental oxygen.

exhaled air from mixing with the oxygen in the reservoir bag. The patient inhales oxygen from the bag, and exhaled air escapes through flutter valves on the side of the mask. To inflate the reservoir bag, cover the one-way valve with your gloved thumb before placing it on the patient's face. The oxygen reservoir bag should be sufficiently inflated (about two-thirds full) so as not to deflate when the patient inhales. If this happens, increase the flow rate of the oxygen to refill the reservoir bag. The flow rate should be set at 10–15 LPM. When using a non-rebreather mask with a high flow rate of oxygen, up to 90 percent oxygen concentration can be delivered to the patient.

BVM

A BVM can be used on a breathing or nonbreathing patient. With a BVM, the oxygen flow rate should be set at 15 LPM or more. The BVM with an oxygen reservoir bag is capable of supplying 90 percent or more oxygen concentration when used at 15 LPM or more (Fig. 12-8). Squeeze the bag between each breath for patients breathing less than 10 times per minute. To assist a person breathing more than 30 times per minute, squeeze the bag on every second breath.

Assembly for a Variable-Flow-Rate System

Begin by examining the cylinder to be certain that it is labeled "Oxygen." The cylinders come with a protective covering over the tank opening. Remove this covering. If it is not built into the tank, remove the O-ring gasket. While pointing the cylinder away from you, open the cylinder for 1 second. This will remove any dirt or debris from the cylinder valve. If necessary, reposition the O-ring gasket.

Next, examine the pressure regulator to be sure it is designed for delivering supplemental oxygen. It may be labeled "Oxygen Regulator." Check to see that the pin index corresponds to an oxygen tank. Attach the pressure regulator to the cylinder, seating the prongs inside the holes in the valve. Hand-tighten the screw until the regulator is snug. Open the cylinder one full turn and listen for leaks.

Check the pressure gauge to determine how much pressure is in the cylinder. A full cylinder should have approximately 2000 psi. Attach the chosen delivery device to the oxygen port near the flowmeter, using the appropriate tubing.

Oxygen Administration

To administer oxygen using a variable-flow-rate system, follow the steps described earlier, then turn on the flowmeter and adjust it to the desired flow rate. Listen and feel to make sure that oxygen is flowing into your delivery device. If you are using a non-rebreather mask, ensure that the reservoir bag is two-thirds full before placing the device on the patient. Finally, place the delivery device on the patient.

Fig. 12-8: A bag-valve-mask resuscitator.

Fig. 12-9: Use the "blow-by" technique for children and infants who are frightened by having oxygen masks on their faces.

If young children and infants are frightened by a mask being placed on their face, use a "blow-by" technique. To perform this technique, you, a parent or legal guardian holds the mask about 2 inches from the child's or infant's face waving it slowly from side-to-side as if you are playing a game, thus allowing the oxygen to pass over the face and be inhaled (Fig. 12-9).

You should monitor the effectiveness of the oxygen delivery; a pulse oximeter can be used to do so.

Assembly and Administration for a Fixed-Flow-Rate System

To operate a fixed-flow-rate system, simply turn it on according to the manufacturer's instructions, check that oxygen is flowing and place the delivery device on the patient. You can also use the "blow-by" technique using a fixed-flow-rate system by following the same procedure outlined above.

Securing and Handling Cylinders

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

Specific attention should be given to the following areas concerning oxygen cylinders:

- Check for cylinder leaks, abnormal bulging, and defective or inoperative valves or safety devices (Fig. 12-10, A).
- Check for the physical presence of rust or corrosion on a cylinder or cylinder neck.
- Any foreign substances or residues, such as adhesive tape around the cylinder neck, oxygen valve or regulator assembly, can hamper oxygen delivery and in some cases may have the potential to cause a fire or explosion.
- Ensure that all oxygen cylinders have proper hydrostatic testing and are marked appropriately.
- Be aware of the specific testing requirements of steel and aluminum tanks (e.g., 10 years initial testing for steel cylinders and 5 years for aluminum cylinders).

SAFETY PRECAUTIONS

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

Also, follow these recommended guidelines:

- Be sure that oxygen is flowing before putting the delivery device over the patient's face.
- Do not use oxygen around flames or sparks including smoking materials, such as cigarettes, cigars and pipes. Oxygen causes fire to burn more rapidly and intensely.
- Do not use grease, oil or petroleum products to lubricate or clean the regulator. This could cause an explosion.
- Do not stand oxygen cylinders upright unless they are well secured. If a cylinder falls, the regulator or valve could become damaged or cause injury due to the intense pressure in the tank.
- Do not drag or roll cylinders.
- Do not carry a cylinder by the valve or regulator (Fig. 12-10, B).
- Do not hold on to protective valve caps or guards when moving or lifting cylinders.
- Do not deface, alter or remove any labeling or markings on the oxygen cylinder.
- Do not attempt to mix gases in an oxygen cylinder or transfer oxygen from one cylinder to another.

If defibrillating using an automated external defibrillator (AED), make sure that no one is touching or is in contact with the patient or the resuscitation equipment. Do not defibrillate someone when around flammable materials, such as free-flowing oxygen or gasoline.

Fig. 12-10, A–B: Because they are highly pressurized, special care should be taken when handling oxygen cylinders. Be sure to **(A)** check for defects before use and **(B)** carry them appropriately by the body of the cylinder, not the valve.

PUTTING IT ALL TOGETHER

Administering supplemental oxygen to someone experiencing a breathing emergency can help improve hypoxia. It can also help reduce pain and breathing discomfort. When using oxygen, follow safety precautions and use the equipment according to the manufacturer's instructions.

An oxygen delivery device is the piece of equipment a patient breathes through when receiving oxygen. These delivery devices include nasal cannulas, resuscitation masks, simple face masks, non-rebreather masks and BVMs. The resuscitation mask and BVM are the most appropriate devices for EMRs, as they can be used with breathing and nonbreathing patients. These devices can significantly increase the oxygen concentration that an injured or ill person needs, help ventilate a nonbreathing patient and reduce the likelihood of disease transmission.

Be familiar with the unique features and benefits of these devices as well as their appropriate flow rates and situations in which they should be used based on local protocols.

You Are the Emergency Medical Responder

The 45-year-old man who was experiencing chest pain and difficulty breathing is now slightly cyanotic (skin has a bluish color), is gasping for air and is breathing 26 times per minute. What breathing devices could you use to help this patient? After a couple of minutes, the man complains of having a mask on his face but is still gasping for air. How would you change your care for this patient?

Skill Sheet 12-1

Oxygen Delivery

STEP 1

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

STEP 2

Clear the valve.

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

STEP 3

Attach the regulator.

- Put the O-ring gasket into the valve on top of the cylinder, if necessary.
- Make sure that it is designed for delivering supplemental oxygen and that the O-ring gasket is secure.

- Check to see that the pin index corresponds to an oxygen tank.
- Secure the regulator on the cylinder by placing the two metal prongs into the valve.
- Hand-tighten the screw until the regulator is snug.

(*Continued*)

Skill Sheet 12-1

Oxygen Delivery *Continued*

STEP 4

Open the cylinder counterclockwise one full turn.

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

STEP 5

Attach the delivery device.

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

STEP 6

Adjust the flowmeter.

- Turn the flowmeter to the desired flow rate.
  - With a nasal cannula, set the rate at **1–6** LPM.
  - With a resuscitation mask, set the rate at **6–15** LPM.
  - With a non-rebreather mask, set the rate at **10–15** LPM.
    - Ensure that the oxygen reservoir bag is two-thirds inflated by placing your thumb over the one-way valve at the bottom of the mask until the bag is sufficiently inflated.
  - With a BVM, set the rate at **15** LPM or more.

(*Continued*)

Skill Sheet 12-1

Oxygen Delivery *Continued*

STEP 7

Verify the oxygen flow.

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

STEP 8

Place the delivery device on the patient and continue care until more advanced medical personnel take over.

STEP 9

Break down the oxygen equipment.

- To break down the tank, reverse the steps from above, being sure to bleed the pressure regulator by turning on the flowmeter after the tank has been turned off.

UNIT 4

Circulation

13 CIRCULATION AND CARDIAC EMERGENCIES

You Are the Emergency Medical Responder

A man suddenly collapses. He is lying on the floor and does not appear to be moving. You, as a police officer trained in emergency medical response, recognize the emergency, activate the emergency response plan and perform a primary assessment. The emergency medical services (EMS) system has been activated. You determine that the man is unresponsive; has no severe, life-threatening bleeding; is not breathing normally and does not have a pulse. You have an automated external defibrillator (AED) in your patrol car. How would you respond?

KEY TERMS

Acute coronary syndrome (ACS): Term that describes a range of clinical conditions, including unstable angina and myocardial infarction, that are due to insufficient blood supply to the heart muscle resulting from coronary heart disease (CHD).

Acute myocardial ischemia: An episode of chest pain due to reduced blood flow to the heart muscle.

Angina pectoris: Pain in the chest that comes and goes at different times; caused by a lack of oxygen reaching the heart; can be stable (occurring under exertion or stress) or unstable (occurring at rest, without reason).

Arrhythmia: Electrical disturbances in the regular rhythmic beating of the heart.

Asystole: A condition where 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.

Atrial fibrillation: Irregular and fast electrical discharges from the left or right atrium of the heart that lead to an irregular heartbeat; one of the most common types of abnormal cardiac rhythm.

Atrioventricular (AV) node: A cluster of cells in the center of the heart, between the atria and ventricles; serves as a relay to slow down the signal received from the sinoatrial (SA) node before it passes through to the ventricles.

Automated external defibrillator (AED): A portable electronic device that analyzes the heart's electrical rhythm and, if necessary, can deliver an electrical shock to a person in cardiac arrest.

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

Cardiac Chain of Survival: A set of five critical steps that, when performed in rapid succession, increase the patient's chance of surviving cardiac arrest; each link of the chain depends on, and is connected to, the other links.

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

Cardiovascular disease: A disease affecting the heart and blood vessels.

Chest compressions: A technique used in CPR in which external pressure is placed on the chest to help circulate oxygen-rich blood through the arteries and to the vital organs.

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.

Commotio cordis: Sudden cardiac arrest from a blunt, non-penetrating blow to the chest, of which the basis is ventricular fibrillation (V-fib) triggered by chest wall impact immediately over the heart.

Congestive heart failure: A chronic condition in which the heart no longer pumps blood effectively throughout the body.

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 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.

Electrocardiogram (ECG or EKG): A diagnostic test that measures and records the electrical activity of the heart.

Heart: A fist-sized muscular organ that pumps blood throughout the body.

High-performance CPR: Providing high-quality chest compressions as part of a well-organized team response to a cardiac arrest.

Hypertension: Another term for high blood pressure.

Implantable cardioverter-defibrillator (ICD): A miniature version of an AED, implanted under the skin, that acts to automatically recognize and help correct abnormal heart rhythms.

Myocardial infarction (MI): The death of cardiac muscle tissue due to a sudden deprivation of circulating blood; also called a heart attack.

Normal sinus rhythm (NSR): The normal, regular rhythm of the heart, set by the SA node in the right atrium of the heart.

(*Continued*)

KEY TERMS continued

Pacemaker: A device implanted under the skin, sometimes below the right collarbone, to help regulate the heartbeat in someone whose natural pacemaker (the sinoatrial node) is not functioning properly, causing the heart to skip beats or beat too fast or too slow.

Return of spontaneous circulation (ROSC): A term to describe the successful resuscitation of a patient in cardiac arrest; a return of a pulse during resuscitative efforts.

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

Silent heart attack: A heart attack during which the patient has either no symptoms or very mild symptoms that the person does not associate with heart attacks; mild symptoms include indigestion or sweating.

Sinoatrial (SA) node: A cluster of cells in the right atrium that generates the electrical impulses that set the pace of the heart's natural rhythm.

Sudden cardiac arrest: A condition where the heart's pumping action stops abruptly, usually due to abnormal heart rhythms called arrhythmias, most commonly ventricular fibrillation (V-fib) or ventricular tachycardia (V-tach); unless an effective heart rhythm is restored, death follows within a matter of minutes.

Transdermal medication patch: A patch on the skin that delivers medication; commonly contains nitroglycerin, nicotine or other medications; should be removed prior to placing defibrillation pads on the chest.

Ventricular fibrillation (V-fib): A life-threatening heart rhythm in which the heart is in a state of totally disorganized electrical activity.

Ventricular tachycardia (V-tach): A life-threatening heart rhythm in which there is very rapid contraction of the ventricles.

LEARNING OBJECTIVES

After reading this chapter, and completing the class activities, you will have the information needed to:

- Describe how to recognize and care for a patient who may be experiencing a heart attack.
- Describe how to care for a patient who may be experiencing cardiac arrest.
- List the reasons for the heart to stop beating.
- Describe the skill components of CPR.
- List the steps of one-responder CPR for an adult, a child and an infant.
- Explain when it is appropriate to stop performing CPR.
- Describe how to perform two-responder CPR for an adult, a child and an infant.
- Define defibrillation and describe how it works.
- Identify the abnormal heart rhythms commonly present during cardiac arrest.
- Describe the role and importance of early defibrillation in cardiac arrest.
- List the general steps for using an automated external defibrillator (AED).
- Identify precautions for using an AED.
- Identify special situations that may arise when using an AED.

SKILL OBJECTIVES

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

- Demonstrate one-responder CPR for an adult, a child and an infant.
- Demonstrate two-responder CPR for an adult, a child and an infant.
- Demonstrate how to use an AED for adult and pediatric patients in cardiac arrest.

INTRODUCTION

In this chapter, you will learn how to recognize and provide care for a patient who is experiencing signs and symptoms of a heart attack or whose heart stops beating. A heart attack occurs when blood vessels supplying the heart become blocked and fail to provide the heart enough blood and oxygen necessary to function properly. The condition in which the heart stops functioning is known as cardiac arrest. It can sometimes result from a heart attack but cardiac arrest can also be caused by sudden, irregular electrical activity of the heart as well as many other causes. To provide care for a patient in cardiac arrest, you need to know how to perform cardiopulmonary resuscitation (CPR) and use an automated external defibrillator (AED). CPR can keep a patient's vital organs supplied with blood containing oxygen until more highly trained personnel arrive to provide advanced life support care. In many cases, however, CPR by itself cannot correct the underlying problem. An AED can analyze the heart's electrical rhythm and deliver a shock to help the heart to restore an effective rhythm. Sudden cardiac arrest can happen to anyone at anytime, and although not common, can occur in children and infants.

As an emergency medical responder (EMR), you must assess patients quickly and be prepared to perform high-quality CPR and use an AED in cases of cardiac arrest. This chapter covers the basic principles of how to recognize cardiac emergencies and provide the appropriate care.

THE CIRCULATORY SYSTEM

Anatomy of the Circulatory System

The ***heart*** is a muscular organ, which functions like a pump. About the size of the patient's fist, it lies between the lungs, in the middle of the chest, behind the lower half of the sternum (breastbone) (Fig. 13-1). The heart is protected by the ribs and sternum in front and by the spine in back. It has four chambers and is separated into right and left halves. The right side of the heart has two chambers known as the right atrium, which receives oxygen-depleted blood from the veins of the body, and the right ventricle, which pumps the oxygen-depleted blood to the lungs where waste products are removed and oxygen is absorbed.

The now oxygen-rich blood returns to the left side of the heart, where it enters the left atrium and goes on to the left ventricle, where it is pumped to all parts of the body. One-way valves direct the flow of blood as it moves through each of the heart's four chambers. For the circulatory system to be effective, the respiratory system must also be working so that the blood can pick up oxygen in the lungs.

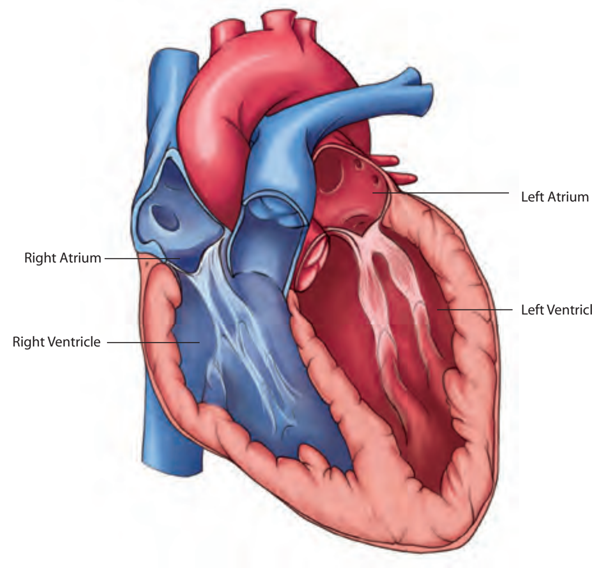


Fig. 13-1: The heart.

Physiology of the Circulatory System

The Heart's Electrical System

An electrical system in the heart triggers the contraction or pumping action of the heart muscle. In a healthy heart, an electrical impulse comes from a point near the top of the heart called the ***sinoatrial (SA) node***. The impulse travels through the atria, the upper chambers of the heart, down to the ***atrioventricular (AV) node***, near the bottom of the right atrium (Fig. 13-2).

From the AV node, the impulse divides into two branches, then into the right and left ventricles.

How the Heart Functions

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

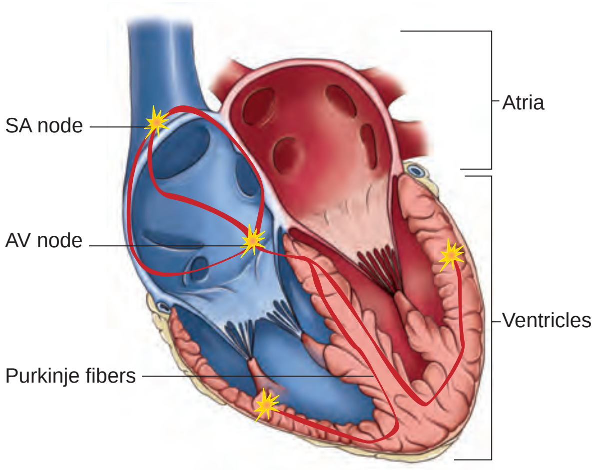


Fig. 13-2: The heart's electrical system.

These right and left branches become a network of fibers, called Purkinje fibers, which spread electrical impulses across the heart. Under normal circumstances, these impulses reach the muscular walls of the ventricles causing the muscles to contract and force blood out of the heart to circulate throughout the body. The contraction of the left ventricle results in a pulse. The pauses between the pulse beats are the periods between contractions. As the left ventricle relaxes, or is at rest, blood refills the chamber and there is a pause between pulse beats.

An ***electrocardiogram (ECG or EKG)*** is a diagnostic test that graphically measures and records the electrical activity and rhythm of the heart. Electrodes attached to an electrocardiograph pick up electrical impulses and transmit them to a monitor. The peaks and valleys of each wave, the size, shape and frequency, show the heart's rhythm and how the electrical system is functioning. The normal conduction of electrical impulses without any disturbances is known as ***normal sinus rhythm (NSR)***.

Perfusion

As the blood flows through the arteries, oxygen and nutrients such as glucose are delivered to cells throughout the body, and as blood flows through the veins, carbon dioxide and other wastes are taken away. This continuous process is called perfusion (Fig. 13-3).

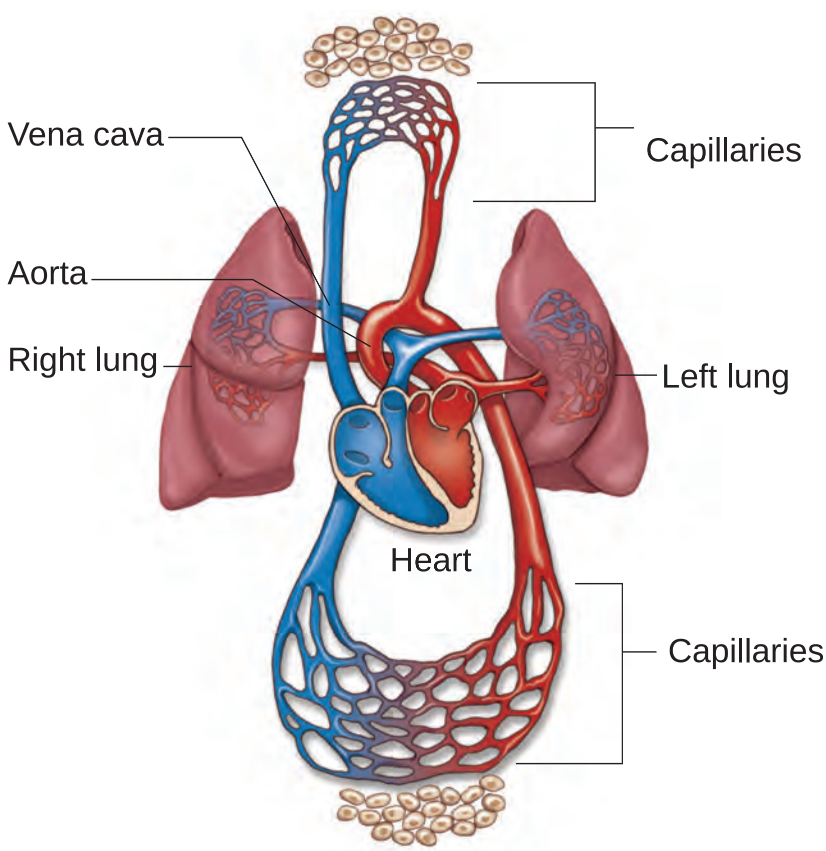


Fig. 13-3: Blood continuously flows through the arteries delivering oxygen and other nutrients to the body's cells. It also flows through the veins, taking away carbon dioxide and other wastes. The process is called perfusion.

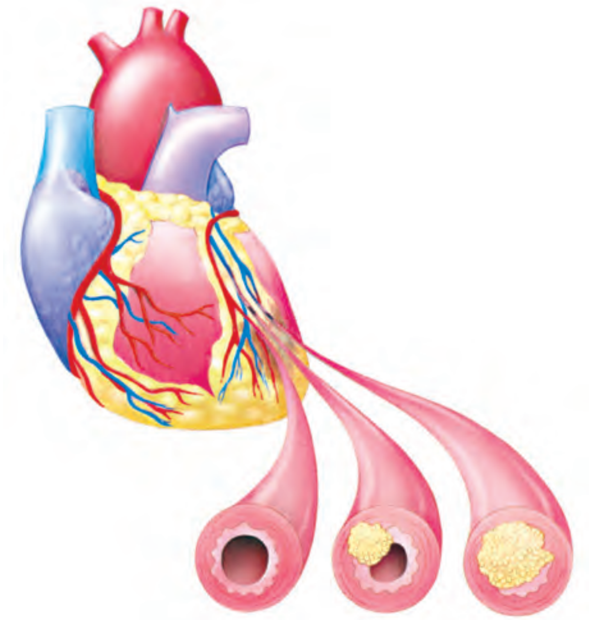


Fig. 13-4: In atherosclerosis, a buildup of cholesterol and fatty deposits on inner artery walls results in hardened, narrowed arteries.

The primary gases exchanged are oxygen and carbon dioxide. All cells require oxygen to function. Cells also require energy to function. Glucose, a simple sugar molecule, is the main source of energy inside the cell.

Pathophysiology of the Circulatory System

Cardiovascular disease is an abnormal condition that affects the heart and blood vessels. An estimated 90 million Americans suffer from some form of the disease. It remains the number one killer in the United States and a major cause of disability. The most common conditions caused by cardiovascular disease include ***coronary heart disease (CHD)***, also known as coronary artery disease (CAD), and stroke. (See Chapter 14 for more information on stroke.)

CHD occurs when the arteries that supply blood to the heart muscle become hardened and narrowed, a process called ***atherosclerosis***. This damage occurs gradually, as ***cholesterol*** and fatty deposits called plaque build up on the inner artery walls. As this buildup worsens, the arteries become narrower, reducing the amount of blood that can flow through them and preventing the heart from getting the blood or oxygen it needs (Fig. 13-4).

Patients who suffer from ***acute myocardial ischemia*** (reduced blood flow to the cardiac muscle) suffer chest pain, which usually results from CHD and is referred to as ***acute coronary syndrome (ACS)***. This reduced blood and oxygen supply to the heart can cause symptoms of angina pectoris or a heart attack.

A heart attack, or ***myocardial infarction (MI)***, occurs when coronary blood vessels become blocked by plaque buildup or a blood clot blocks one of the arteries supplying the heart. This may lead to an irregular heartbeat (***arrhythmia***) which then causes the pumping action of the heart to work less efficiently. A heart attack is one of the leading causes of cardiac arrest, which is when the heart ceases to function as a pump. As the reduction of blood flow or blockage progresses, some people experience symptoms such as chest pain, pressure or discomfort, an early warning sign that the heart is not receiving enough oxygen-rich blood. Others may suffer a heart attack or even cardiac arrest without any warning signs or symptoms. If a blockage in a coronary artery of the heart is not treated quickly, the affected heart muscle tissue will die.

Pediatric Considerations

Cardiac Pathophysiology

Heart problems in children and infants are almost always secondary to airway and respiratory problems but can also be related to congenital heart conditions. When cardiac arrest occurs in children and infants, it is often caused by:

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

CRITICAL FACTS

Cardiovascular disease afflicts approximately 90 million Americans and is the number one killer in the United States. Common conditions caused by this disease include CHD and stroke.

Considerations for Older Adults

Cardiac Pathophysiology

In older adult patients, a general decrease in pain perception may cause a different reaction to a heart attack. Older adults often suffer what is known as a "***silent heart attack***," meaning that there is an absence of chest pain or pressure. The symptoms of a heart attack most commonly shown by older adult patients include general weakness or fatigue, aching shoulders and abdominal pain or indigestion.

Other Specific Cardiovascular Emergencies

Angina Pectoris

A medical term for "pain in the chest," ***angina pectoris*** develops when the heart needs more oxygen than it gets, because the arteries leading to it are too narrow. Angina pectoris is normally a transient condition. When a person with angina exercises, gets excited or is emotionally upset, the heart might not get enough oxygen. This lack of oxygen can cause chest discomfort or pain. People with angina usually have medicine they can take to stop the pain. Stopping physical activity or easing the distress and taking the medicine usually end the discomfort or pain.

Arrhythmias

Arrhythmias are electrical disturbances in the regular rhythmic beating of the heart. Some people have heart arrhythmias that do not cause problems. In others, they can indicate a more serious problem that leads to heart disease, stroke or sudden cardiac death.

Atrial Fibrillation

Atrial fibrillation is one of the most common types of abnormal cardiac rhythm. When someone experiences atrial fibrillation, the two upper chambers of the heart (the atria) beat out of coordination with the two lower chambers (the ventricles). This causes an irregular and often rapid heart rate that leads to the inability to adequately deliver blood to the ventricles. Atrial fibrillation can be controlled with medication and other treatments. Although not usually life threatening, atrial fibrillation is a risk factor for stroke and heart attack.

Congestive Heart Failure

Also called heart failure, ***congestive heart failure*** is a chronic condition in which the heart no longer pumps blood effectively throughout the body. This may cause high blood pressure and a buildup of fluid throughout the body, resulting in difficulty breathing and weight gain. Fluid buildup and swelling usually occur in the face, hands, legs, ankles and feet.

Hypertension

Also known as high blood pressure, ***hypertension*** is one of the main ***risk factors*** for heart attack and stroke. A patient is considered to have hypertension when blood pressure is higher than 140/90 mmHg. The causes of hypertension are not clear; however, certain medications, sodium intake and stress can contribute to a rise in blood pressure. Secondary hypertension is caused by an underlying condition such as a kidney abnormality or tumor of the adrenal gland.

Diabetes

Diabetes can affect the nerves; therefore, people with diabetes may not experience the classic heart attack sign of chest pain and may suffer a "silent heart attack." People who experience silent heart attacks may have no warning signs or they may have very mild signs. When this occurs, the diagnosis of a heart attack may have to be confirmed by special tests. (See Chapter 14 for more information on diabetes.)

Women and Heart Attacks

Although women may experience chest pain, pressure or discomfort during a heart attack, they are more likely to experience some of the other warning signs and symptoms, particularly shortness of breath; nausea or vomiting; stomach, back or jaw pain; or unexplained fatigue or malaise. When they do experience chest pain, women may have a greater tendency to have atypical chest pain: sudden, sharp but short-lived pain outside the breastbone. As a result, women often will delay telling others about their symptoms.

Assessment of Cardiac Emergencies

The sooner you recognize the signs and symptoms of a heart attack and act, the better chance you have to save a life. Many people will deny they are

CRITICAL FACTS

A heart attack is caused by blockages from plaque buildup or blood clots, which affect the ability of the heart to pump effectively. A heart attack is one of the leading causes of cardiac arrest, which is when the heart ceases to function as a pump.

having a heart attack. Summon more advanced medical personnel if the patient shows some or all of the following signs and symptoms:

- Discomfort, pressure or pain. The major symptom is persistent discomfort, pressure or pain in the chest that does not go away. Unfortunately, it is not always easy to distinguish heart attack pain from the pain of indigestion, muscle spasms or other conditions. This often causes people to delay getting medical care. Brief, stabbing pain or pain that gets worse when you bend or breathe deeply is not usually caused by a heart problem but may be associated with other serious medical conditions.
- The pain associated with a heart attack can range from discomfort to an unbearable crushing sensation in the chest. The patient may describe it as pressure, squeezing, tightness, aching or heaviness in the chest. Many heart attacks start slowly, as mild discomfort, pressure or pain often felt in the center of the chest (Fig. 13-5). It may spread to the shoulder, arm, neck, jaw, stomach or back. The discomfort or pain becomes constant. It is usually not relieved by resting, changing position or taking medicine. When interviewing the patient, ask open-ended questions, such as "Can you describe how you feel for me?" so you can hear the symptoms described in the patient's own words.
- Any chest discomfort or pain that is severe, lasts longer than a few minutes (about 3–5 minutes), goes away and comes back or persists even during rest requires immediate medical care. Even people who have had a previous heart attack may not recognize the signs and symptoms, because each heart attack can have entirely different signs and symptoms.
- Pain that comes and goes, such as with angina pectoris. Some people with CHD may have chest pain or pressure that comes and goes and is usually treated with a medication called nitroglycerin. Nitroglycerin is prescribed in several forms including tablets, spray, paste or patches. This medication dilates blood vessels, including the coronary arteries, to help reduce the workload of the heart.
- Difficulty breathing is another sign of a heart attack. The patient may be breathing faster than normal because the body tries to get much-needed oxygen to the heart. A patient who is sitting upright and learning forward with hands on knees in the tripod position is struggling to breathe. Difficulty breathing also includes noisy breathing and shortness of breath.
- Other signs and symptoms include pale or ashen skin, especially around the face. The patient also may be damp with sweat. Some people suffering from a heart attack sweat heavily, feel dizzy or lightheaded and/or may lose consciousness. Nausea is also a sign and symptom of a heart attack.

Fig. 13-5: Some people experience symptoms such as chest pain, pressure or discomfort during a heart attack.

Providing Care for Cardiac Emergencies

If you think someone is having a heart attack:

- Take immediate action and summon more advanced medical personnel.

CRITICAL FACTS

The key to saving the life of a patient having a heart attack is early recognition of signs and symptoms, including chest discomfort, pressure or pain that does not go away or comes and goes, and difficulty breathing.

Fig. 13-6: If you think someone is having a heart attack, summon more advanced medical personnel and have the patient stop any activity and rest.

- Have the patient stop any activity and rest (Fig. 13-6).
- Loosen any tight or uncomfortable clothing.
- Closely monitor the patient until more advanced medical personnel take over. Notice any changes in the patient's appearance or behavior.
- Comfort the patient.
- If medically appropriate and local protocols or medical direction permit, give aspirin if the patient can chew, swallow and has no known contraindications. Be sure the patient has *not* been told by their physician to *not* take aspirin.
- Assist the patient with their prescribed medication and administer supplemental oxygen if the patient is hypoxic and it is available, according to local protocols.
- Be prepared to perform CPR and use an AED.

Aspirin Can Lessen Heart Attack Damage

You may be able to help a conscious patient who is showing early signs of a heart attack by offering an appropriate dose of aspirin when the signs first begin. Local protocols regarding administration of medicines, such as aspirin, may vary for EMRs and should be followed. Aspirin should never take the place of more advanced medical care. If the patient is conscious and able to take medicine by mouth, ask if they:

- Are allergic to aspirin.
- Have a stomach ulcer or stomach disease.
- Are taking any blood thinners, such as warfarin (Coumadin®).
- Have been told by a physician to *not* take aspirin.

If the patient answers *no* to *all* of these questions, administration of two to four 81-mg low-dose (162 mg to 324 mg) aspirins or one 5-grain (325-mg) adult aspirin tablet should be considered based on local protocols. Have the patient *chew* the aspirin completely, which speeds up the absorption of the aspirin into the bloodstream.

Be sure that *only* aspirin is given and not acetaminophen (e.g., Tylenol®) or nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen (e.g., Motrin® or Advil®) and naproxen (e.g., Aleve®). Likewise, products meant for multiple symptoms/uses, such as cold, fever and headache, should not be used. Coated aspirin may be administered as long as the patient completely chews the aspirin.

CARDIAC ARREST

When the heart stops beating, or beats too ineffectively to circulate blood to the brain and other vital organs, this is called ***cardiac arrest***. The beats or contractions of the heart become ineffective if they are weak, irregular or uncoordinated, because, at that point, the blood no longer flows through the arteries to the rest of the body.

When the heart stops beating properly, the body cannot survive. Normal breathing will stop soon after, and the body's organs will no longer receive the oxygen they need to function. Without oxygen, brain damage can begin in about 4 to 6 minutes, and the damage can become irreversible after about 8 to 10 minutes.

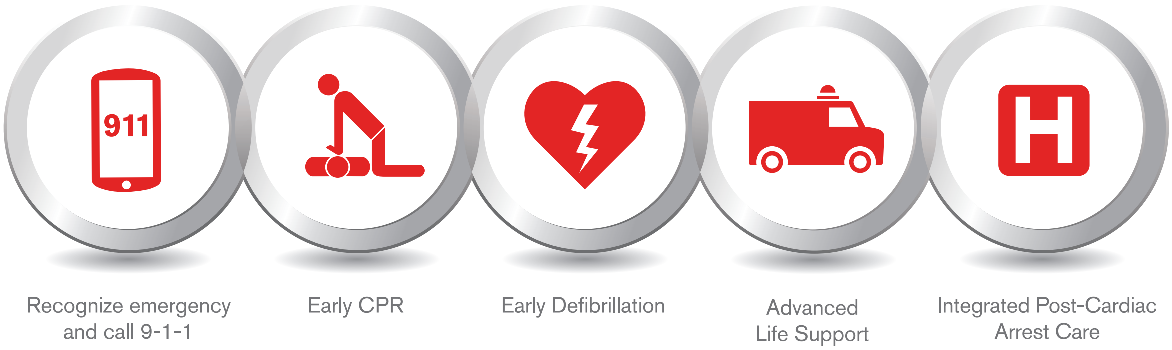
A person in cardiac arrest is not breathing normally and has no pulse. The heart has either stopped beating or is beating weakly and irregularly so that a pulse cannot be detected.

Cardiovascular disease is the primary cause of cardiac arrest, but not the only cause. About 610,000 people in the United States die each year from all forms of the disease. Other causes of cardiac arrest include drowning, choking, drug overdose, severe injury, brain damage and electrocution.

Cardiac arrest can happen suddenly, without any of the warning signs usually seen in a heart attack. This is known as ***sudden cardiac arrest*** or sudden cardiac death and accounts for more than 350,000 deaths annually in the United States. Sudden cardiac arrest is caused by abnormal, chaotic electrical activity of the heart (known as arrhythmias). The most common life-threatening abnormal arrhythmia is ventricular fibrillation (V-fib).

Cardiac Chain of Survival

Adult Cardiac Chain of Survival



The five links in the Adult Cardiac Chain of Survival are:

1. Recognition of a cardiac emergency and activation of the emergency response system. The sooner more advanced medical personnel are called, the sooner EMS personnel will respond and provide care to the patient.
2. Early CPR. CPR helps supply blood containing oxygen to the brain and other vital organs to help prevent brain damage and death.
3. Early defibrillation. An electrical shock called defibrillation may help restore an effective heart rhythm and significantly increase the patient's chance for survival.
4. Advanced life support. Advanced medical personnel can provide the proper tools and medication needed to continue the lifesaving care.
5. Integrated post-cardiac arrest care. Integrated care to optimize ventilation and oxygenation and treat hypotension immediately after the return of spontaneous circulation (ROSC).

Pediatric Cardiac Chain of Survival

The five links in the Pediatric Cardiac Chain of Survival are:

1. Prevention of arrest.
2. Early high-quality CPR.
3. Rapid activation of the EMS system or response team to get help on the way quickly—no matter the patient's age.
4. Pediatric advanced life support.
5. Integrated post-cardiac arrest care.

Cardiac Chain of Survival

During the primary assessment, you learned to identify and care for life-threatening conditions. As an EMR, you must learn how to provide care for cardiac emergencies, such as heart attack and cardiac arrest. To effectively respond to cardiac emergencies, it helps to understand the importance of the ***Cardiac Chain of Survival***. Following the links in the Cardiac Chain of Survival gives a patient in cardiac arrest the greatest chance of survival. See the Cardiac Chain of Survival sidebar for more information.

For each minute CPR and defibrillation are delayed, the patient's chance for survival is reduced between 7 and 10 percent.

In the adult and pediatric Cardiac Chain of Survival, each link of the chain depends on and is connected to the other links. The layperson or bystander is the first link in the cardiac chain of survival and can greatly influence the first three links, which, when performed rapidly, have demonstrated to improve outcomes. But for this five-step sequence to work and ensure the greatest chance of survival, it is very important to quickly recognize the emergency and call for help, start CPR promptly and continue until an AED is ready to use or more advanced medical personnel arrive and coordinate care.

Laypersons should be informed through community outreach programs and public awareness campaigns that by taking quick action, including calling 9-1-1 or the designated emergency number, starting CPR immediately and using an AED if one is available, it is more likely a person in cardiac arrest will survive.

HIGH-QUALITY CPR

Cardiopulmonary resuscitation (CPR) circulates blood that contains oxygen to the vital organs of a patient in cardiac arrest when the heart and normal breathing have stopped. CPR includes ***chest compressions*** and ventilations as well as the use of an AED (see Skill Sheets 13-1 to 13-3). For adult patients, CPR consists of 30 chest compressions followed by 2 ventilations.

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

- Patient is on a firm, flat surface to allow for adequate compression. In a non-healthcare setting this would typically be on the floor or ground, while in a healthcare setting this may be on a stretcher or bed with a CPR board or CPR feature applied.
- Chest is exposed to ensure proper hand placement and the ability to visualize chest recoil (Fig. 13-7).
- Hands are correctly positioned, with the heel of one hand in the center of the chest on the lower half of the sternum with the other hand on top. Most responders find that interlacing their fingers makes it easier to provide compressions while keeping the fingers off the chest.
- Arms are as straight as possible, with the shoulders directly over the hands to promote effective compressions. Locking elbows will help maintain straight arms.
- Compressions are given at the correct rate of at least 100 per minute to a maximum of

Fig. 13-7: To provide high-quality chest compressions, the chest should be exposed to ensure proper hand placement and the ability to visualize chest recoil.

120 per minute, and at the proper depth of at least 2 inches, but no more than 2.4 inches for an adult to promote adequate circulation.

- Chest must be allowed to fully recoil between each compression to allow blood to flow back into the heart following the compression.

Science Note: Evidence shows that a rate of chest compressions that exceeds 120 compressions per minute begins to detrimentally impact compression depth by causing responders to be less likely to compress the chest at least 2 inches for an adult. Additional evidence shows that depth of chest compressions greater than 2.4 inches leads to increased non-life-threatening injuries, such as rib fractures, in the average adult and should be avoided. These upper limits for the rate and depth of compressions exist to improve patient outcomes, but it is also critical to maintain a rate between 100 and 120 compressions per minute and a depth of at least 2 inches. Both rate and depth of compressions are best measured using a feedback device if available.

Chest Compressions

Effective chest compressions are essential for high-quality CPR. While not fully understood, it is believed the compressions increase the level of pressure in the chest cavity, which squeezes the heart and stimulates a contraction, causing oxygenated blood to circulate through the arteries to the brain and other vital organs (Fig. 13-8, A–B). Chest compressions can also increase the likelihood that a successful

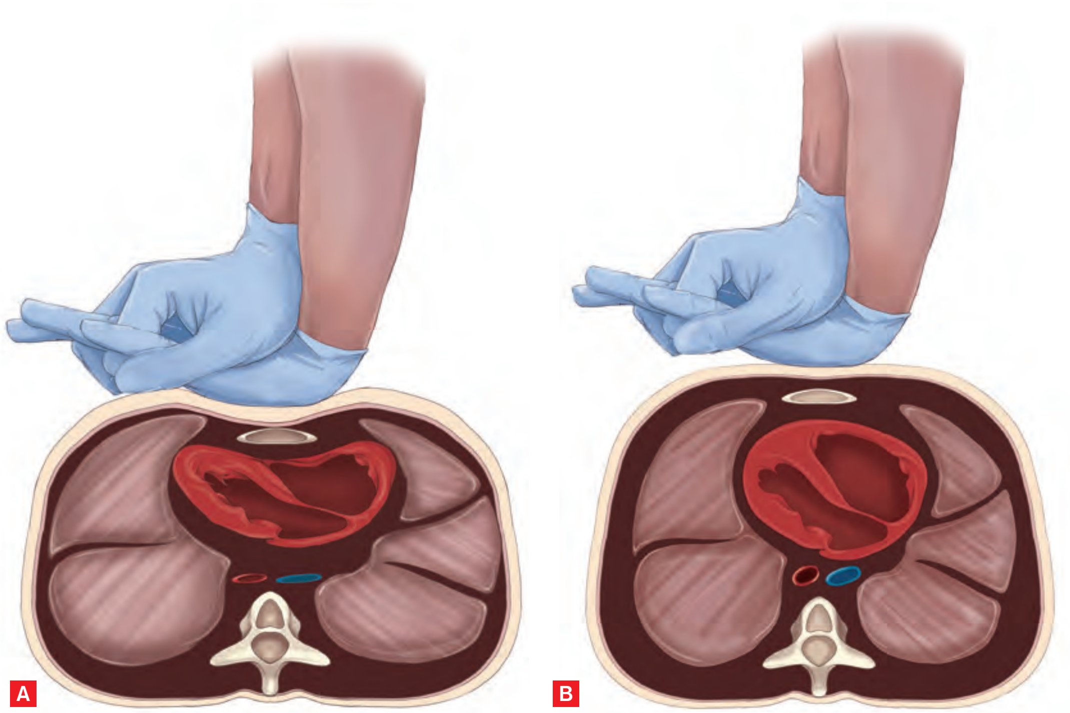


Fig. 13-8, A–B: To perform chest compressions correctly: **(A)** Push straight down at least 2 inches with a smooth movement; and **(B)** after each compression, completely release the pressure on the chest, allowing it to fully return to its normal position.

CRITICAL FACTS

The five links in the Adult Cardiac Chain of Survival are: recognition of a cardiac emergency and activation of the emergency response system, early CPR, early defibrillation, advanced life support and integrated post-cardiac arrest care.

A patient who is unconscious, not breathing normally and has no pulse is in cardiac arrest and needs CPR. CPR is a combination of chest compressions and ventilations that circulates blood containing oxygen to the brain and other vital organs for a person whose heart and breathing have stopped.

shock can be delivered to a patient suffering a sudden cardiac arrest, especially if more than several minutes have elapsed since the patient's collapse.

The effectiveness of compressions can be reduced if:

- Compressions are too shallow.
- Compression rate is too slow or too fast.
- There is sub-maximum recoil (not letting the chest come all the way back up).
- There are frequent interruptions.
- The patient is not on a firm, flat surface.

Correct Hand Position

Keeping your hands in the correct position allows you to give the most effective compressions. The correct position for your hands is over the lower half of the sternum (breastbone) in the middle of the chest (Fig. 13-9). At the lowest point of the sternum is an arrow-shaped piece of hard tissue called the xiphoid process. Avoid pressing directly on the xiphoid process, which can break off and puncture underlying organs and tissues causing potentially serious injury.

To find the correct hand position, place the heel of one hand on the center of the exposed chest, along the sternum, and then place the other hand on top. Use only the *heel* of your hand to apply pressure on the sternum when compressing the chest. Try to keep your fingers off the chest by interlacing them or holding them upward. Applying pressure with your fingers can cause inefficient chest compressions or unnecessary injury to the chest. Positioning the hands correctly allows for the most effective compressions and decreases the chance of causing injury.

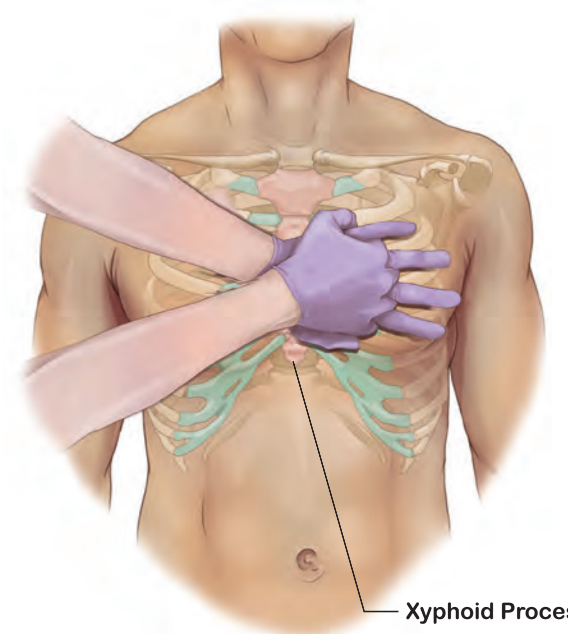


Fig. 13-9: Place the heel of one hand on the center of the exposed chest, along the sternum, and then place the other hand on top. Try to keep your fingers off the chest by interlacing them or holding them upward.

Position of the Responder

Your body position is important when giving chest compressions. Compressing the chest straight down provides the best blood flow. The correct body position is also less tiring for you.

Kneel at the patient's side opposite the chest with your hands in the correct position. Keep your elbows as straight as possible, with your shoulders directly over your hands (Fig. 13-10). When you press down in this position, you are pushing straight down onto the patient's sternum. Keeping your arms as straight as possible prevents you from tiring quickly.

Compressing the chest requires less effort in this position. When you press down, the weight of your upper body creates the force needed to compress the chest. Push with the weight of your upper body, not with the muscles of your arms. Push straight down. Do not rock back and forth. Rocking results in less effective compressions and wastes energy. If your arms and shoulders tire quickly, you are not using the correct body position.

Compression Technique

Rate of Compression

Give compressions at a rate of at least 100 per minute to a maximum of 120 per minute. You can help yourself maintain the right pace by counting either aloud or in your head: *one* (as you press down) *and* (as you release the pressure) *two* (pressing down again) *and* (release again) and so on. When you get to 13, you can drop the "and" as it may be tiring and may alter the timing of compressions. Use a feedback device if available as it may help you to maintain a steady rhythm. Count the number of compressions, then give ventilations, before starting another cycle of compressions and ventilations.

Depth of Compressions

Each time you push down, the breastbone of an adult should move at least 2 inches. The downward movement should be smooth, not jerky. Maintain a steady down-and-up rhythm and do not pause in between. If your hands slip out of position, follow the steps listed earlier to

Fig. 13-10: Performing chest compressions with the appropriate body position ensures their effectiveness and prevents you from tiring quickly.

quickly reposition them. To avoid possible injury to the patient's ribs and sternum, try to limit the maximum compression depth to 2.4 inches if using a feedback device. If in doubt, always press harder to ensure you reach at least 2 inches.

Recoil

After each compression, completely release the pressure on the chest. It is not necessary to break contact with the chest; simply allow the chest to fully return to its normal position (full recoil) before you start the next compression. It is during this phase of CPR that the chambers of the heart will refill with blood, ready to be circulated throughout the body with the next compression. The heart also receives its supply of oxygenated blood during this phase, making full recoil crucial.

Interruptions

It is critical to minimize interruptions in giving chest compressions. If compressions must be interrupted, do so for no more than 10 seconds. For example, you may need to move the patient to a location where CPR can be more effectively administered. Chest compressions are more effective when the patient is on a firm, flat surface. If the patient is on a softer surface such as a bed, couch or pressure-relieving mattress, carefully position the patient face-up on the floor or a backboard. CPR may also be interrupted briefly for defibrillation, insertion of an advanced airway or when responders change positions between compressions and ventilations.

Hands-Only CPR

Hands-only CPR, or continuous chest compressions, is a simplified form of CPR that eliminates ventilations or rescue breaths. It has its roots in dispatcher-assisted cardiac emergency situations where the caller is untrained, unwilling, unsure or otherwise unable to perform full CPR (chest compressions with ventilations or rescue breaths). Providing instruction on how to give chest compressions alone is less complex than trying to explain full CPR. The main focus of hands-only CPR is on the untrained layperson or a bystander who witnesses the sudden collapse of an adult. EMRs should be aware that if they come upon a bystander giving chest compressions only, that person is performing CPR correctly.

Chest compressions alone may provide effective circulation of blood containing oxygen in the first few minutes of an out-of-hospital cardiac arrest. The same quality compression techniques of full CPR apply to compression-only CPR, including hand position, compression depth, speed, full recoil and minimal interruptions. Hands-only CPR does not affect the use of an AED.

Ventilations

Artificial ventilation is a way of forcing air into the lungs of a patient who is not breathing. The oxygen in the air will be absorbed by blood flowing through the lungs and carried to tissues and the body's vital organs.

CRITICAL FACTS When giving ventilations during CPR, if the chest does not rise after the first breath, reopen the airway, make a seal and try a second breath. If the breath is not successful, move directly back to compressions and check the airway for an obstruction before attempting subsequent ventilations. If an obstruction is found, remove it and attempt ventilations. However, *NEVER perform a blind finger sweep.*

Different methods of providing ventilations are covered in Chapters 10 and 12, including:

- Mouth-to-mask ventilations.
- Ventilations using a bag-valve-mask (BVM) resuscitator.

In addition, if a resuscitation mask or BVM are not available, you may need to provide mouth-to-mouth ventilations based on local protocols and your willingness to do this without a barrier device. To provide mouth-to-mouth ventilations:

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

If you are unable to make a complete seal over a patient's mouth, you may need to use mouth-to-nose ventilations:

- With the head tilted back, close the mouth by pushing on the chin.
- Seal your mouth around the patient's nose and breathe into the nose.
- If possible, open the patient's mouth between ventilations to allow air to escape.

Science Note: With mouth-to-mouth ventilations, the patient receives a concentration of oxygen at approximately 16 percent compared to the oxygen concentration of ambient air at approximately 20 percent. Giving individual ventilations can help maintain this oxygen concentration level. However, if you do not break the seal and take a breath between ventilations, the second ventilation may contain an oxygen concentration of 0 percent with a high concentration of carbon dioxide (CO_2).

Providing ventilations can save a patient's life, but overventilation can be potentially harmful, especially for a patient in cardiac arrest. For example, if the ventilation is given too forcefully, or at too fast a rate, the pressure in the patient's chest will remain too high even between breaths. This stops the blood from returning to the right side of the heart, and means that less blood is available to be pumped to other vital organs and tissues as CPR continues.

Compression and Breathing Cycles

When performing CPR on an adult, child or infant, it is delivered in cycles of chest compressions followed by ventilations (Fig. 13-11, A–B). Complete the compressions, then re-establish an open airway by tilting the patient's head and lifting the chin, and then provide ventilations. When you are finished giving ventilations, quickly reposition your hands on the center of the exposed chest and start another cycle of compressions and ventilations. The pause to provide 2 ventilations should take less than 10 seconds from the last compression to the first compression of the next cycle of CPR.

One-Responder and Two-Responder CPR—Adult

When performing CPR on an adult, certain components are the same regardless of the number of responders present (see Table 13-1).

One-Responder CPR

When performing one-responder CPR on an adult patient, the lone responder is responsible for conducting the scene size-up and the primary assessment, and for performing all the steps of CPR including the use of the AED, if available. CPR can be exhausting, and attempts should be made to find additional resources as early as possible during the scene size-up.

Fig. 13-11, A–B: CPR is delivered in cycles of **(A)** chest compressions and **(B)** ventilations.

Table 13-1:

One- and Two-Responder Adult CPR

	ONE-RESPONDER CPR	TWO-RESPONDER CPR
Hand position	Hands centered on lower half of sternum	Hands centered on lower half of sternum
Compression rate	Between 100 and 120 compressions per minute	Between 100 and 120 compressions per minute
Compression depth	At least 2 inches but no more than 2.4 inches	At least 2 inches but no more than 2.4 inches
Compression/ventilation ratio	30:2	30:2

Two-Responder CPR

When two responders are available, Responder 1 performs the scene size-up and primary assessment, and begins the process of providing CPR, starting with chest compressions. Meanwhile, Responder 2 calls for additional resources and gets/prepares the AED, if available. Responder 1 continues to provide high-quality CPR with 30 compressions to 2 ventilations until Responder 2 is ready to assist and/or the AED is ready to analyze.

When the AED is ready to analyze, Responder 1 should move to the patient's head, and Responder 2 should prepare to provide chest compressions and get into the hovering position. Responders should continue providing cycles of chest compressions and ventilations, switching positions about every 2 minutes or when the responder performing compressions begins to fatigue. Given that AEDs prompt to analyze every 2 minutes, the AED analyze period is an ideal time for responders to switch positions. Responders

> **CRITICAL FACTS**
>
> Once you begin CPR, do not stop. If you must, do so for no more than 10 seconds. Reasons to discontinue CPR include more advanced medical personnel taking over for you, seeing obvious signs of life, an AED being available and ready to use, or being too exhausted to continue.

call for a position change by using an agreed-upon term (such as "Switch") at the start of the last compression cycle. The responder providing compressions should count out loud and raise the volume of their voice as they near the end of each cycle (… 21 … 22 … 23 … 24 … **25 … 26 … 27 … 28 … 29 … 30**). The responder at the chest will move to give ventilations while the responder at the head will move to the chest to provide compressions.

In a healthcare setting, often there will be more than two responders. It is the responsibility of the team leader to orchestrate movements between responders to ensure no one responder becomes fatigued and that all critical areas are addressed: compressions, ventilations and AED. For example, additional responders may be assimilated into roles of compressor or ventilator, allowing the team leader to monitor performance and ensure that high-quality CPR is maintained. Additionally, if a BVM is available, ideally it is prepared by a third responder positioned at the top of the head with one responder squeezing the bag while another responder maintains an open airway and seals the mask.

Advanced Airways

When a patient has an advanced airway such as a supraglottic airway device or an endotracheal tube, CPR must be performed a little differently. A supraglottic airway device (e.g., a laryngeal mask airway) is an advanced airway that does not enter and directly protect the trachea like an endotracheal tube, but it allows for improved ventilation. At a minimum, two responders must be present. One responder gives 1 ventilation every 6 seconds, which is about 10 ventilations per minute. At the same time, the second responder continues giving compressions at a rate of between 100 and 120 compressions per minute. There is no pause between compressions or ventilations, and responders do not use the 30 compressions to 2 ventilations ratio. This process is a continuous delivery of compressions and ventilations with no interruption.

Drowning

When a patient is removed from the water, responders should assume the nature of arrest was the result of a drowning and that the patient is hypoxic. The sequence of care for suspected drowning patients of all ages is different than the sequence of care for other cardiac arrests. Prior to starting CPR, responders should deliver 2 initial ventilations to suspected drowning patients of all ages if there is no normal breathing or only gasping and no pulse.

Stopping CPR

Once you have started providing CPR to an adult, continue with 30 compressions followed by 2 ventilations (1 cycle = 30:2) until:

- You see signs of ***return of spontaneous circulation (ROSC)*** such as patient movement or normal breathing.
- An AED is ready to analyze the patient's heart rhythm.
- Other trained responders take over and relieve you from compression or ventilation responsibilities.
- You are presented with a valid do not resuscitate (DNR) order.
- You are alone and too exhausted to continue.
- The scene becomes unsafe.

AUTOMATED EXTERNAL DEFIBRILLATION

Each year, more than 350,000 Americans die suddenly of cardiac arrest. CPR can help by supplying blood containing oxygen to the brain and other vital organs. In many cases, however, an AED is needed to correct an abnormal electrical problem and allow the heart to restore an effective rhythm. Sudden cardiac arrest can happen to anyone at any time, and although less common, it can occur in children and infants.

AUTOMATED EXTERNAL DEFIBRILLATORS

Automated external defibrillators (AEDs) are portable electronic devices that analyze the heart's rhythm and can deliver an electrical shock, known as defibrillation, which helps the heart to re-establish an effective rhythm (Fig. 13-12).

They can greatly increase the likelihood of survival if the shock is administered soon enough. For every minute lifesaving care, including CPR and defibrillation, is delayed, it is estimated that survival declines between 7 and 10 percent. Different types of AEDs are available, but all are similar in operation and have some common features, such as electrode (AED or defibrillation) pads, voice prompts, visual displays and/or lighted buttons that help guide the responder through the steps of the AED operation.

AEDs monitor the heart's electrical activity through two electrodes (i.e., AED pads) placed on the chest. The computer determines the need for a shock by looking at the pattern, size and frequency of EKG waves. If the EKG waves resemble a shockable rhythm, such as V-fib or V-tach, the machine readies an electrical charge. When the electrical charge disrupts the irregular heartbeat, it is called ***defibrillation***. This allows the heart's natural electrical system to correct itself and begin to fire off electrical impulses that will cause the heart to beat effectively.

History of Defibrillation

The presence of cardiac arrhythmias or disturbances of the heart's electrical system, and the ability to correct fibrillation with electrical shock, has been known since the mid-19th century.[1] Electrical-shocking devices, or defibrillators, were first developed during the 1920s. A portable version was introduced onto mobile coronary units in Belfast, Northern Ireland, in 1966.[2] Defibrillation by emergency medical technicians (EMTs) without the presence of a physician was first performed in Portland, Oregon, in 1969.

As technology improved over the years, newer generations of more compact, simple-to-operate, semi-automatic defibrillators known as AEDs evolved allowing EMTs and EMRs, as well as trained lay responders and the general public, to provide this lifesaving technology. With these devices, a computer analyzes the heart's rhythm and advises whether a shock is needed. Typically, the responder is guided through the steps of providing defibrillation by voice instructions and visual prompts from the AED. This includes placing the electrode (defibrillation) pads on the person's chest, analyzing the heart's rhythm, delivering a shock if needed and reminders to perform CPR when appropriate. Some AEDs can be configured to deliver lower energy levels considered appropriate for children and infants.

When EMRs and other responders are trained to use AEDs, they can significantly reduce the amount of time it takes to administer a first shock in a sudden cardiac arrest, researchers say. In Eugene and Springfield, Oregon, AEDs were placed on every fire truck, and all firefighters were trained to use them. Researchers saw these communities' survival rates for cardiac arrest increase by 18 percent in the first year.[3]

The vast majority of states recognize defibrillator training for EMTs, EMRs and other responders. All states and the District of Columbia have enacted AED Good Samaritan protection for lay responders.[4] Today, AEDs are widely dispersed and can be found in areas where large groups of people gather, such as convention centers, airports, stadiums, shopping malls, large businesses, schools and industrial complexes.

The most common abnormal heart rhythm that causes sudden cardiac arrest occurs when the ventricles simply quiver, or fibrillate, without any organized rhythm. This condition is called ***ventricular fibrillation (V-fib)***. In V-fib, the electrical impulses fire at random, creating chaos and preventing the heart from pumping and circulating blood.

Another less common life-threatening heart rhythm, called ***ventricular tachycardia (V-tach)***, occurs when the heart beats too fast. In V-tach, an abnormal electrical impulse controls the heart, originating in the ventricles instead of in the SA node. This abnormal impulse fires so quickly that the heart's chambers do not have time to fill, and the heart is unable to pump blood effectively. With little or no blood circulating, there may be no pulse. As with V-fib, there is no breathing or pulse.

[1]Bocka, JJ MD: Automatic external defibrillation, *eMedicine*, April 3, 2006.

[2]Pantridge JF, Geddes JS: A mobile intensive care unit in the treatment of myocardial infarction, *Lancet* 2:271, 1967.

[3]Graves JR, Austin D Jr, Cummins RO: *Rapid Zap: Automated Defibrillation.* Englewood Cliffs, NJ, Prentice-Hall, 1989.

[4]American Heart Association: *AED Legislation/ Good Samaritan Laws by State.* Reviewed/updated July 16, 2008.

Fig. 13-12: AEDs.

Delivering an electrical shock with an AED disrupts all electrical activity long enough to allow the heart to spontaneously develop an effective rhythm on its own. If V-fib or V-tach is not corrected, all electrical activity will eventually cease, a condition called ***asystole***. Asystole cannot be corrected by defibrillation.

You cannot tell what, if any, rhythm the heart has by feeling for a pulse. CPR, started immediately and continued until defibrillation, helps maintain a low level of circulation in the body until defibrillation, and increases the likelihood that the defibrillation shock will allow the heart to correct the abnormal rhythm.

Use an AED when the following conditions are present:

- The patient is unresponsive.
- There is *no normal* breathing.
- You do *not* detect a pulse.

Using an AED

When a cardiac arrest occurs, an AED should be used as soon as it is available and ready to use. If the AED advises that a shock is needed, follow protocols to give 1 shock followed by about 2 minutes of CPR. If CPR is in progress, chest compressions should not be interrupted until the AED is turned on, the defibrillation pads are applied and the AED is ready to analyze the heart rhythm.

Chest compressions can increase the likelihood that a defibrillation shock will be successful. Always follow local protocols and medical direction when using an AED and performing CPR. Be thoroughly familiar with the manufacturer's operating instructions and maintenance guidelines for the device that you will be operating.

The general steps of operating an AED include:

1. Turning on the AED and preparing it for use. Once the AED is turned on, it will guide the

CRITICAL FACTS

V-fib is the most common cause of sudden cardiac arrest. In V-fib, heart ventricles quiver instead of beating properly, due to erratic electrical impulses.

AEDs are portable electronic devices that analyze the heart's rhythm and can deliver an electrical shock, known as defibrillation, which helps the heart to re-establish an effective rhythm.

When a cardiac arrest occurs, an AED should be used as soon as it is available and ready to use. If the AED advises that a shock is needed, follow protocols to give 1 shock followed by about 2 minutes of CPR.

responder through all the steps of operation with voice and visual prompts. Some models have a power button that must be pressed or a handle that has to be pulled, while others will activate upon opening the case or lid.

2. Exposing the patient's chest and wiping the chest dry if necessary. The AED pads must be applied to the patient's *bare, dry* chest. If the patient's chest is moist or wet, it should be wiped with a small towel or gauze pads to ensure the best adhesion of the AED pads.
3. Attaching the AED pads to the patient's bare, dry chest. Remove the AED pads from their sealed packaging. Peel the backing off from each pad, one at a time, to expose the adhesive, conductive surface of the pad before it is applied to the patient's bare chest. Many AED pads have illustrations on them that show correct pad placement. Some AED pads are preconnected to the device, and some must be plugged into the device before rhythm analysis can begin. The pads should be appropriate to the patient. For example, pediatric AED pads must not be used on an adult patient because the lower energy levels may not be enough to defibrillate the patient, but if no pediatric pads are available, adult pads can be used on a child or infant.
4. Analyzing the heart rhythm. Most AEDs will automatically begin analysis when the pads are attached to the patient and connected to the device, while others have an "analyze" button that must be pushed. *No one* should touch or bump into the patient during the rhythm analysis as this could produce faulty readings.
5. Delivering a defibrillation shock. Once the analysis of the rhythm is complete, the AED will advise either to shock or not to shock the patient. If a shockable rhythm is detected, the AED will cycle up an electrical energy charge that will supply the shock to the patient. Some models can deliver the shock automatically, while others have a "shock" button that must be manually pushed to deliver the shock. *No one* should be in contact with the patient when the shock is delivered, because they could also receive a shock and thereby reduce the effectiveness of the defibrillation shock by absorbing some of the electrical energy. After a shock is delivered, or if no shock is advised, a period of time is programmed to allow for CPR until the next rhythm analysis begins. If the AED prompts to troubleshoot a problem such as "check electrodes" or "check pads," check to see that the AED pads are connected properly to the device and placed on the patient's chest with good adhesion, according to the manufacturer's instructions and local protocols. Spare batteries should be available in case of a "low battery" warning, but shocks can still be delivered with a low battery warning on some models.

After a shock is delivered or if no shock is indicated, immediately perform about 2 minutes of CPR, starting with compressions, before the AED begins analyzing the heart rhythm again. This pause is automatically programmed into the device and will be preceded by a voice prompt to resume CPR. You do *not* need to wait for the AED prompts to finish to begin chest compressions after a shock was delivered or a no shock advised prompt. If at any time you notice a sign of ROSC, such as normal breathing, stop CPR and monitor the patient's condition.

Special AED Situations

Some situations require responders to pay special attention when using an AED. These include using AEDs around water, on patients with implantable devices, on patients with transdermal patches and on patients with jewelry or body piercings. 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.

Pacemakers and Implantable Cardioverter-Defibrillators

Sometimes patients may have had a ***pacemaker*** implanted. These small implantable devices are sometimes located in the area below the right or left collarbone. There may be a small lump that can be felt under the skin.

Other patients may have an ***implantable cardioverter-defibrillator (ICD)***, a miniature version of an AED, which acts to automatically recognize and restore abnormal heart rhythms. Sometimes, a patient's heart beats irregularly, even if the patient has a pacemaker or an ICD.

If the implanted device is visible or you know that the patient has one, do *not* place the defibrillation pad directly over the device (Fig. 13-13). This may interfere with the delivery of the shock. Adjust pad placement if necessary and continue to follow established protocols. If you are not sure, use the AED as needed. It will not harm the patient or responder.

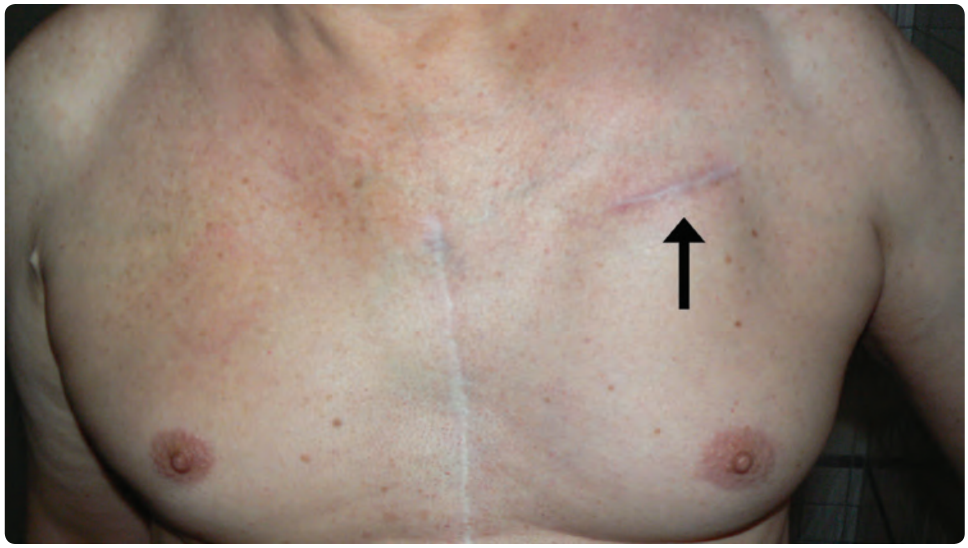


Fig. 13-13: Scars and/or a small lump may indicate that the patient has had some sort of device implanted. *Photo: courtesy of Ted Crites.*

Responders should be aware that it is possible to receive a mild shock if an implantable ICD delivers a shock to the patient while CPR is performed. This risk of injury to responders is minimal, and the amount of electrical energy involved is low. Much of the electrical energy is absorbed by the patient's own body tissues. Some protocols may include temporarily deactivating the shock capability of an ICD with a donut magnet or other precautions. EMRs should be aware of and follow any special precautions associated with ICDs, but delays in delivering CPR and defibrillation shocks from an AED should *not* occur.

AEDs Around Water

If the patient is in freestanding water, remove the patient before defibrillation. A shock delivered in water could conduct to responders or bystanders. Once you have removed the patient from the water, be sure there are no puddles of water around you, the patient or the AED. Remove wet clothing from the chest for proper pad placement, if necessary. Dry the patient's chest and attach the AED pads.

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

Transdermal Medication Patches

Some patients may use a ***transdermal medication patch***. The most common of these patches is the nitroglycerin patch, used by those with a history of cardiac problems. Since nitroglycerin or other medications can be absorbed by a responder, remove the patch from the patient's chest with a gloved hand before placing the defibrillation pads on the chest. Nicotine patches used to stop smoking look similar to nitroglycerin patches. To avoid wasting time trying to identify patches, remove any patch you see on the patient's chest with a gloved hand (Fig. 13-14). *Never* place AED electrode pads directly on top of medication patches.

Hypothermia

Some patients who have experienced hypothermia have been resuscitated successfully even after

Fig. 13-14: Remove any type of transdermal medication patch from the patient's chest with a gloved hand before defibrillation pads are placed on the chest.

prolonged exposure. If you do not feel a pulse, begin CPR until an AED becomes available. Follow local protocols as to whether an AED should be used. If the patient is wet, dry their chest and attach the AED pads. If a shock is indicated, deliver a shock and follow the instructions of the AED. If there are no obvious signs of life, continue CPR. Continue CPR and protect the patient from further heat loss. Wet garments should be removed, if possible. The patient should *not* be defibrillated in water. CPR or defibrillation should *not* be withheld to rewarm the patient. EMRs should handle hypothermia patients gently, as shaking them could result in V-fib.

Trauma

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

Chest Hair

Some patients have excessive chest hair that may cause difficulty with pad-to-skin contact. Since time to first shock is critical, and chest hair *rarely* interferes with pad adhesion, attach the pads and analyze the heart's rhythm as soon as possible. Press firmly on the pads to attach them to the patient's chest. If you get a "check pads" or similar message from the AED, remove the pads and replace 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 patient's chest and attach new pads to the patient's chest. Spare defibrillation pads and a safety razor should be included in the AED kit.

Jewelry and Body Piercings

Jewelry and body piercings do *not* need to be removed when using an AED. These are simply distractions that do no harm to the patient, but taking time to remove them delays delivery of the first shock. Do *not* delay the use of an AED to remove jewelry or body piercings. Do *not* place the defibrillation pad directly over metallic jewelry or body piercings. Adjust pad placement if necessary and continue to follow established protocols.

AED PRECAUTIONS

When operating an AED, follow these general precautions:

- Do *not* use alcohol to wipe the patient's chest dry; alcohol is flammable.
- Do *not* use pediatric AED pads on an adult, as they may not deliver enough energy for defibrillation.
- Do *not* touch the patient while the AED is analyzing. Touching or moving the patient may affect the analysis.
- Before shocking a patient with an AED, make sure that *no one* is touching or is in contact with the patient or the resuscitation equipment.
- Do *not* touch the patient while defibrillating. You or someone else 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 patient who is in contact with freestanding water. Move the patient away from puddles of water or swimming pools, or out of the rain, before defibrillating.
- Do *not* use an AED on a patient wearing a nitroglycerin patch or other medication patch on the chest. With a gloved hand, remove any patches from the chest before attaching the defibrillation pads.

AED MAINTENANCE

For defibrillators to function optimally, they must be maintained like any other machine. AEDs require minimal maintenance. These devices have various self-testing features. However, it is important that operators be 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.
- 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 defibrillation 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 before placing it back in service.
- If at any time the machine fails to work properly or warning indicators are recognized, discontinue use, place it out of service and contact the manufacturer immediately.

High-Performance CPR

High-performance CPR refers to providing high-quality chest compressions as part of a well-organized team response to a cardiac arrest. Coordinated, efficient, effective teamwork is essential to minimize the time spent not in contact with the chest to improve patient outcomes.

Think about all of the activities performed during a resuscitation. For example:

- AED pads are applied.
- AED must charge.
- Pocket mask or BVM may need to be repositioned.
- Airway may need to be reopened.
- Other personnel arrive on scene.
- Responders switch positions.
- Advanced airway may need to be inserted.
- Pulse checks may be done, but unnecessarily.

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

Science Note: Current research indicates that survival following resuscitation is significantly affected by the quality of CPR performed. One important aspect is minimizing interruptions in chest compressions, which helps to maximize the blood flow generated by the compressions.

Chest Compression Fraction

Chest compression fraction, or CCF, is the term used to denote the proportion of time that chest compressions are performed. It represents the fraction of time spent performing compressions, that is, the time that the responders are in contact with the patient's chest, divided by the total time of the resuscitation, beginning with the arrival on scene until the ROSC. Expert consensus identifies a CCF of at least 60 percent to promote optimal outcomes, with a goal of 80 percent.

To achieve the best CCF percentage, a coordinated team approach is needed, with each member assuming pre-assigned roles, anticipating the next action steps for yourself and other team members. This coordinated team approach also includes integrating and assimilating additional personnel, such as paramedics or a code team, who arrive on scene.

To further your understanding of high-performance CPR, consider the example of an automotive racing team. Each crew member has a specific role when the race car arrives in the pit area. They are supervised by a leader, who keeps the crew on task and gets the race car back on the track. The quality, efficiency and swiftness of the crew's actions can ultimately affect the outcome of how the race car performs. The same is true for a team response to CPR. All team members should have specific roles during a resuscitation. Based on available resources, potential roles include the following:

- Team leader
- Compressor
- Responder managing the airway
- Responder providing ventilations
- Responder managing the AED
- Recorder

Keep in mind that there are no national protocols in place for high-performance CPR. How you function within a team setting, including how additional personnel assimilate into the team, may vary depending on your local protocols or practice.

Integration of More Advanced Personnel

During resuscitation, numerous people may be involved in providing care to the patient. Responders must work together as a team in a coordinated effort to achieve the best outcomes for the patient. Characteristics of effective teamwork include well-defined roles and responsibilities; clear, closed-loop communication; and respectful treatment of others.

Coordination becomes even more important when more advanced personnel, such as an advanced life support team or code team, arrive on the scene. This coordination of all involved is necessary to:

- Ensure that all individuals involved work as a team to help promote the best outcome for the patient.
- Promote effective perfusion to the vital organs.
- Minimize interruptions of chest compressions, which have been shown to improve survival.

Ultimately, it is the team leader who is responsible for this coordination. When more advanced personnel arrive on scene, it is the team leader who communicates with advanced personnel, providing them with a report of the patient's status and events. The team leader also sets clear expectations, prioritizes, directs, acts decisively, encourages team input and interaction, and focuses on the big picture.

Crew Resource Management

During resuscitation, crew resource management helps to promote effective and efficient teamwork (Fig. 13-15). Crew resource management is a communication process that centers around the team leader, who coordinates the actions and activities of team members so that the team functions effectively and efficiently. For example, when new individuals arrive on the scene or when team members switch roles during an emergency, it is the team leader who is responsible for coordinating these activities.

During resuscitation, the team leader directs and coordinates all the working elements, including team members, activities and actions, as well as equipment, to focus on providing high-quality CPR, the goal of any resuscitation effort.

Crew resource management also guides team members to directly and effectively communicate to a team leader about dangerous or time-critical decisions. It was developed as a result of several airline disasters as a way to prevent future incidents. Crew resource management has been shown to help avoid medical errors in healthcare.

To effectively communicate via crew resource management, team members should get the attention of the team leader, and state their concern, the problem as they see it and a solution. Working together, the team should then be sure to obtain direction from the team leader.

PROVIDING CPR/AED FOR CHILDREN AND INFANTS

CPR/AED Differences Between Children and Adults

When performing CPR on a child, there are some subtle differences in technique. These differences include opening the airway, compression depth, the ratio of compressions to ventilations depending on the number of responders, and AED pads and pad placement.

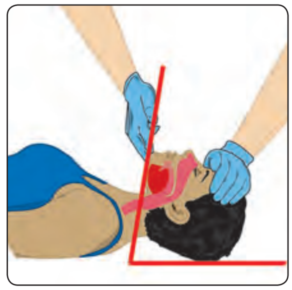
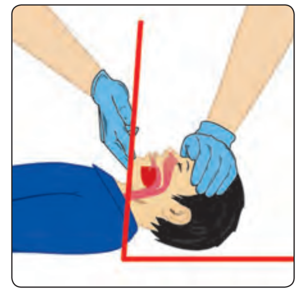
Airway

To open the airway of a child, you would use the same head-tilt/chin-lift maneuver as for an adult. However, you would only tilt the head slightly past a neutral position, avoiding any

Fig. 13-15: During resuscitation, crew resource management helps to promote effective and efficient teamwork.

Table 13-2:

Airway and Ventilation Differences: Adult and Child

	ADULT	CHILD (Age 1 through onset of puberty)
Airway		
Head-tilt/chin-lift maneuver	 **Past neutral** position	 **Slightly past neutral** position
Ventilations		
Respiratory arrest	 **1** ventilation every **5** to **6** seconds	 **1** ventilation every **3** seconds

hyperextension or flexion in the neck. Table 13-2 illustrates airway and ventilation differences for an adult and child.

Compressions

The positioning and manner of providing compressions to a child are also very similar to an adult. Place your hands in the center of the exposed chest on the lower half of the sternum and compress at a rate of between 100 and 120 compressions per minute.

However, the depth of compression is different. For a child, compress the chest only *about 2 inches*, which is 1/3 the anterior-posterior diameter of the chest, instead of at least 2 inches, but no more than 2.4 inches, as you would for an adult. For smaller children, you may need to compress the chest with only one hand. Ensure you are able to compress the chest about 2 inches.

Compressions-to-Ventilations Ratio

When you are the only responder, the ratio of compressions to ventilations for a child is the same as for an adult, that is, 30 compressions to 2 ventilations (30:2). However, in two-responder situations, this ratio changes to 15 compressions to 2 ventilations (15:2).

Science Note: Most child-related cardiac arrests occur as a result of a hypoxic event such as an exacerbation of asthma, an airway obstruction or a drowning. As such, ventilations and appropriate oxygenation are important for a successful resuscitation. In these situations, laryngeal spasm may occur, making passive ventilation during chest compressions minimal or nonexistent. Therefore, it is critical to correct the oxygenation problem by providing high-quality CPR prior to leaving the child or infant.

Science Note: Based on local protocols or practice, it is permissible to provide two ventilations prior to initiating CPR after the primary assessment if a hypoxic event is suspected.

AEDs

AEDs work the same way regardless of the patient's age, but there are differences in the pads used for children as well as the pad placement based on the size of the child. For children over the age of 8 years and weighing more than 55 pounds, you would continue to use adult AED pads, placing them in the same location as for an adult—one pad to the right of the sternum and below the right clavicle, with the other pad on the left side of the chest on the midaxillary line a few inches below the left armpit. However, for children 8 years of age or younger or weighing less than 55 pounds, use pediatric AED pads if available. Be aware that some AEDs use a switch or key instead of changing pads, so follow the directions from the AED manufacturer on how to care for pediatric patients with their device.

At no time should the AED pads touch each other when applied. If it appears that the AED pads would touch each other based on the size of the child's chest, use an anterior and posterior pad placement as an alternative. Apply one pad to the center of the child's chest on the sternum and one pad to the child's back between the scapulae. Table 13-3 summarizes the differences for CPR and AED for adults and children.

CPR/AED DIFFERENCES FOR INFANTS

Like with children, several differences need to be addressed when providing CPR to an infant. These differences include the primary assessment (assessing the level of consciousness and checking the pulse), opening the airway, compression depth, the ratio of compressions to ventilations depending on the number of responders and AED pad placement.

Primary Assessment Variations: Infant

When assessing the infant's level of consciousness, you should shout, "Are you okay?" or use the infant's name if known, and tap the bottom of the foot rather than the shoulder as part of the "shout-tap-shout" sequence. Another variation for the infant involves the pulse check. For an infant, check the brachial pulse with two fingers on the inside of the upper arm. Be careful not to use your thumb because it has its own detectable pulse. You will need to expose the arm to accurately feel a brachial pulse.

Science Note: AVPU is not as accurate in infants and children as it is in adults. The pediatric assessment triangle—Appearance, Effort of breathing, and Circulation—can give you a more accurate depiction of an infant's status. Regardless of what tool is used, the recognition of an unresponsive infant is the priority.

Airway

To open the airway of an infant, use the same head-tilt/chin-lift maneuver as you would for an adult or child. However, only tilt the head to a neutral position, taking care to avoid any hyperextension or flexion in the neck. Be careful not to place your fingers on the soft tissues under the chin or neck to open the airway. Table 13-4 illustrates airway and ventilation differences for an adult, child and infant.

Compressions

Although the rate of compressions is the same for an infant as for an adult or child, the positioning and manner of providing compressions to an infant are different because of the infant's smaller size. Positioning also differs based on the number of responders involved.

CRITICAL FACTS

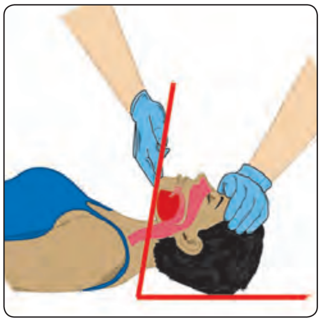
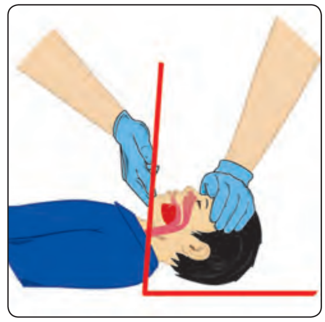
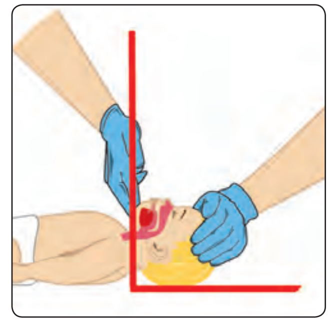
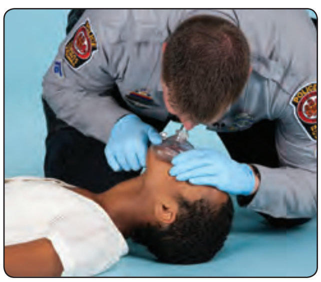
In the absence of pediatric pads or a pediatric setting on the AED, you may use adult pads for the child. Be sure that the pads will not touch each other if considering a traditional pad placement on the anterior chest. Use the anterior and posterior pad placement if the pads may touch each other. Remember: because the energy supplied by pediatric pads is reduced, they would not be effective for an adult patient and should not be used. Always follow local protocols, medical direction and the manufacturer's instructions.

Table 13-3:

CPR/AED Differences: Adult and Child

	ADULT	CHILD (Age 1 through onset of puberty)
Compressions		
Hand position	Hands centered on lower half of sternum 	Hands centered on lower half of sternum 
Compression rate	Between 100 and 120 compressions per minute	Between 100 and 120 compressions per minute
Compression depth	**At least** 2 inches (but no more than 2.4 inches)	**About** 2 inches (or 1/3 the anterior-posterior diameter of the chest)
Compression/ ventilation ratio	▪ One-responder CPR: 30:2 ▪ Two-responder CPR: 30:2	▪ One-responder CPR: 30:2 ▪ Two-responder CPR: **15:2**
AED		
AED pads	Adult pads: age > 8 years, weight > 55 pounds	▪ **Pediatric pads: age 1–8 years, weight < 55 pounds** ▪ Adult pads if pediatric pads not available
AED pad placement	 ▪ Upper right chest below right clavicle to the right of sternum ▪ Left side of chest several inches below left armpit on midaxillary line	 ▪ Upper right chest below right clavicle to the right of sternum ▪ Left side of chest several inches below left armpit on midaxillary line ▪ **If pads risk touching each other—anterior/posterior placement**

Table 13-4:
Airway and Ventilation Differences: Adult, Child and Infant

	ADULT	CHILD (Age 1 through onset of puberty)	INFANT (Birth to age 1)
Airway			
Head-tilt/ chin-lift maneuver	 **Past neutral** position	 **Slightly past neutral** position	 **Neutral** position
Ventilations			
Respiratory arrest	 **1** ventilation every **5** to **6** seconds	 **1** ventilation every **3** seconds	 **1** ventilation every **3** seconds

The firm, flat surface necessary for providing compressions is also appropriate for an infant. However, that surface can be above the ground, such as a stable table or countertop. Often it is easier for the responder to provide compressions from a standing position rather than kneeling at the patient's side.

Compressions are delivered at the same rate for adults and children, that is, at a rate of at least 100 per minute to a maximum of 120 compressions per minute. However, for an infant, only compress the chest *about* 1½ inches (or 1/3 the anterior-posterior diameter of the chest).

One-Responder CPR

To perform compressions when one responder is present, place two fingers from your hand closest to the infant's feet in the center of the exposed chest, just below the nipple line on the sternum. The fingers should be oriented so that they are parallel, not perpendicular to the sternum. Responders may use either their index finger and middle finger or their middle finger and fourth finger to provide compressions. Fingers that are more similar in length tend to make the delivery of compressions easier. The ratio of compressions to ventilations is the same for an adult or child, that is, 30 compressions to 2 ventilations (30:2).

Two-Responder CPR

When two responders are caring for an infant in cardiac arrest, the positioning of the responders and the method of performing chest

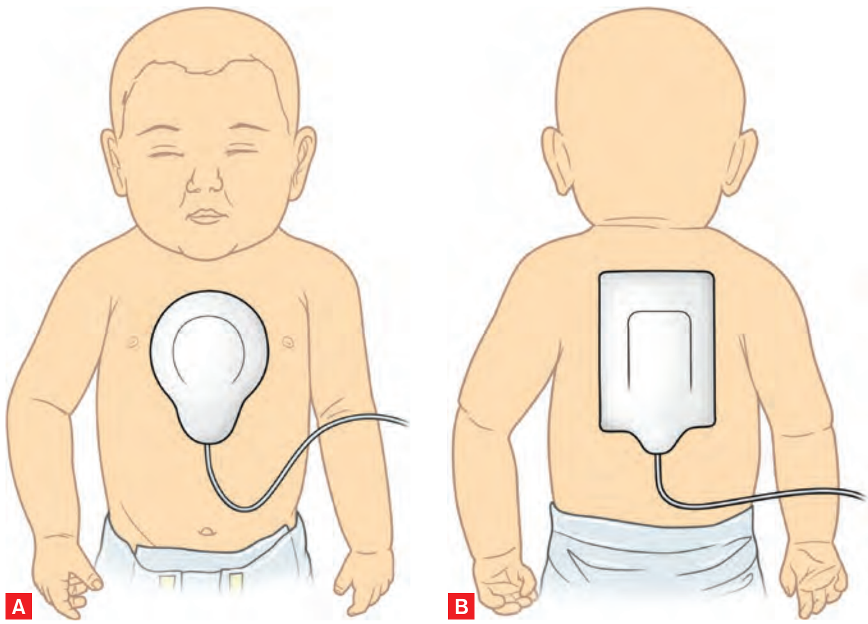


Fig. 13-16, A–B: **(A)** Anterior placement of an AED pad for an infant; **(B)** posterior placement of the pad.

compressions differ from that of an adult or child. The responder performing chest compressions will be positioned at the infant's feet while the responder providing ventilations will be at the infant's head. Compressions are delivered using the encircling thumbs technique. To provide compressions using this technique:

- Place both thumbs on the center of the infant's exposed chest side by side, just below the nipple line.
- Have the other fingers encircling the infant's chest toward the back, providing support.

While positioned at the infant's head, the responder providing ventilations will open the airway using two hands and seal the mask using the E-C technique. With two responders, the ratio of compressions to ventilations changes to that of a child, that is, 15 compressions to 2 ventilations (15:2).

AEDs

While the need to deliver a defibrillation for an infant occurs less often than for an adult, the use of an AED remains a critical component of infant cardiac arrest care. As with a child patient, use pediatric AED pads if available. Keep in mind that similar to a child, some AEDs use a switch or key instead of changing pads, so follow the directions from the AED manufacturer on how to care for pediatric patients with their device.

When applying the pads, place one pad in the center of the anterior chest and the second pad in the posterior position centered between the scapulae (Fig. 13-16, A–B). Just as with a child, if no pediatric pads are available, use adult AED pads. Table 13-5 summarizes the differences in CPR and AED for adults, children and infants.

Pediatric Consideration—Poor Perfusion

When a child or an infant is not breathing normally and has a pulse less than or equal to 60 beats per minutes, perform compressions (CPR) if there are signs of poor perfusion. Recheck breathing and pulse every 2 minutes. If there is no pulse, provide CPR.

Additional Resources

While it is rare in the professional setting to be alone with a child or infant, there is a slight change of when you should call for additional resources when you are alone. After determining that an adult is unresponsive and you are alone, you should immediately call for additional resources and get an AED. With children, it is more important to provide about 2 minutes of CPR before leaving them to call for additional resources or get an AED unless the arrest is witnessed and believed to be cardiac in origin.

Table 13-5:
CPR/AED Differences: Adult, Child and Infant

	ADULT	CHILD (Age 1 through onset of puberty)	INFANT (Birth to age 1)	
Compressions				
Hand position	 Hands centered on lower half of sternum	 Hands centered on lower half of sternum	 One responder: **Two fingers** centered on sternum, **just below nipple line**	 Two responders: **Thumbs** centered on chest side by side, **just below nipple line.**
Compression rate	Between 100 and 120 compressions per minute	Between 100 and 120 compressions per minute	Between 100 and 120 compressions per minute	
Compression depth	**At least** 2 inches, but no more than 2.4 inches	**About** 2 inches (or 1/3 the anterior-posterior diameter of the chest)	**About 1½ inches** (or 1/3 the anterior-posterior diameter of the chest)	
Compression/ ventilation ratio	▪ One-responder CPR: 30:2 ▪ Two-responder CPR: 30:2	▪ One-responder CPR: 30:2 ▪ Two-responder CPR: **15:2**	▪ One-responder CPR: 30:2 ▪ Two-responder CPR: **15:2**	
AED				
AED pads	Adult pads: age > 8 years, weight > 55 pounds	▪ **Pediatric pads: age 1 to 8 years, weight < 55 pounds** ▪ Adult pads if pediatric pads not available	▪ **Pediatric pads** ▪ Adult pads if pediatric pads not available	

(*Continued*)

Table 13-5: continued

	ADULT	CHILD (Age 1 through onset of puberty)	INFANT (Birth to age 1)
AED			
AED pad placement	 ▪ Upper right chest below right clavicle to the right of sternum ▪ Left side of chest several inches below left armpit on midaxillary line	 ▪ Upper right chest below right clavicle to the right of sternum ▪ Left side of chest several inches below left armpit on midaxillary line ▪ **If pads risk touching each other—anterior/posterior placement**	 ▪ Anterior/posterior placement: ▪ **Middle of chest** ▪ **Back between scapulae**

PUTTING IT ALL TOGETHER

When the heart stops beating, or beats too ineffectively to circulate blood to the brain and other vital organs, this is called cardiac arrest. Irreversible brain damage is likely to occur after about 8 to 10 minutes from lack of oxygen. By starting CPR immediately, and using an AED, you can help keep the patient's brain and other vital organs supplied with oxygen and help the heart restore an effective, pumping rhythm. By summoning more advanced medical personnel, you can increase the cardiac arrest patient's chances for survival. A patient who is unconscious, not breathing normally and has no pulse is in cardiac arrest and needs immediate CPR. When performing CPR, always remember the following points regarding the quality and maximum effectiveness of CPR:

- Chest compressions should be given fast, smooth and deep.
- Let the chest fully recoil or return to its normal position after each compression before starting the downstroke of the next compression.
- Minimize any interruptions in chest compressions.

If two responders are available, begin two-responder CPR as soon as possible. Change positions about every 2 minutes and continue CPR. Once you start CPR, do not stop unnecessarily.

The heart's electrical system controls the pumping action of the heart. Damage to the heart from disease or injury can disrupt the heart's electrical system, resulting in an abnormal heart rhythm that can stop circulation. The two most common treatable abnormal rhythms initially present in patients suffering sudden cardiac arrest are V-fib and V-tach.

An AED is a portable electronic device that analyzes the heart's rhythm and delivers an electrical shock to the heart, called defibrillation. Defibrillation disrupts the electrical activity of V-fib and V-tach long enough to allow the heart to develop an effective rhythm on its own. AEDs are used in conjunction with CPR.

Use an AED as soon as one becomes available. The sooner the shock is administered, the greater the likelihood of the patient's survival. AEDs are appropriate for use on adults, children and infants in cardiac arrest. When using an AED, follow your local protocols and the manufacturer's operating instructions, and be aware of AED precautions and special situations.

You Are the Emergency Medical Responder

The man who collapsed is unconscious, is not breathing normally and does not have a pulse. He has no severe, life-threatening bleeding. You send another responder to summon more advanced medical personnel and to bring the AED. You begin CPR. Once the AED arrives, the other responder prepares the AED for use. How would you respond? When can you stop performing CPR?

Skill Sheet 13-1

CPR/AED—Adult

STEP	ACTION	COMPETENCIES
1	**Scene size-up:** ▪ Scene safety* ▪ Standard precautions* ▪ Number of patients ▪ Nature of illness/mechanism of injury ▪ General impression, including severe, life-threatening bleeding* ▪ Additional resources needed?	▪ Sequence of these is not critical if all goals are accomplished and verbalized. (PPE may be worn instead of verbalized.) ▪ Resources may include: 9-1-1 or designated emergency number, Advanced Life Support, Rapid Response Team, Code Team, or additional personnel as needed or appropriate.
2	**Primary assessment:** ▪ Assesses level of consciousness (LOC)* ▪ Opens the airway ▪ Checks breathing and carotid pulse simultaneously for at least 5 seconds, but no more than 10 seconds*	▪ **LOC:** Shouts, "Are you OK?" (or a reasonable facsimile) to elicit a verbal stimuli ▪ **LOC:** Taps the patient's shoulder to elicit painful stimuli and shouts again (shout-tap-shout) ▪ **Airway:** Opens using head-tilt/chin-lift maneuver past a neutral position or a modified jaw thrust ▪ **Breathing/pulse check:** Checks for breathing and carotid pulse simultaneously for at least 5 seconds, but no more than 10 seconds
3	**Chest compressions:** ▪ Exposes chest ▪ Initiates 30 chest compressions using correct hand placement at the proper rate and depth, allowing for full chest recoil*	▪ **Hand position:** Centered on the lower half of the sternum ▪ **Depth:** At least 2 inches ▪ **Number:** 30 compressions ▪ **Rate:** Between 100 and 120 compressions per minute (15–18 seconds) ▪ **Full chest recoil:** 26 of 30 compressions
4	**Ventilations:** ▪ Opens the airway* ▪ Gives 2 ventilations using a pocket mask*	▪ **Airway:** Head-tilt/chin-lift maneuver past a neutral position ▪ **Ventilations (2):** 1 second in duration ▪ **Ventilations (2):** Visible chest rise ▪ **Ventilations (2):** Minimizes interruptions to less than 10 seconds
5	**Continues CPR:** ▪ Gives 30 chest compressions using correct hand placement at the proper rate and depth, allowing for full chest recoil* ▪ Opens the airway ▪ Gives 2 ventilations with pocket mask	▪ **Hand position:** Centered on the lower half of the sternum ▪ **Depth:** At least 2 inches ▪ **Number:** 30 compressions ▪ **Rate:** Between 100 and 120 compressions per minute (15–18 seconds) ▪ **Full chest recoil:** 26 of 30 compressions

*Denotes a Critical Action.

(*Continued*)

Skill Sheet 13-1

CPR/AED—Adult *Continued*

STEP	ACTION	COMPETENCIES
6	**Arrival of the AED and additional responders:** ▪ Initial responder continues care* ▪ Communicates with additional responders ▪ Prepares for rotation upon AED analysis	▪ **Continues care:** Maintains uninterrupted CPR ▪ **Communicates** relevant patient information including patient age if known ▪ **Verbalizes** compression count to coordinate ventilations with additional responders ▪ **Verbalizes** coordination plan to switch compressors upon AED analysis
7	**AED applied:** ▪ Turns on machine ▪ Attaches AED pads* ▪ Plugs in connector, if necessary ▪ Continues compressions	▪ **AED on:** Activates within 15 seconds of arrival ▪ **Pads:** Pad 1—right upper chest below right clavicle and right of sternum; Pad 2—left side of chest several inches below left armpit on midaxillary line
8	**AED analysis and rotation:** ▪ Ensures all responders are clear while AED analyzes and prepares for shock* ▪ Says, "Stand clear" ▪ Rotates responders during analysis to prevent fatigue ▪ Prepares BVM	▪ **Clear:** Ensures no one is touching the patient during analysis ▪ **Rotation:** Switches compressor during analysis ▪ **Hover:** Hovers hands (new compressor) a few inches above chest during analysis to prepare for CPR
9	**Shock advised:** ▪ Says, "Stand clear"* ▪ Presses shock button to deliver shock*	▪ **Clear:** Ensures no one is touching the patient while shock is being delivered ▪ **Delivers shock:** Depresses shock button within 10 seconds
10	**Resumes CPR:** ▪ Continues with 5 cycles of CPR (30 compressions/2 ventilations)* ▪ Performs compressions (Responder 2) ▪ Manages airway and mask seal (Responder 1) ▪ Provides ventilations using BVM (Responder 1) ▪ Continues until AED prompts	▪ **Resumes CPR:** Immediately following shock, resumes CPR, starting with compressions, until prompted by the AED for analysis ▪ **Hand position:** Centered on the lower half of the sternum ▪ **Depth:** At least 2 inches ▪ **Number:** 30 compressions ▪ **Rate:** Between 100 and 120 compressions per minute (15–18 seconds) ▪ **Full chest recoil:** 26 of 30 compressions
11	**Ventilations with BVM:** ▪ Opens the airway from top of the head ▪ Maintains mask seal ▪ Compresses BVM to give 2 ventilations	▪ **Seal:** Using the E-C technique ▪ **Airway:** Head-tilt/chin-lift maneuver past a neutral position ▪ **Ventilations (2):** 1 second in duration ▪ **Ventilations (2):** Visible chest rise

*Denotes a Critical Action.

(*Continued*)

Skill Sheet 13-1

CPR/AED—Adult *Continued*

STEP	ACTION	COMPETENCIES
		▪ **Ventilations (2):** Minimizes interruptions to less than 10 seconds ▪ **Ventilations (2):** Bag squeezed enough to make chest rise; does not fully squeeze bag (approximately 400–700 ml of volume, avoiding overinflation)
12	**Anticipates compressor change:** ▪ Communicates with additional responders ▪ Prepares for rotation upon AED analysis	▪ **Verbalizes** coordination plan to switch compressors prior to AED analysis
13	**AED analyzes:** ▪ Says, "Stand clear" ▪ No shock advised	▪ **Clear:** Ensures no one is touching the patient during analysis ▪ **Rotation:** Switches compressor during analysis ▪ **Hover:** Hovers hands (new compressor) a few inches above chest during analysis to prepare for CPR
14	**Resumes CPR:** ▪ Continues with 5 cycles of CPR (30 compressions/2 ventilations)* ▪ Performs compressions (Responder 3) ▪ Manages airway and mask seal (Responder 1) ▪ Provides ventilations using BVM (Responder 2) ▪ Continues until AED prompts	▪ **Resumes CPR:** Immediately following shock, resumes CPR, starting with compressions, until prompted by the AED for analysis ▪ **Hand position:** Centered on the lower half of the sternum ▪ **Depth:** At least 2 inches ▪ **Number:** 30 compressions ▪ **Rate:** Between 100 and 120 compressions per minute (15–18 seconds) ▪ **Full chest recoil:** 26 of 30 compressions
15	**Anticipates compressor change:** ▪ Communicates with additional responders ▪ Prepares for rotation upon AED analysis	▪ **Verbalizes** coordination plan to switch compressors prior to AED analysis
16	**AED analyzes and rotation:** ▪ Says, "Stand clear"* ▪ No shock advised	▪ **Clear:** Ensures no one is touching the patient during analysis ▪ **Rotation:** Switches compressor during analysis ▪ **Hover:** Hovers hands (new compressor) a few inches above chest during analysis to prepare for CPR
17	**Spontaneous patient movement:** ▪ Checks for breathing and pulse	▪ **Pulse check:** Opens the airway and checks for breathing and pulse simultaneously for at least 5 seconds, but no more than 10 seconds

*Denotes a Critical Action.