



Responding to Emergencies: Comprehensive First Aid/CPR/AED

American Red Cross

Table of Contents

About This Course x

PART ONE

Introduction / 1

CHAPTER 1 If Not You ... Who? 2

CHAPTER 2 Responding to
an Emergency 15

CHAPTER 3 Before Giving Care 25

PART TWO

Assessment / 40

CHAPTER 4 The Human Body 41

CHAPTER 5 Checking the Person 62

PART THREE

Life-Threatening Emergencies / 78

CHAPTER 6 Cardiac Emergencies 79

CHAPTER 7 Breathing Emergencies ... 111

CHAPTER 8 Bleeding 139

CHAPTER 9 Shock..... 152

PART FOUR

Injuries / 158

CHAPTER 10 Soft Tissue Injuries..... 159

CHAPTER 11 Musculoskeletal Injuries ... 185

CHAPTER 12 Injuries to the
Extremities 200

CHAPTER 13 Injuries to the Head,
Neck or Spine 226

CHAPTER 14 Injuries to the Chest,
Abdomen and Pelvis..... 242

PART FIVE

Medical Emergencies / 254

CHAPTER 15 Sudden Illnesses..... 255

CHAPTER 16 Poisoning 276

CHAPTER 17 Bites and Stings 297

CHAPTER 18 Substance Abuse
and Misuse..... 317

CHAPTER 19 Heat-Related Illnesses
and Cold-Related
Emergencies 335

PART SIX

Special Situations / 352

CHAPTER 20 Water-Related
Emergencies 353

CHAPTER 21 Pediatric, Older Adult
and Special Situations 364

CHAPTER 22 Emergency Childbirth..... 384

CHAPTER 23 Disaster, Remote
and Wilderness
Emergencies 398

APPENDIX Answers to Ready
to Respond? Questions
and Answers to Study
Questions 421

Glossary 441

Sources 452

Photography Credits 455

Index 456

Detailed Table of Contents

About This Course x

PART ONE Introduction / 1

CHAPTER 1 If Not You ... Who?, 2

| | |
|----------------------------------|----|
| Objectives | 3 |
| Key Terms | 3 |
| Introduction | 4 |
| Types of Emergencies | 4 |
| Your Role in an Emergency | 4 |
| Preparing for an Emergency | 6 |
| Incident Stress | 12 |
| Summary | 13 |
| Ready to Respond? | 13 |
| Study Questions | 14 |

CHAPTER 2 Responding to an Emergency, 15

| | |
|--|----|
| Objectives | 16 |
| Key Term | 16 |
| Introduction | 16 |
| Taking Action: The Emergency Action Steps .. | 16 |
| Summary | 23 |
| Ready to Respond? | 23 |
| Study Questions | 24 |

CHAPTER 3 Before Giving Care, 25

| | |
|---------------------------------------|----|
| Objectives | 26 |
| Key Terms | 26 |
| Introduction | 27 |
| Preventing Disease Transmission | 27 |
| Legal Considerations | 32 |
| Reaching and Moving a Person | 34 |
| Summary | 37 |
| Ready to Respond? | 37 |
| Study Questions | 37 |

Skill Sheet

| | |
|---|----|
| 3-1: Removing Disposable Latex-Free Gloves | 39 |
|---|----|

PART TWO Assessment / 40

CHAPTER 4 The Human Body, 41

| | |
|--|----|
| Objectives | 42 |
| Key Terms | 42 |
| Introduction | 43 |
| Anatomical Terms | 43 |
| Body Systems | 46 |
| Interrelationships of Body Systems | 59 |
| Summary | 59 |
| Ready to Respond? | 59 |
| Study Questions | 60 |

CHAPTER 5 Checking the Person, 62

| | |
|---|----|
| Objectives | 63 |
| Key Terms | 63 |
| Introduction | 63 |
| Checking for Life-Threatening Conditions | 63 |
| Checking a Responsive Person | 66 |
| Interviewing the Person | 69 |
| Checking the Person from Head to Toe | 69 |
| Checking for Shock | 71 |
| Summary | 71 |
| Ready to Respond? | 71 |
| Study Questions | 72 |

Skill Sheets

| | |
|--|----|
| 5-1: Checking a Responsive Person | 74 |
| 5-2: Checking a Person Who Appears to Be Unresponsive | 76 |

PART THREE

Life-Threatening Emergencies / 78

CHAPTER 6 **Cardiac Emergencies, 79**

| | |
|----------------------------------|-----|
| Objectives | 80 |
| Key Terms | 80 |
| Introduction | 81 |
| Cardiovascular Disease | 81 |
| Heart Attack | 82 |
| Angina Pectoris | 84 |
| Cardiac Arrest | 85 |
| CPR | 88 |
| AED | 88 |
| Summary | 99 |
| Ready to Respond? | 99 |
| Study Questions | 100 |

Skill Sheets

| | |
|--|-----|
| 6-1: Giving CPR to an Adult | 103 |
| 6-2: Giving CPR to a Child | 105 |
| 6-3: Giving CPR to an Infant | 107 |
| 6-4: Using an AED | 109 |

CHAPTER 7 **Breathing Emergencies, 111**

| | |
|---|-----|
| Objectives | 112 |
| Key Terms | 112 |
| Introduction | 112 |
| The Breathing Process | 113 |
| Respiratory Distress and Respiratory Arrest | 114 |
| Asthma | 118 |
| Choking | 121 |
| Summary | 128 |
| Ready to Respond? | 128 |
| Study Questions | 129 |

Skill Sheets

| | |
|--|-----|
| 7-1: Assisting with an Asthma Inhaler | 131 |
| 7-2: Caring for an Adult Who Is Choking | 133 |
| 7-3: Caring for a Child Who Is Choking | 135 |
| 7-4: Caring for an Infant Who Is Choking | 137 |

CHAPTER 8 **Bleeding, 139**

| | |
|---------------------------------------|-----|
| Objectives | 140 |
| Key Terms | 140 |
| Introduction | 141 |
| The Blood and Blood Vessels | 141 |
| When Severe Bleeding Occurs | 142 |
| External Bleeding | 142 |
| Internal Bleeding | 147 |
| Summary | 148 |
| Ready to Respond? | 148 |
| Study Questions | 149 |

Skill Sheets

| | |
|--|-----|
| 8-1: Using Direct Pressure to Control External Bleeding | 150 |
| 8-2: Using a Commercial Tourniquet | 151 |

CHAPTER 9 **Shock, 152**

| | |
|-----------------------------|-----|
| Objectives | 153 |
| Key Terms | 153 |
| Introduction | 153 |
| Shock | 153 |
| Summary | 156 |
| Ready to Respond? | 156 |
| Study Questions | 157 |

PART FOUR

Injuries / 158

CHAPTER 10

Soft Tissue Injuries, 159

| | |
|-----------------------------|-----|
| Objectives | 160 |
| Key Terms | 160 |
| Introduction | 161 |
| The Soft Tissues | 161 |
| Wounds | 161 |
| Burns | 173 |
| Summary | 180 |
| Ready to Respond? | 180 |
| Study Questions | 181 |

CHAPTER 11

Musculoskeletal Injuries, 185

| | |
|--|-----|
| Objectives | 186 |
| Key Terms | 186 |
| Introduction | 186 |
| The Musculoskeletal System | 187 |
| Injuries to the Musculoskeletal System | 190 |
| Summary | 197 |
| Ready to Respond? | 197 |
| Study Questions | 198 |

CHAPTER 12

Injuries to the Extremities, 200

| | |
|---|-----|
| Objectives | 201 |
| Key Terms | 201 |
| Introduction | 201 |
| Immobilizing Serious Extremity Injuries | 202 |
| Upper Extremity Injuries | 205 |
| Lower Extremity Injuries | 210 |
| Summary | 215 |
| Ready to Respond? | 215 |
| Study Questions | 216 |

Skill Sheets

| | |
|---|-----|
| 12-1: Applying a Sling and Binder | 218 |
| 12-2: Applying a Rigid Splint | 220 |
| 12-3: Applying an Anatomic Splint | 222 |
| 12-4: Applying a Soft Splint | 224 |

CHAPTER 13

Injuries to the Head, Neck or Spine, 226

| | |
|---|-----|
| Objectives | 227 |
| Key Terms | 227 |
| Introduction | 227 |
| Recognizing Serious Head, Neck and Spinal Injuries | 228 |
| Specific Injuries | 233 |
| Summary | 239 |
| Ready to Respond? | 239 |
| Study Questions | 240 |

CHAPTER 14

Injuries to the Chest, Abdomen and Pelvis, 242

| | |
|------------------------------|-----|
| Objectives | 243 |
| Key Terms | 243 |
| Introduction | 243 |
| Chest Injuries | 244 |
| Abdominal Injuries | 247 |
| Pelvic Injuries | 250 |
| Summary | 252 |
| Ready to Respond? | 252 |
| Study Questions | 253 |

PART FIVE

Medical Emergencies / 254

CHAPTER 15

Sudden Illnesses, 255

| | |
|-------------------------------------|-----|
| Objectives | 256 |
| Key Terms | 256 |
| Introduction | 257 |
| Sudden Illnesses | 257 |
| Specific Sudden Illnesses | 259 |
| Summary | 272 |
| Ready to Respond? | 272 |
| Study Questions | 273 |

CHAPTER 16

Poisoning, 276

| | |
|------------------------------|-----|
| Objectives | 277 |
| Key Terms | 277 |
| Introduction | 277 |
| Poisoning | 278 |
| Types of Poisoning | 281 |
| Anaphylaxis | 288 |
| Summary | 291 |
| Ready to Respond? | 291 |
| Study Questions | 292 |

Skill Sheet

| | |
|---|-----|
| 16-1: Administering an Epinephrine Auto-Injector | 294 |
|---|-----|

CHAPTER 17

Bites and Stings, 297

| | |
|--|-----|
| Objectives | 298 |
| Key Terms | 298 |
| Introduction | 298 |
| Insect Stings | 298 |
| Tick Bites | 299 |
| Mosquito Bites | 303 |
| Spider Bites and Scorpion Stings | 305 |
| Venomous Snakebites | 307 |
| Marine-Life Stings | 308 |
| Domestic and Wild Animal Bites | 310 |
| Human Bites | 311 |
| Summary | 314 |
| Ready to Respond? | 314 |
| Study Questions | 315 |

CHAPTER 18

Substance Abuse and Misuse, 317

| | |
|---|-----|
| Objectives | 318 |
| Key Terms | 318 |
| Introduction | 319 |
| Forms of Substance Abuse and Misuse | 319 |
| Abused and Misused Substances | 320 |
| Signs and Symptoms of Substance Abuse and Misuse | 329 |
| Care for Substance Abuse and Misuse | 330 |
| Summary | 332 |
| Ready to Respond? | 332 |
| Study Questions | 333 |

CHAPTER 19

Heat-Related Illnesses and Cold-Related Emergencies, 335

| | |
|--|-----|
| Objectives | 336 |
| Key Terms | 336 |
| Introduction | 337 |
| How Body Temperature Is Controlled | 337 |
| Types of Heat-Related Illnesses | 340 |
| Cold-Related Emergencies | 344 |
| Summary | 349 |
| Ready to Respond? | 349 |
| Study Questions | 350 |

PART SIX

Special Situations / 352

CHAPTER 20

Water-Related Emergencies, 353

| | |
|---|-----|
| Objectives | 354 |
| Key Terms | 354 |
| Introduction | 354 |
| Water-Related Emergencies | 354 |
| Taking Action in a Water-Related Emergency | 357 |
| Moving an Unresponsive Person to Dry Land | 360 |
| Summary | 361 |
| Ready to Respond? | 362 |
| Study Questions | 363 |

CHAPTER 21

Pediatric, Older Adult and Special Situations, 364

| | |
|---|-----|
| Objectives | 365 |
| Key Terms | 365 |
| Introduction | 366 |
| Children and Infants | 366 |
| Older Adults | 374 |
| People with Disabilities | 377 |
| Language Barriers | 380 |
| Crime Scenes and Hostile Situations | 380 |
| Summary | 381 |
| Ready to Respond? | 381 |
| Study Questions | 382 |

CHAPTER 22

Emergency Childbirth, 384

| | |
|---|-----|
| Objectives | 385 |
| Key Terms | 385 |
| Introduction | 386 |
| Pregnancy and the Birth Process | 386 |
| Assisting with Delivery | 388 |
| Caring for the Newborn and Mother | 391 |
| Special Considerations | 392 |
| Summary | 395 |
| Ready to Respond? | 395 |
| Study Questions | 396 |

CHAPTER 23

Disaster, Remote and Wilderness Emergencies, 398

| | |
|--|-----|
| Objectives | 399 |
| Key Terms | 399 |
| Introduction | 399 |
| Disaster, Remote and Wilderness Emergencies | 400 |
| Taking Action Using Modified CHECK—CALL—CARE | 402 |
| Difficult Decisions | 411 |
| Protection from the Environment | 412 |
| Preparing for Emergencies | 414 |
| Summary | 418 |
| Ready to Respond? | 418 |
| Study Questions | 419 |

APPENDIX

Answers to Ready to Respond? Questions and Answers to Study Questions, 421

Glossary, 441

Sources, 452

Photography Credits, 455

Index, 456

ABOUT THIS COURSE

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

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

- Recognize when an emergency has occurred.
- Follow the emergency action steps:
CHECK—CALL—CARE.
- Give care for an injury or sudden illness until emergency medical services (EMS) personnel arrive.

How You Will Learn

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

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

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

Requirements for American Red Cross Certification

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

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

To obtain certification, you must:

- Attend and participate in all class sessions.
 - *Note: If a participant must miss a session, the instructor should assign the appropriate make-up work to cover the course material missed during the participant's absence.*
- Participate in all skill sessions.
- Demonstrate competency in all required skills and scenarios.
- Pass each section of the written exam with a score of 80 percent or better.

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

How to Use This Textbook

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

Learn and Respond ►

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



Objectives

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

Key Terms

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

OBJECTIVES

After reading this chapter, you should be able to:

- List four conditions that must be present for disease transmission to occur.
 - Identify two ways in which a pathogen can enter the body.
 - Describe how to minimize the risk of disease transmission when giving care in a situation that involves visible blood.
 - Describe the difference between consent and implied consent.
 - Describe the purpose of Good Samaritan laws.
 - List three situations in which moving a person is necessary.
 - List seven limitations you should be aware of before you attempt to move someone.
 - Describe five ways to move a person.
- After reading this chapter and completing the class activities, you should be able to:
- Demonstrate how to remove disposable latex-free gloves.

KEY TERMS

- Abandonment:** Ending the care of an injured or ill person without obtaining that person's consent or without ensuring that someone with equal or greater training will continue care.
- Consent:** Permission to receive emergency care granted by a competent adult either verbally or nonverbally.
- Direct contact transmission:** Mode of transmission of pathogens that occurs through directly touching infected blood or other potentially infectious materials (OPIM), or other agents such as chemicals, drugs or toxins.
- Disease transmission:** The passage of a disease from one person to another.
- Implied consent:** Legal concept that assumes a person would consent to receive emergency care if they were able or old enough to do so.
- Indirect contact transmission:** Mode of transmission of pathogens that occurs when a person touches objects that have the blood or other potentially infectious materials (OPIM) of an infected person, and that infected blood or OPIM enters the body through a correct entry site.
- OPIM:** Other potentially infectious materials such as body fluids (other than blood).
- Personal protective equipment (PPE):** The equipment and supplies that help prevent the responder from directly contacting infected materials; includes gloves, gowns, masks, shields and protective eyewear.
- Standard precautions:** Safety measures taken to prevent exposure to blood and OPIM when giving care to injured or ill persons; assumes that all body fluids, secretions and excretions (except sweat) are potentially infective.

Responding to Emergencies | 26 | Before Giving Care

Study Questions

- Match each term with the correct definition.
a. External bleeding c. Pressure bandage e. Arteries g. Tourniquet
b. Direct pressure d. Internal bleeding f. Veins
 - Using your gloved hand to apply pressure on the wound to control bleeding
 - Bleeding that can be seen coming from a wound
 - The escape of blood from an artery, vein or capillary inside the body
 - A tight band placed around an arm or leg to constrict blood vessels in order to stop blood flow to a wound
 - Blood vessels that carry blood from all parts of the body to the heart
 - Vessels that transport blood to the capillaries for distribution to the cells
 - A bandage applied snugly to maintain pressure on the wound to control bleeding
- List two signs and symptoms of severe, life-threatening external bleeding.
 - Describe how to control severe, life-threatening external bleeding.
 - List five signs and symptoms of severe internal bleeding.

Use the following scenario to answer question 5.

The usual Saturday morning baseball game is in progress. A few spectators are standing around on the sidelines. As Milo takes a swing at a curve ball, he loses his grip on the bat, which flies several feet, hitting Chris hard on the thigh. Chris drops to the ground, clutching his leg. The skin where the leg was struck immediately becomes red and begins to swell.

- What type of bleeding do you suspect Chris has?

For question 6, circle the letter of the correct answer.

- A child has a deep cut on their arm. The child's face is moist and very pale. What would you do first?
a. Have someone call 9-1-1 or the designated emergency number. b. Apply a hemostatic dressing to the wound. c. Place a cold pack on the affected arm. d. Apply pressure at the closest pressure point.

Answers are listed in the Appendix.

Responding to Emergencies | 149 | Bleeding

Study Questions

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

READY TO RESPOND? ▶

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

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

Ready to Respond?

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

What If...? ▶

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

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

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

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

While 30 compressions is the recommended amount, performing 28 chest compressions in one cycle and 32 chest compressions in another cycle is not going to hurt the person's chances of survival. Rather, what is important are the chest compression rate and depth, which, for an adult, should be between 100 and 120 compressions per minute and at least 2 inches deep, while minimizing any interruptions.

The EMS System

Emergency Medical Services Dispatcher

EMS call takers, also known as **emergency medical dispatchers (EMDs)**, work in emergency communications centers. When 911 is dialed, an EMD receives the call and quickly determines what help is needed and then dispatches the appropriate **emergency medical services (EMS) personnel**. EMS personnel include the four nationally recognized levels of training in **prehospital care**: emergency medical responders, emergency medical technicians and paramedics and advanced emergency medical technicians. An increasing number of dispatchers are trained EMDs and can provide instructions on how to help, including how to perform CPR, until EMS personnel arrive.

Emergency Medical Responder

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

Emergency Medical Technician

Emergency medical technicians (EMTs) have the next highest level of training. Their certification involves approximately 150 hours of training. EMTs take over the care from the responder who is initially at the emergency scene, and work on stabilizing and preparing the patient for transport.

Advanced Emergency Medical Technician

Advanced emergency medical technicians (AEMTs) receive more training than EMTs, which allows them to insert IVs, administer a limited number of lifesaving medications and perform some advanced airway procedures. This level of care used to be called **EMT-intermediate**.

Paramedic

Paramedics have more in-depth training than AEMTs and are considered allied health professionals. They also perform more invasive procedures than any other prehospital care provider. Some paramedics also give non-emergency community-based care as part of state and local community paramedicine and mobile integrated healthcare programs.



Sidebars

Feature articles called sidebars enhance the information presented in the main body of the textbook. They present historical and current information and events that relate to the content of the chapter.

Smart Moves Prevention Boxes ▶

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

SMART MOVES ▶ PREVENTING FOOD POISONING

By following the steps: Clean, Separate, Cook and Chill, you can reduce the likelihood of foodborne illnesses from occurring.

Clean

- Wash hands thoroughly (for 20 seconds) with soap and running water before and after preparing or handling food; between handling raw and cooked foods; and whenever handling food preparation surfaces, dishes and utensils.
- Wash all surfaces and utensils after each use.
- Wash fruits and vegetables, but not meat, poultry or eggs.

Separate

- Use separate cutting boards—one for produce and one for raw meat, poultry, seafood and eggs—as well as separate plates and utensils for cooked and raw foods.
- Keep meat, poultry, seafood and eggs separate from other food in your grocery cart, when bagging and later at home in the refrigerator.

Cook

- Use a food thermometer to make sure food is cooked to the proper temperature (see [www.foodsafety.gov](#) for more details). Clean the thermometer after each use.
- Follow microwave directions to cook food thoroughly (to 165° F or 74° C). If the instructions say to let food sit after microwaving, do so as it allows the food to cook more completely.

Chill

- Refrigerate perishable foods within 2 hours.
- Never thaw or marinate foods on the counter.
- Make sure your refrigerator and freezer are at 32° F (0° C) and at 0° F (-18° C) or below, respectively.
- Know when to throw food out.

SOURCE: [foodsafety.gov](#); [Keep food safe: Check your steps](#). <http://www.foodsafety.gov/keep/foodsafety/index.html>. Accessed December 2016.

Table 7-1. Special Situations: Choking in an Adult or Child

| Special Situation | Solution |
|--|---|
| <p>The person is too large for you to wrap your arms around to give abdominal thrusts.</p>  | <p>Give chest thrusts instead of abdominal thrusts. To give chest thrusts, position yourself behind the person as you would for abdominal thrusts. Place the thumb side of your fist against the center of the person's breastbone. Then cover your fist with your other hand and pull straight back, giving a quick inward thrust into the person's chest.</p> |
| <p>The person is obviously pregnant or known to be pregnant.</p>  | <p>Give chest thrusts instead of abdominal thrusts.</p> |
| <p>The person is in a wheelchair.</p>  | <p>Give abdominal thrusts in the same way that you would for a person who is standing. It may be necessary to kneel behind the wheelchair. If features of the wheelchair make it difficult to give abdominal thrusts, give chest thrusts instead.</p> |
| <p>You are alone and choking.</p>  | <p>Call 9-1-1 or the designated emergency number using a landline or a GPS-enabled mobile phone. Even if you are not able to speak, the open line will cause the dispatcher to send help. Give yourself abdominal thrusts, using your hands, just as if you were giving abdominal thrusts to another person. Alternatively, bend over and press your abdomen against any firm object, such as the back of a chair or a railing. Do not bend over anything with a sharp edge or corner that might hurt you, and be careful when leaning on a railing that is elevated.</p> |

◀ Tables

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

Skill Sheets ▶

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

Skill Sheet 8-2

Using a Commercial Tourniquet

Note: Always follow the manufacturer's instructions when applying a tourniquet.

1. Place the tourniquet around the limb, approximately 2 inches above the wound. Avoid placing the tourniquet over a joint.



2. Secure the tourniquet tightly in place according to the manufacturer's instructions.



3. Tighten the tourniquet by twisting the rod until the flow of bright red blood stops.



4. Secure the rod in place using the clip or holder.

5. Note and record the time that you applied the tourniquet and give this information to EMS personnel when they arrive.
 - Once you apply a tourniquet, do not loosen or remove it.



6

CARDIAC EMERGENCIES

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

Learn and Respond 



OBJECTIVES

After reading this chapter, you should be able to:

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

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

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

KEY TERMS

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

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

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

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

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

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

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

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

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

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

(Continued)

KEY TERMS continued

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

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

Ventricular tachycardia (V-tach): A life-threatening heart rhythm in which there is very rapid contraction of the ventricles (the lower chambers of the heart), causing the heart to pump blood ineffectively or not at all.

Introduction

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

Cardiovascular Disease

Cardiovascular disease is an abnormal condition that affects the heart and blood vessels. It is the number one killer in the United States and is a major cause of disability. Cardiovascular disease causes **coronary heart disease (CHD)**, also known as coronary artery disease. People with cardiovascular disease are likely also to have disease of other blood vessels, which can cause strokes. More information about stroke is included in Chapter 15.

CHD occurs when the **coronary arteries** that supply blood to the heart muscle harden and narrow in a process called **atherosclerosis**. The 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. This reduces the amount of blood that can flow through the arteries, and prevents the heart from getting the blood and oxygen it needs. If the heart does not get blood containing oxygen, it will not work properly. CHD accounts for about half of the cardiovascular-disease-related deaths in adult Americans each year. Because atherosclerosis develops gradually, it can remain undetected for many years. Most people with atherosclerosis are unaware they have it. Fortunately, atherosclerosis can be slowed or stopped by taking steps to reduce **risk factors** and adopting a healthy lifestyle.

Risk Factors for Coronary Heart Disease

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

The good news is that some risk factors for CHD can be reduced. Cigarette smoking, a poor diet, uncontrolled high blood cholesterol or high blood pressure, excessive weight and lack of regular exercise all increase the risk of heart disease. When individuals exhibit multiple risk factors, the risk of heart attack is much greater. Appropriate steps can be taken to control these risk factors—such as quitting smoking, eating healthier, exercising regularly and following the care prescribed by a healthcare provider—all to improve one's chances for living a long and healthy life.

Heart Attack

A **heart attack** occurs when blood flow to part of the heart muscle is blocked (e.g., as a result of coronary artery disease). Because the cells in the affected area of the heart muscle are not receiving the oxygen and nutrients they need, they die, causing permanent damage to the heart muscle (Figure 6-1). Seeking advanced medical care as soon as you recognize the signs and symptoms of a heart attack can minimize the damage to the heart and may save the person's life.

When a person is having a heart attack, every minute counts.

Signs and Symptoms of a Heart Attack

Signs and symptoms of a heart attack vary from person to person, and can be different in women than they are in men. Even people who have had a heart attack before may not experience the same signs and symptoms if they have a second heart attack. A person who is having a heart attack may show any of the following signs and symptoms:

- Chest pain, which can range from mild to unbearable. The person may complain of pressure, squeezing, tightness, aching or heaviness in the chest. The pain or discomfort is persistent, lasting longer than 3 to 5 minutes, or going away and then coming back. It is not relieved by resting, changing position or taking medication. It may be difficult to distinguish the pain of a heart attack from the pain of indigestion, heartburn or a muscle spasm.
- Discomfort or pain that spreads to one or both arms, the back, the shoulder, the neck, the jaw or the upper part of the stomach
- Dizziness or light-headedness
- Trouble breathing, including noisy breathing, shortness of breath or breathing that is faster than normal
- Nausea or vomiting
- Pale, ashen (gray) or slightly bluish skin, especially around the face and fingers
- Sweating
- A feeling of anxiety or impending doom
- Extreme fatigue (tiredness)
- Unresponsiveness

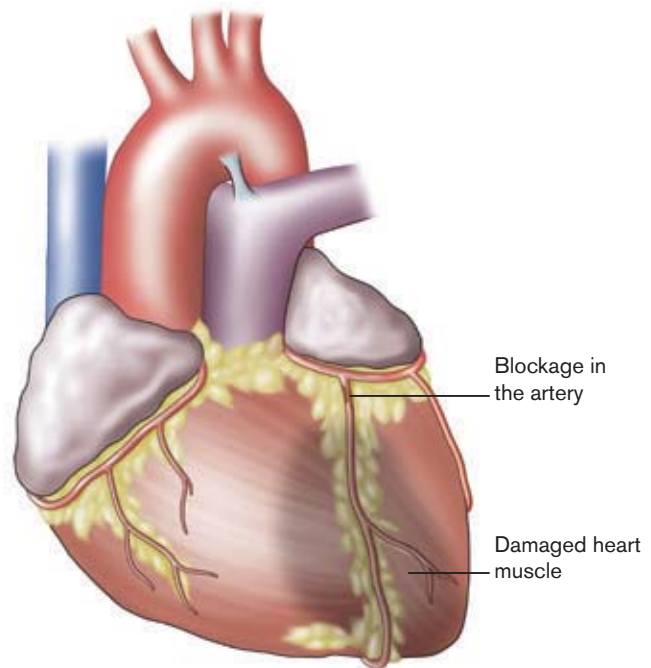


Figure 6-1. A heart attack occurs when blood flow to the heart is blocked.

Heart Attack

Although men often have the “classic” signs and symptoms of a heart attack, such as chest pain that radiates down one arm, women often have more subtle signs and symptoms or experience the signs and symptoms of a heart attack differently than men do (Figure 6-2). For example, in women, the “classic” signs and symptoms

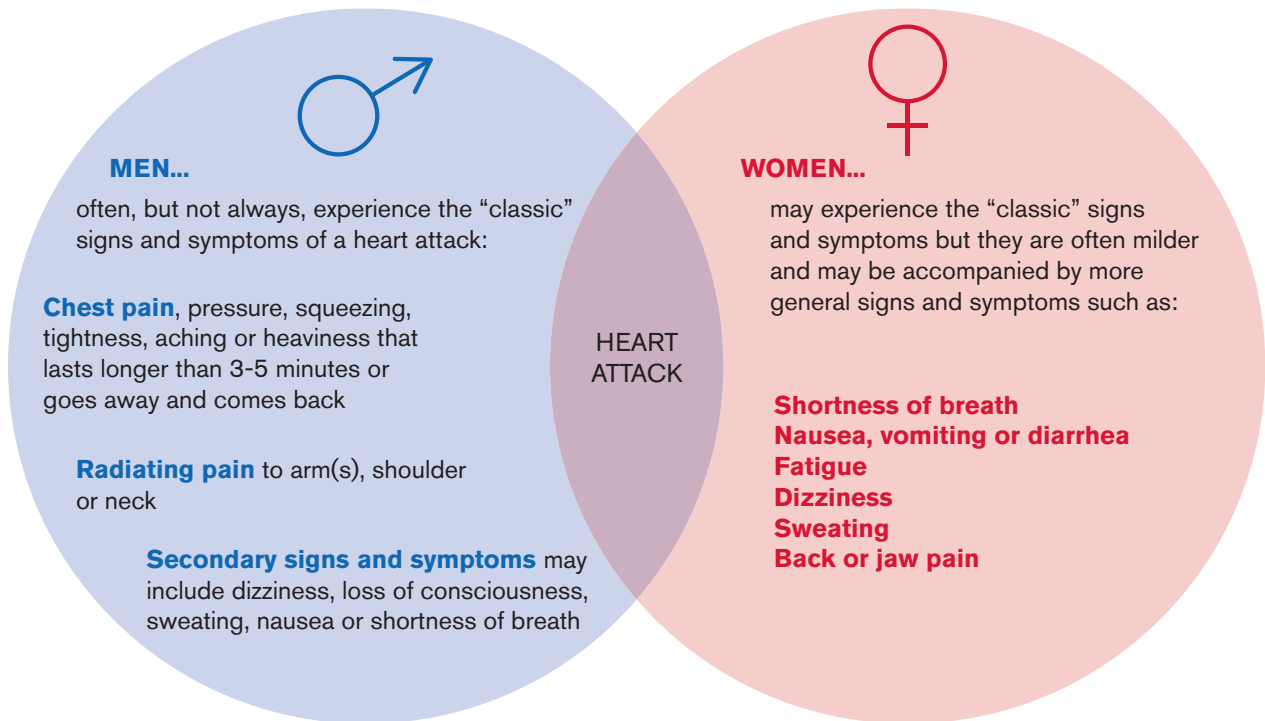


Figure 6-2. Men and women often experience heart attacks differently.

may be milder or accompanied by more general signs and symptoms such as shortness of breath, nausea or vomiting, extreme fatigue, and dizziness or light-headedness. Because these signs and symptoms are so general and nonspecific, women may experience them for hours, days or even weeks leading up to the heart attack but dismiss them as nothing out of the ordinary.

The signs and symptoms of a heart attack may also be more subtle in people with certain medical conditions such as diabetes.

First Aid Care for a Heart Attack

If you think that a person is having a heart attack, call 9-1-1 or the designated emergency number immediately. Trust your instincts. Many people who are having a heart attack delay seeking care because they hope they are experiencing signs and symptoms of a more minor condition that will go away with time, such as indigestion, heartburn, a muscle strain or the flu. People often worry about calling an ambulance and going to the emergency room for a “false alarm.” However, most people who die of a heart attack die within 2 hours of first experiencing signs or symptoms. Even when a heart attack is not fatal, early advanced medical care can help to minimize the damage to the heart. Always seek advanced medical care as soon as signs and symptoms of a heart attack are noted.

If you think that someone might be having a heart attack, you should:

- Call 9-1-1 or the designated emergency number immediately. Never try to drive a person who is experiencing signs and symptoms of a heart attack to the hospital yourself. EMS personnel can transport the person to the hospital safely while initiating care.
- Have the person stop what they are doing and rest in a comfortable position to reduce the heart’s need for oxygen. Many people experiencing a heart attack find it easier to breathe while sitting (Figure 6-3).
- Loosen any tight or uncomfortable clothing.
- Reassure the person. Anxiety increases the person’s discomfort.



Figure 6-3. Tell a person with signs and symptoms of a heart attack to stop and rest. Many people find breathing easier while sitting.

- If the person has a history of heart disease and takes a prescribed medication to relieve chest pain (e.g., nitroglycerin), offer to locate the medication and help the person to take it.
- If the person is responsive, able to chew and swallow, and allowed to have aspirin, you may offer two low-dose (81-mg) aspirin tablets or one 5-grain (325-mg) regular-strength aspirin tablet (Box 6-1).
- Closely monitor the person's condition until EMS personnel arrive and take over. Notice any changes in the person's appearance or behavior.
- If you are trained in giving CPR and using an automated external defibrillator (AED), be prepared to give CPR and use an AED if the person becomes unresponsive.

Angina Pectoris

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

A person who knows that they have a history of angina may tell you they have a prescribed medication, such as nitroglycerin, that will temporarily widen (i.e., vasodilate) the arteries and therefore help relieve the pain. **Nitroglycerin** is commonly prescribed as a small tablet that dissolves under the tongue or as an oral spray. Sometimes nitroglycerin patches or paste are placed on the chest and the medication is absorbed transdermally (i.e., through the skin) into the bloodstream. Once absorbed into the body, nitroglycerin dilates the blood vessels to make it easier for blood to reach heart muscle tissue, thus relieving the chest pain.

Box 6-1. Aspirin for a Heart Attack

You may be able to help a person who is showing early signs and symptoms of a heart attack by offering the person an appropriate dose of aspirin. Aspirin can help to prevent blood clotting and is most effective when given soon after the onset of signs and symptoms of a heart attack. However, you should never delay calling 9-1-1 or the designated emergency number to find or offer aspirin.

Before offering aspirin, make sure the person is responsive, able to chew and swallow, and allowed to have aspirin. Ask the person:

- Are you allergic to aspirin?
- Do you have a stomach ulcer or stomach disease?
- Are you taking any blood thinners, such as warfarin (Coumadin™)?
- Have you ever been told by a healthcare provider to avoid taking aspirin?

If the person answers “no” to each of these questions, you may offer the person two low-dose (81-mg) aspirin tablets or one 5-grain (325-mg) regular-strength aspirin tablet. Have the person chew the aspirin completely. Chewing the aspirin speeds its absorption into the bloodstream. Do not offer the person an aspirin-containing combination product meant to relieve multiple conditions, or another type of pain medication, such as acetaminophen (Tylenol®), ibuprofen (Motrin®, Advil®) or naproxen (Aleve®). These medications do not work the same way aspirin does and are not beneficial for a person who is experiencing a heart attack.



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

Cardiac Arrest

Cardiac arrest is not the same as a heart attack. Remember, a heart attack occurs when blood flow to part of the heart muscle is blocked, causing part of the heart muscle to die. **Cardiac arrest**, on the other hand, occurs when the heart stops beating or beats too ineffectively to circulate blood to the brain and other vital organs. A network of special cells in the heart muscle conducts electrical impulses that coordinate contraction, causing the heart to beat rhythmically. In cardiac arrest, the electrical impulses become abnormal and chaotic or may even become absent. This causes the heart to lose the ability to beat rhythmically, or to stop beating altogether (Figure 6-4).

Cardiovascular disease and certain congenital heart conditions (conditions that a person is born with) can increase a person's risk for cardiac arrest. Breathing emergencies, such as choking or drowning, can also lead to cardiac arrest because if the body's supply of oxygen is interrupted, the heart soon stops beating. Every organ in

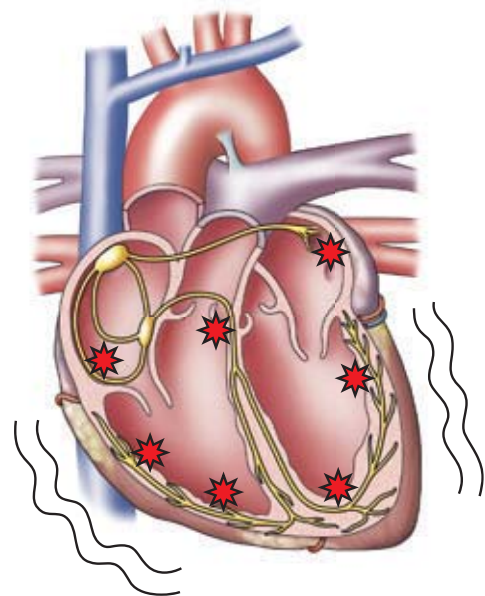


Figure 6-4. Cardiac arrest occurs when the electrical impulses that control the heartbeat become abnormal and chaotic or even absent.

the body needs a steady supply of oxygen in order to work properly, and the heart is no exception. Severe trauma, electric shock and drug overdose are other potential causes of cardiac arrest. Although cardiac arrest is more common in adults, it does occur in young people as well. The most common causes of cardiac arrest in children and infants are breathing emergencies, congenital heart disorders and trauma.

When the heart stops beating properly, the body cannot survive for long. Breathing will soon stop, 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 (Figure 6-5). Death occurs within a matter of minutes if the person does not receive immediate care.

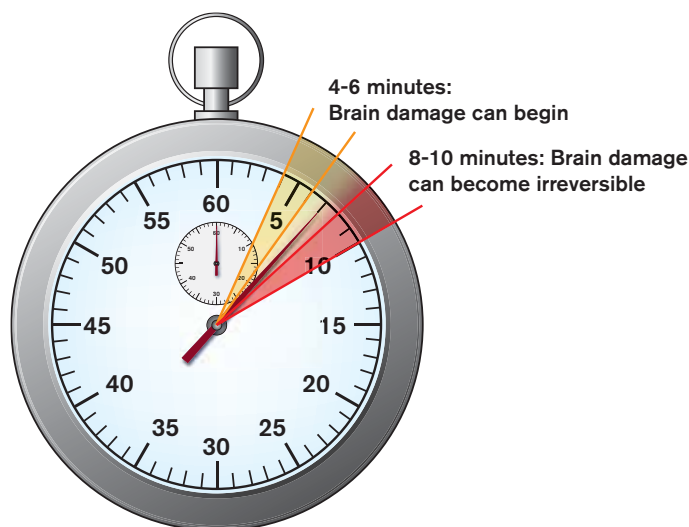


Figure 6-5. Every minute counts in cardiac arrest.

Signs and Symptoms of Cardiac Arrest

When a person experiences cardiac arrest, you may see the person suddenly collapse. When you check the person, you will find that the person is not responsive and not breathing, or only gasping. (In an unresponsive person, isolated or infrequent gasping in the absence of normal breathing may be **agonal breaths**, which can occur even after the heart has stopped beating. Agonal breaths are not breathing and are a sign of cardiac arrest.) The person has no heartbeat.

Cardiac arrest can happen suddenly and without any warning signs. When this occurs, the person is said to have experienced **sudden cardiac arrest**. People who have a history of cardiovascular disease or a congenital heart disorder are at higher risk for sudden cardiac arrest. However, sudden cardiac arrest can happen in people who appear healthy and have no known heart disease or other risk factors for the condition. A person who experiences sudden cardiac arrest is at very high risk for dying and needs immediate care.

First Aid Care for Cardiac Arrest

When a person experiences cardiac arrest, quick action on the part of those who witness the arrest is crucial and gives the person the greatest chance for survival. The **Cardiac Chain of Survival** describes five actions that, when performed in rapid succession, increase the person's likelihood of surviving cardiac arrest (Box 6-2). In the Cardiac Chain of Survival, each link of the chain depends on, and is connected to, the other links.

Four out of every five cardiac arrests in the United States occur outside of the hospital. That means trained lay responders like you are often responsible for initiating the Cardiac Chain of Survival. When you complete the first three links in the Cardiac Chain of Survival—recognizing cardiac arrest and activating the EMS system, immediately beginning CPR and using an AED as soon as possible—you give the person the best chance for surviving the incident.

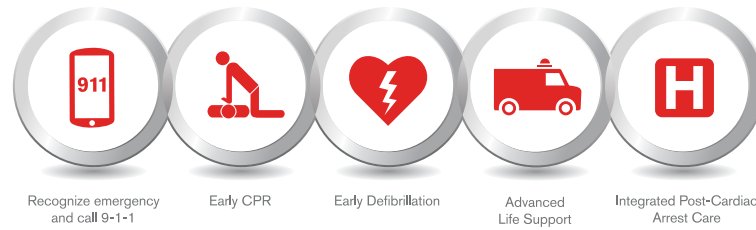
For each minute that CPR and use of an AED are delayed, the person's chance for survival is reduced by about 10 percent.

If you think that a person is in cardiac arrest:

- Have someone call 9-1-1 or the designated emergency number immediately.
- Begin CPR immediately.
- Use an AED as soon as possible.

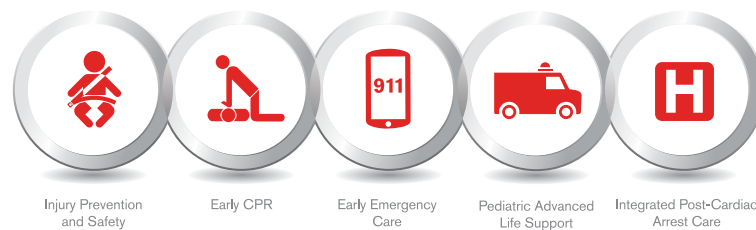
Box 6-2. The Cardiac Chain of Survival

Adult Cardiac Chain of Survival



- **Recognition of cardiac arrest and activation of the emergency medical services (EMS) system.** The sooner someone recognizes that a person is in cardiac arrest and calls 9-1-1 or the designated emergency number, the sooner people capable of providing advanced life support will arrive on the scene.
- **Early CPR.** CPR circulates oxygen-containing blood to the brain and other vital organs, helping to prevent brain damage and death.
- **Early defibrillation.** Defibrillation (delivery of an electrical shock using an AED) may restore an effective heart rhythm, significantly increasing the person's chances for survival.
- **Early advanced life support.** Provided by EMS personnel at the scene and en route to the hospital, early advanced life support gives the person access to emergency medical care delivered by trained professionals.
- **Integrated post-cardiac arrest care.** After the person is resuscitated, an interdisciplinary team of medical professionals works to stabilize the person's medical condition, minimize complications, and diagnose and treat the underlying cause of the cardiac arrest to improve survival outcomes.

Pediatric Cardiac Chain of Survival



- **Prevention.** Because cardiac arrest in children often occurs as the result of a preventable injury (such as trauma, drowning, choking or electrocution), the Pediatric Cardiac Chain of Survival has "prevention" as the first link.
- **Early CPR.** CPR circulates oxygen-containing blood to the brain and other vital organs, helping to prevent brain damage and death.
- **Activation of the emergency medical services (EMS) system.** The sooner someone recognizes that a person is in cardiac arrest and calls 9-1-1 or the designated emergency number, the sooner people capable of providing advanced life support will arrive on the scene.
- **Early advanced life support.** Provided by EMS personnel at the scene and en route to the hospital, early advanced life support gives the person access to emergency medical care delivered by trained professionals.
- **Integrated post-cardiac arrest care.** After the person is resuscitated, an interdisciplinary team of medical professionals works to stabilize the person's medical condition, minimize complications, and diagnose and treat the underlying cause of the cardiac arrest to improve survival outcomes.

CPR

CPR, or **cardiopulmonary resuscitation**, is a skill that is used when a person is in cardiac arrest to keep oxygenated blood moving to the brain and other vital organs until advanced medical help arrives (Figure 6-6). CPR involves giving sets of 30 chest compressions followed by sets of 2 rescue breaths. When you give compressions, you press down on the person's chest. This squeezes (compresses) the heart between the breastbone (sternum) and spine, moving blood out of the heart and to the brain and other vital organs. After each compression, you must let the chest return to its normal position. This allows blood to flow back into the heart. The rescue breaths you give after each set of 30 compressions deliver a fresh supply of oxygen into the person's lungs. When you give CPR, you help to keep oxygenated blood moving throughout the body, which can buy the person some time until advanced medical help arrives.



Figure 6-6. CPR keeps oxygen-containing blood circulating to the brain and other vital organs.

Although full CPR (compressions and rescue breaths) is preferred, if you are unable or unwilling for any reason to give full CPR, you can give **compression-only CPR** instead. In compression-only CPR, you give continuous chest compressions, with no rescue breaths. After checking the scene and the person and calling 9-1-1 or the designated emergency number, give chest compressions without stopping until another trained responder or EMS personnel take over or you notice an obvious sign of life.

Many lay responders worry about hurting the person (for example, by breaking the person's ribs or breastbone) while giving CPR, but a person who is in need of CPR is clinically dead (i.e., the person has no heartbeat and is not breathing). It is very unlikely that you will injure the person while giving CPR, but even if you do, consider this: any injury you may cause is secondary when compared with the person's current circumstances, and the injury will heal with medical care and time. Remember: the worst thing to do is nothing!

AED

While CPR can help to prevent brain damage and death by keeping oxygenated blood moving throughout the body, an AED can correct the underlying problem for some people who go into sudden cardiac arrest. Two abnormal heart rhythms in particular, **ventricular fibrillation (V-fib)** and **ventricular tachycardia (V-tach)**, can lead to sudden cardiac arrest. Both abnormal rhythms impair the heart's ability to pump and circulate blood throughout the body and are life threatening (for more information, see When the Heart Fails later in this chapter). However, in many cases, V-fib and V-tach can be corrected by an electrical shock delivered by an AED. This shock disrupts the heart's electrical activity long enough to allow the heart to spontaneously develop an effective rhythm on its own. Starting CPR immediately and using an AED as soon as possible gives the person the best chance for surviving cardiac arrest (Figure 6-7).



Figure 6-7. Immediately beginning CPR and using an AED as soon as possible gives the person the best chance for survival.

Caring for Cardiac Arrest

If you check a person and find that they are unresponsive and not breathing or only gasping, begin CPR immediately, starting with chest compressions. Proper technique is important. Skill sheets 6-1, 6-2 and 6-3 describe step by step how to give CPR to an adult, child and infant, respectively. Table 6-1 summarizes the key differences in giving CPR to an adult, child or infant. See also Smart Moves: Improving CPR Techniques.

Giving CPR to an Adult

First, make sure the person is lying face-up on a firm, flat surface. For example, if the person is on a soft surface like a sofa or bed, quickly move them to the floor before you begin. Kneel beside the person.

- **Position your hands.** Place the heel of one hand in the center of the person's chest on the person's breastbone (sternum). If you feel the notch at the end of the breastbone, move your hand slightly toward the person's head. Place your other hand on top of your first hand and interlace your fingers or hold them up so that your fingers are not on the person's chest. If you have arthritis in your hands, you can grasp the wrist of the hand positioned on the chest with your other hand instead. The person's clothing should not interfere with finding the proper hand position or your ability to give effective compressions. If it does, loosen or remove enough clothing to allow deep compressions in the center of the person's chest.
- **Give a set of 30 compressions.** Position your body so that your shoulders are directly over your hands. This will let you push on the chest using a straight down-and-up motion, which moves the most blood with each push and is also less tiring. Keeping



Table 6-1. **Comparison of CPR Technique in Adults, Children and Infants**



Adult

About age 12 years or older



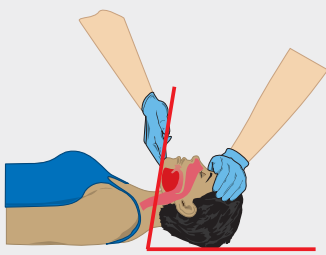
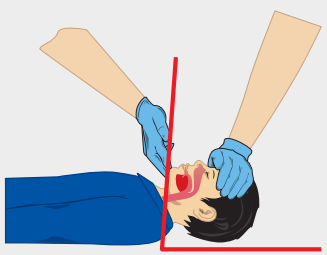
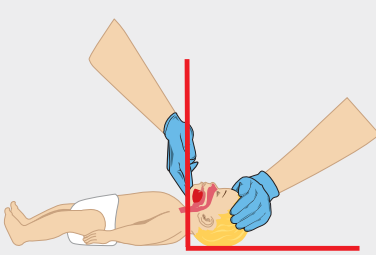
Child

Between the ages of 1 and 12 years



Infant

Younger than 1 year

| Hand Position | | |
|--|---|---|
| Two hands in center of chest | Two hands in center of chest | Two fingers on center of chest, just below the nipple line |
| Chest Compressions | | |
| Compress at least 2 inches Rate: 100 to 120 compressions/minute | Compress about 2 inches Rate: 100 to 120 compressions/minute | Compress about 1½ inches Rate: 100 to 120 compressions/minute |
| Rescue Breaths | | |
| Tilt head to past-neutral position ; pinch nose shut and form seal over mouth | Tilt head to slightly past-neutral position ; pinch nose shut and form seal over mouth | Tilt head to neutral position ; form seal over mouth and nose |
|  |  |  |
| Sets | | |
| 30 chest compressions and 2 rescue breaths | 30 chest compressions and 2 rescue breaths | 30 chest compressions and 2 rescue breaths |

your arms straight, push down at least 2 inches, and then let the chest completely return to its normal position. Push hard and push fast! You want to go at a rate of between 100 and 120 compressions per minute. As you give compressions, count out loud up to 30. Maintain a smooth, steady down-and-up rhythm and do not pause between compressions.

- **Give a set of 2 rescue breaths.** Once you have given 30 compressions, give 2 rescue breaths. First, open the airway using the **head-tilt/chin-lift maneuver**. Place one of your hands on the person's forehead and two fingers of your other hand on the bony part of the person's chin. Tilt the person's head back and lift the chin. For an adult, tilt the head to a past-neutral position (see Table 6-1). If possible, use a CPR breathing barrier when you are giving rescue breaths, but do not delay rescue breaths to find a breathing barrier or learn how to use it. Pinch the person's nose shut. Take a normal breath, make a complete seal over the person's mouth with your mouth, and blow into the person's mouth to give the first rescue breath. Take another breath, make a seal and give the second rescue breath. Each rescue breath should last about 1 second and make the person's chest rise. After you finish giving 2 rescue breaths, return to giving compressions as quickly as possible. The process of giving 2 rescue breaths and getting back to compressions should take less than 10 seconds. Never give more than 2 rescue breaths per set. Table 6-2 describes how to troubleshoot special situations when giving rescue breaths.



Once you begin CPR, continue giving sets of 30 chest compressions and 2 rescue breaths until:

- You notice an obvious sign of life, such as movement. (If the person shows an obvious sign of life, stop CPR, place the person in the recovery position and continue to monitor the person's condition until EMS personnel take over.)
- An AED is ready to use and no other trained responders are available to assist you with the AED.




SMART MOVES > IMPROVING CPR TECHNIQUES

Counting out loud as you give compressions can help you to keep a steady, even rhythm. For compressions 1 through 12, say "1 and 2 and 3 and 4 and 5 and 6 and..." up to 12. When you get to 13, just say the number: "13, 14, 15, 16..." up to 30. Push down as you say the number and come up as you say "and" (or the second syllable of the number). This will help you to keep a steady, even rhythm.

Incorrect technique or body position can cause your arms and shoulders to tire quickly when you are giving compressions. Use the weight of your upper body, not your arm muscles, to compress the chest. Avoid rocking back and forth, because rocking makes your compressions less effective and wastes your energy. Also avoid leaning on the chest, because leaning prevents the chest from returning to its normal position after each compression, limiting the amount of blood that can return to the heart.

When giving rescue breaths, keep the person's head tilted back and avoid taking too large of a breath or blowing too forcefully. Failing to keep the person's head tilted back, taking too large of a breath or blowing too forcefully can force air into the person's stomach instead of into their lungs, which can make the person vomit and cause other complications. Remember: Keep the head tilted back, take a normal breath and blow just enough to make the chest rise.

Table 6-2. **Special Situations: Rescue Breathing**

| Special Situation | Solution |
|---|--|
| <p>The breaths do not make the chest rise.</p>  | <p>Never give more than 2 rescue breaths per set. If the first rescue breath does not cause the chest to rise, retilt the head to ensure that the airway is properly opened and ensure that the person's nose and mouth are properly sealed before giving the second rescue breath. If the second breath does not make the chest rise, an object may be blocking the person's airway. Give CPR with one modification: after each set of compressions and before giving rescue breaths, open the mouth, look for an object in the person's mouth and, if you see it, remove it.</p> |
| <p>The person vomits or there is fluid in the mouth.</p>  | <p>Roll the person onto their side and clear the mouth of fluid using a gloved finger or a piece of gauze. Then roll the person onto their back and resume giving care.</p> |
| <p>You are unable to form a tight seal over the person's mouth (e.g., due to an injury).</p>  | <p>Use mouth-to-nose breathing instead. With the person's head tilted back, close the person's mouth by pushing on the person's chin. Make a complete seal over the person's nose with your mouth and blow in for 1 second to make the chest rise.</p> |

(Continued)

Table 6-2. continued

| Special Situation | Solution |
|---|---|
| <p>The person has a tracheostomy or “stoma,” a surgically created opening in the front of the neck that opens into the trachea (windpipe) to form an alternate route for breathing when the upper airway is blocked or damaged.</p> | <p>Use mouth-to-stoma breathing instead. Expose the person’s neck down to the breastbone and remove anything covering the stoma (e.g., a filter or stoma cover). Wipe away any secretions from the stoma. Make a complete seal over the person’s stoma or tracheostomy tube with your mouth and blow in for 1 second to make the chest rise.</p> <ul style="list-style-type: none"> ■ If the chest does not rise, the tracheostomy tube may be blocked. Remove the inner tube and try rescue breaths again. ■ If you hear or feel air escaping from the person’s mouth or nose, the person is a partial neck breather (i.e., there is still a connection between the trachea and the upper airway, and although the person breathes mainly through the stoma, they are also able to breathe to some extent through the mouth and nose). Seal the person’s mouth and nose with your hand or a tight-fitting mask so that air does not escape out of the mouth or nose when you give rescue breaths into the stoma. |

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

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

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

While 30 compressions is the recommended amount, performing 28 chest compressions in one cycle and 32 chest compressions in another cycle is not going to hurt the person’s chances of survival. Rather, what is important are the chest compression rate and depth, which, for an adult, should be between 100 and 120 compressions per minute and at least 2 inches deep, while minimizing any interruptions.

Giving CPR to a Child

Giving CPR to a child is very similar to giving CPR to an adult. However, in a child, you open the airway by tilting the head to a slightly past-neutral position, rather than to a past-neutral position (see Table 6-1). Rather than compressing the chest to a depth of *at least* 2 inches as you would for an adult, you compress the chest to a depth of *about* 2 inches for a child. Also, for a small child you may only need to give compressions with one hand, instead of two. The rate of chest compressions for a child is the same as it is for an adult—between 100 and 120 compressions per minute.

Giving CPR to an Infant

The general principles of giving CPR to an infant are the same as they are for children and adults. However, because the infant's body is smaller, you will position your hands differently to deliver compressions. Place the pads of two fingers on the center of the infant's chest, just below the nipple line. If you feel the notch at the end of the infant's breastbone, move your fingers slightly toward the infant's head. Place your other hand on the infant's forehead. Give compressions by using the pads of your fingers to compress the chest about 1½ inches at the same rate as you would for an adult or a child—between 100 and 120 compressions per minute.

When you give rescue breaths, open the airway by tilting the head to a neutral position (see Table 6-1). Instead of pinching the nose shut and covering the mouth with your mouth, cover the infant's nose and mouth with your mouth to form a seal.

When to Stop CPR

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

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

If at any time the adult, child or infant begins to breathe normally or show another sign of life, stop CPR, place the person in the recovery position (see Chapter 5) and closely monitor breathing and any changes in the person's condition until EMS personnel take over.

The Heart's Electrical System

The heart's electrical system controls its pumping action. In normal conditions, specialized cells of the heart initiate and transmit electrical impulses. These cells make up the conduction system. Electrical impulses travel through the upper chambers of the heart, called the atria, to the lower chambers of the heart, called the ventricles (Figure 6-8).

The normal point of origin of the electrical impulse is the sinoatrial (SA) node above the atria. This impulse travels to a point midway between the atria and ventricles called the atrioventricular (AV) node. The pathway divides after the AV node into two branches, the right and left ventricles. These right and left branches become a network of fibers, called Purkinje fibers, which spread electrical impulses across the heart. Under normal conditions, this impulse reaches the muscular walls of the ventricles and causes the ventricles to contract.

This contraction forces blood out of the heart to circulate through the body. The contraction of the left ventricle results in a pulse. The pauses between the pulse beats are the periods between contractions. When the heart muscles relax, blood refills the chambers.

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

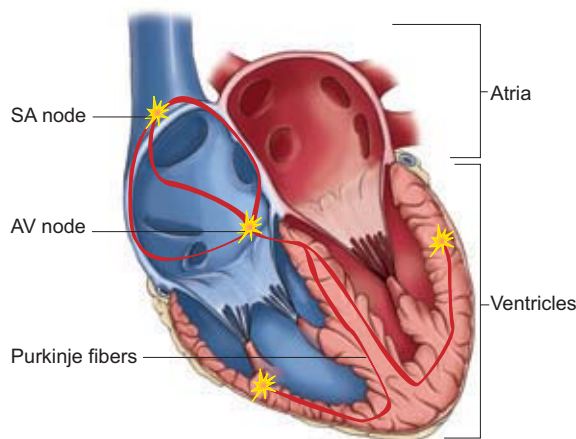


Figure 6-8. The heart's electrical system.

When the Heart Fails

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

V-fib is a state of totally disorganized electrical activity in the heart. It results in fibrillation, or quivering, of the ventricles. In V-fib, the electrical impulses fire at random, creating chaos and preventing the heart from pumping and circulating blood. A person with V-fib will suddenly collapse and stop breathing normally (occasional gasping breaths, or agonal breathing, may be observed for a period of time, but these gasps are not normal breathing).

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

Defibrillation

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

The Amazing Heart

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

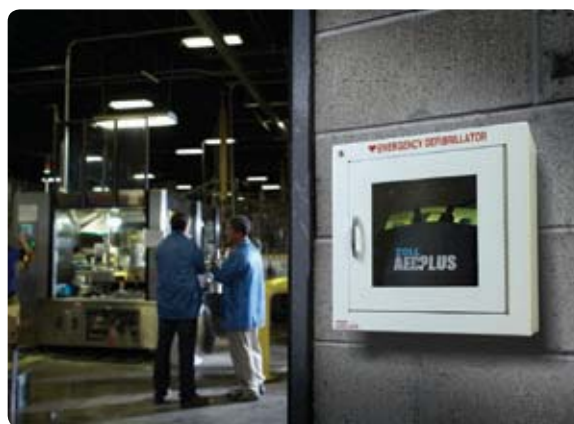
What if... *I accidentally deliver an unnecessary shock while using an AED?*

An AED is designed to allow the responder to deliver a shock only when the AED has detected the presence of a life-threatening arrhythmia (e.g., V-fib or V-tach). If the device does not detect a shockable rhythm, it will instruct you to perform CPR.

Using an AED

Different types of AEDs are available, but all are similar to operate and use visual displays, voice prompts or both to guide the responder. If your place of employment has an AED on site, know where it is located, how to operate it and how to maintain it (Box 6-3). Also take note of the location of AEDs in public places that you frequent, such as shopping centers, airports, recreation centers and sports arenas.

When a person is in cardiac arrest, use an AED as soon as possible. Skill Sheet 6-4 describes how to use an AED step by step. Environmental and person-specific considerations for safe and effective AED use are given in Box 6-4.



Box 6-3. AED Maintenance

AEDs require minimal maintenance, but it is important to check them regularly according to the manufacturer's instructions or your employer's policy to ensure that they are in good working order and ready for use whenever they are needed.

- Familiarize yourself with the owner's manual and follow the manufacturer's instructions for maintaining the equipment.
- Familiarize yourself with the method the AED uses to indicate the status of the device. Many AEDs have a status indicator that displays a symbol or illuminates to indicate that the AED is in proper working order and ready to respond. The status indicator may also display symbols indicating that routine maintenance (e.g., a battery change) is needed or that a problem with the device has been detected. Some AEDs have a warning indicator that will illuminate or beep if the AED is not in proper working order and ready to respond.
- Check to make sure the battery is properly installed and within its expiration date.
- Make sure AED pads are adequately stocked, stored in a sealed package and within their expiration date.



- After using the AED, make sure that all supplies are restocked and that the device is in proper working order.
- If at any time the AED fails to work properly or warning indicators illuminate, take the AED out of service and contact the manufacturer or the appropriate person at your place of employment, according to your employer's policy. You may need to return the AED to the manufacturer for service. If the AED stops working during an emergency, continue giving CPR until EMS personnel take over.

Box 6-4. Considerations for Safe and Effective AED Use

Environmental Considerations

- **Flammable or combustible materials.** Do not use an AED around flammable or combustible materials, such as gasoline or free-flowing oxygen.
- **Metal surfaces.** It is safe to use an AED when the person is lying on a metal surface, as long as appropriate precautions are taken. Do not allow the AED pads to contact the metal surface, and ensure that no one is touching the person when the shock is delivered.
- **Water.** If the person is in water, remove them from the water before using the AED. Once you have removed the person from the water, be sure there are no puddles of water around you, the person or the AED.
- **Inclement weather.** It is safe to use AEDs in all weather conditions, including rain and snow. Provide a dry environment if possible (for example, by sheltering the person with umbrellas), but do not delay defibrillation to do so. Remove wet clothing and wipe the person's chest dry before placing the AED pads. Avoid getting the AED or AED pads wet.

(Continued)

Box 6-4. continued

Person-Specific Considerations

- **Pregnancy.** It is safe to use an AED on a woman who is pregnant.
- **Pacemakers and implantable cardioverter-defibrillators (ICDs).** A person who has a known arrhythmia (irregular heartbeat) may have a pacemaker or an ICD. These are small devices that are surgically implanted under the skin to automatically prevent or correct an irregular heartbeat. You may be able to see or feel the outline of the pacemaker or ICD in the area below the person's collarbone, or the person may wear a medical identification tag indicating that they have a pacemaker or ICD. If the implanted device is visible or you know that the person has a pacemaker or ICD, adjust pad placement as necessary to avoid placing the AED pads directly over the device because doing so may interfere with the delivery of the shock. However, if you are not sure whether the person has an implanted device, place the pads as you normally would.
- **Transdermal medication patches.** Some types of medications, including nitroglycerin (used to relieve chest pain caused by cardiovascular disease) and smoking-cessation medications, are delivered through patches applied to the skin. Remove any medication patches that you see before applying AED pads and using an AED. Wear disposable latex-free gloves to prevent absorption of the drug through your own skin.
- **Chest hair.** Time is critical in a cardiac arrest situation, and chest hair rarely interferes with pad adhesion, so in most cases you should proceed as you normally would—attach the AED pads, pressing firmly to attach them. However, if the person has a great deal of thick chest hair and it seems like the chest hair could interfere with pad-to-skin contact, quickly shave the areas where the pads will be placed and then attach the pads.
- **Jewelry and body piercings.** You do not need to remove the person's jewelry or body piercings before using an AED, but you should avoid placing the AED pads directly over any metallic jewelry or piercings. Adjust pad placement if necessary.

Using an AED on an Adult

To use an AED, first turn the device on. Remove or cut away clothing and undergarments to expose the person's chest. If the person's chest is wet, dry it using a towel or gauze pad. Dry skin helps the AED pads to stick properly. Do not use an alcohol wipe to dry the skin because alcohol is flammable. Next, apply the AED pads. Peel the backing off the pads as directed, one at a time, to expose the adhesive. Place one pad on the upper right side of the person's chest and the other pad on the lower left side of the person's chest below the armpit, pressing firmly to adhere (Figure 6-9). Plug the connector cable into the AED (if necessary) and follow the device's directions. Most AEDs will begin to analyze the heart rhythm automatically, but some may require you to push an "analyze" button to start this process. No one should touch the person while the AED is analyzing the heart rhythm because this could result in a faulty reading.

Next, the AED will tell you to push the "shock" button if a shock is advised. Again, avoid touching the person, because anyone who is touching the person while the device is delivering a

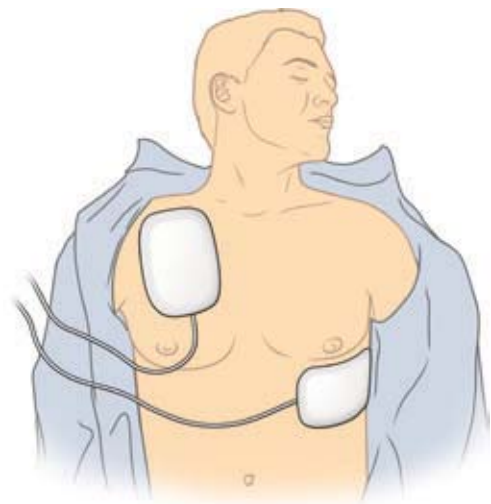


Figure 6-9. Place one AED pad on the upper right side of the chest and the other on the lower left side of the chest, below the armpit.

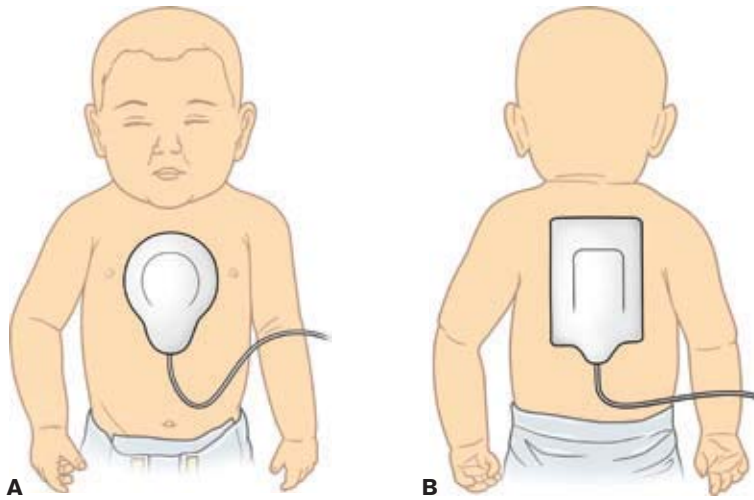


Figure 6-10, A–B. If the person is too small to place both AED pads on the front of the chest without the pads touching, place one on the middle of the chest, **A**, and the other on the back between the shoulder blades, **B**.

shock is at risk for receiving a shock as well. After a shock is delivered (or if the AED determines that no shock is necessary), immediately resume CPR, starting with compressions. The AED will continue to check the heart rhythm every 2 minutes. Listen for prompts from the AED and continue giving CPR and using the AED until you notice an obvious sign of life or EMS personnel arrive. If you notice an obvious sign of life, stop CPR but leave the AED turned on and the pads in place on the person's chest, and continue to follow the AED's prompts.

Using an AED on a Child or Infant

The procedure for using an AED on a child or infant is the same as the procedure for using an AED on an adult. Some AEDs come with pediatric AED pads that are smaller and designed specifically to analyze a child's heart rhythm and deliver a lower level of energy. These pads should be used on children up to 8 years of age or weighing less than 55 pounds. Other AEDs have a key or switch that configures the AED for use on a child up to 8 years of age or weighing less than 55 pounds. If pediatric AED pads are not available or the AED does not have a pediatric setting, it is safe to use adult AED pads and adult levels of energy on a child or infant. (Note that the opposite is not true—you should not use pediatric AED pads or the pediatric setting on an adult because the shock delivered will not be sufficient if the person is older than 8 years of age or weighs more than 55 pounds.)

Just as when you are using an AED on an adult, apply the AED pads to the child's bare, dry chest, placing one pad on the upper right chest and the other pad on the lower left side of the chest below the armpit. If you cannot position the pads this way without them touching (as in the case of an infant or a small child), position one pad in the middle of the chest and the other pad on the back between the shoulder blades (Figure 6-10, A–B). Then follow the standard procedure for using an AED.

Working as a Team

Remember, when you are giving CPR, you want to give high-quality compressions at the appropriate depth and rate. You also want to minimize interruptions to chest compressions. If you are the only trained responder at the scene, you will begin to tire as you give CPR, and the quality of your compressions will diminish. You will also need to stop CPR to ready the AED for use when it arrives, which means that during that time, there is no oxygenated blood moving through the person's body.

Working as a team can lead to a better chance of survival for the person in cardiac arrest, by reducing responder fatigue and minimizing interruptions to chest compressions. Trained responders can share the responsibility for giving compressions, switching off every 2 minutes, which reduces fatigue and leads to better-quality compressions. Having two or more trained responders at the scene also minimizes interruptions to chest compressions when the AED arrives.



Figure 6-11. Working as a team can lead to a better chance of survival for the person in cardiac arrest.

When two or more responders trained in CPR and using an AED are at the scene, all should identify themselves as being trained. The first responder should begin CPR while the second responder calls 9-1-1 or the designated emergency number, obtains the AED and readies the AED for use by turning the device on, applying the pads to the person's chest and plugging in the connector cable, if necessary (Figure 6-11). The first responder should not pause CPR until the device is ready to analyze the person's heart rhythm and the second responder tells everyone to stand clear. While the AED is analyzing, the responders should switch roles so that the second responder can take over giving chest compressions. The responder who is taking over compressions should hover with their hands positioned just above the person's chest so that they can immediately start compressions as soon as the AED prompts that a shock was delivered or that no shock was advised. The responders then switch roles every time the AED analyzes the person's heart rhythm, which occurs every 2 minutes.

Summary

Cardiac emergencies present a major health threat to our communities. Heart attack and cardiac arrest are the two common cardiac emergencies. Learning to recognize the signs and symptoms of a heart attack and responding immediately can reduce the risk of complications and help prevent cardiac arrest. If a person experiences cardiac arrest, the greatest chance of survival occurs when the Cardiac Chain of Survival happens as rapidly as possible. By learning to recognize the signs and symptoms of cardiac emergencies and how to give care, you can make a difference.

READY TO RESPOND? >

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

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

Study Questions

1. Match each term with the correct definition.

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

- ___ A fatty substance that contributes to the risk for heart disease
- ___ Temporary chest pain caused by a lack of oxygen to the heart
- ___ Blood vessels that supply the heart with oxygen-rich blood
- ___ A combination of chest compressions and rescue breaths
- ___ Condition that results when the heart stops beating or beats too irregularly or weakly to circulate blood
- ___ A sudden illness involving the death of heart muscle tissue caused when it does not receive oxygen-rich blood

2. Identify the signs and symptoms of cardiac arrest.

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

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

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

5. Which is the most common sign or symptom of a heart attack?

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

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

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

(Continued)

Study Questions *continued*

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

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

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

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

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

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

10. When is CPR needed for an adult?

- a. When the person is responsive
- b. For every person having a heart attack
- c. When the person is unresponsive and not breathing normally
- d. When the person who is having a heart attack becomes unresponsive but is breathing normally

11. Which is the purpose of CPR?

- a. To keep a person's airway open
- b. To identify any immediate threats to life
- c. To supply the vital organs with blood containing oxygen
- d. To reverse the effects of a heart attack

12. CPR artificially takes over the functions of which two body systems?

- a. Nervous and respiratory systems
- b. Respiratory and circulatory systems
- c. Circulatory and nervous systems
- d. Circulatory and musculoskeletal systems

Use the following scenario to answer questions 13 and 14.

It is Saturday afternoon. You and your mother are at home watching a tennis match on television. At the commercial break, your mother mumbles something about indigestion and heads to the medicine cabinet to get an antacid. Twenty minutes later, you notice that your mom does not respond to a great play made by her favorite player. You ask what is wrong, and she complains that the antacid has not worked. She states that her chest and shoulder hurt. She is sweating heavily. You notice that she is breathing fast and she looks ill.

(Continued)

Study Questions *continued*

13. List the signs and symptoms of a heart attack that you find in this scenario.

14. Your mother suddenly becomes unresponsive. Number in order the following actions you would now take.

- ___ Ensure she is on a firm, flat surface.
- ___ Call 9-1-1 or the designated emergency number.
- ___ Check for responsiveness and breathing. (*She does not respond and is not breathing normally.*)
- ___ Correctly position your hands.
- ___ Give cycles of 30 compressions and 2 rescue breaths.

In questions 15 through 17, circle the letter of the correct answer.

15. If during an analysis an AED prompts, “no shock advised,” you should—

- | | | | |
|---|--|---|---|
| a. Check pad placement on the person’s chest. | b. Reset the AED by turning it off for 10 seconds. | c. Immediately resume CPR until the AED reanalyzes or you notice an obvious sign of life. | d. Unplug the connector from the machine. |
|---|--|---|---|

16. While the AED analyzes the heart rhythm, you should—

- | | | | |
|---|--|---------------------------|----------------------|
| a. Ensure that no one, including you, is touching the person. | b. Make sure that the person’s airway is maintained. | c. Finish a cycle of CPR. | d. None of the above |
|---|--|---------------------------|----------------------|

17. If the AED pads risk touching each other, such as with a small child or infant, you should—

- | | | | |
|--|---|---|---|
| a. Place the pads as usual. It does not matter if they touch each other. | b. Place one pad on the stomach and one pad on the chest. | c. Reverse the position of the pads on the chest. | d. Place one pad in the middle of the chest, and the other on the back between the shoulder blades. |
|--|---|---|---|

Answers are listed in the Appendix.

Skill Sheet 6-1

Giving CPR to an Adult

1. Verify that the person is unresponsive and not breathing.
 - Shout to get the person's attention, using the person's name if you know it. If the person does not respond, tap the person's shoulder and shout again while checking for normal breathing.
 - If the person does not respond and is not breathing or only gasping, continue to step 2.



2. Place the person on their back on a firm, flat surface. Kneel beside the person.

3. Give 30 chest compressions.
 - Place the heel of one hand in the center of the person's chest, with your other hand on top. Position your body so that your shoulders are directly over your hands.
 - Keeping your arms straight, push down at least 2 inches, and then let the chest return to its normal position.
 - Push hard and push fast! Give compressions at a rate of between 100 and 120 compressions per minute.



4. Give 2 rescue breaths.
 - Place the breathing barrier over the person's nose and mouth.
 - Open the airway. (Put one hand on the forehead and two fingers on the bony part of the chin and tilt the head back to a past-neutral position.)
 - Pinch the nose shut and make a complete seal over the person's mouth with your mouth.
 - Take a normal breath and blow into the person's mouth for about 1 second, looking to see that the chest rises.
 - Take another breath, make a seal, then give the second rescue breath.



Note: If the first rescue breath does not cause the chest to rise, retilt the head and ensure a proper seal before giving the second rescue breath. If the second breath does not make the chest rise, an object may be blocking the airway. After the next set of chest compressions and before attempting rescue breaths, open the mouth, look for an object and, if seen, remove it using a finger sweep. Continue to check the person's mouth for an object after each set of compressions until the rescue breaths go in.

(Continued)

Skill Sheet 6-1

Giving CPR to an Adult *Continued*

5. Continue giving sets of 30 chest compressions and 2 rescue breaths until:
 - You notice an obvious sign of life.
 - An AED is ready to use, and no other trained responders are available to assist you with the AED.
 - You have performed approximately 2 minutes of CPR (5 sets of 30:2), and another trained responder is available to take over compressions.
 - EMS personnel take over.
 - You are alone and too tired to continue.
 - The scene becomes unsafe.

Skill Sheet 6-2

Giving CPR to a Child

1. Verify that the child is unresponsive and not breathing.

- Shout to get the child's attention, using the child's name if you know it. If the child does not respond, tap the child's shoulder and shout again while checking for normal breathing.
- If the child does not respond and is not breathing or only gasping, continue to step 2.



2. Place the child on their back on a firm, flat surface. Kneel beside the child.

3. Give 30 chest compressions.

- Place the heel of one hand in the center of the child's chest, with your other hand on top. Position your body so that your shoulders are directly over your hands. (Alternatively, in a small child, you can use a one-handed CPR technique: place the heel of one hand in the center of the child's chest.)
- Keeping your arms straight, push down about 2 inches, and then let the chest return to its normal position.
- Push hard and push fast! Give compressions at a rate of between 100 and 120 compressions per minute.



4. Give 2 rescue breaths.

- Place the breathing barrier over the child's nose and mouth.
- Open the airway. (Put one hand on the forehead and two fingers on the bony part of the chin and tilt the head back to a slightly past-neutral position.)
- Pinch the nose shut and make a complete seal over the child's mouth with your mouth.
- Take a normal breath and blow into the child's mouth for about 1 second, looking to see that the chest rises.
- Take another breath, make a seal, then give the second rescue breath.



(Continued)

Skill Sheet 6-2

Giving CPR to a Child *Continued*

Note: *If the first rescue breath does not cause the chest to rise, retilt the head and ensure a proper seal before giving the second rescue breath. If the second breath does not make the chest rise, an object may be blocking the airway. After the next set of chest compressions and before attempting rescue breaths, open the mouth, look for an object and, if seen, remove it using a finger sweep. Continue to check the child's mouth for an object after each set of compressions until the rescue breaths go in.*

5. Continue giving sets of 30 chest compressions and 2 rescue breaths until:

- You notice an obvious sign of life.
- An AED is ready to use, and no other trained responders are available to assist you with the AED.
- You have performed approximately 2 minutes of CPR (5 sets of 30:2), and another trained responder is available to take over compressions.
- You have performed approximately 2 minutes of CPR (5 sets of 30:2), you are alone and caring for a child, and you need to call 9-1-1 or the designated emergency number.
- EMS personnel take over.
- You are alone and too tired to continue.
- The scene becomes unsafe.

Skill Sheet 6-3

Giving CPR to an Infant

1. Verify that the infant is unresponsive and not breathing.

- Shout to get the infant's attention, using the infant's name if you know it. If the infant does not respond, tap the bottom of the infant's foot and shout again while checking for normal breathing.
- If the infant does not respond and is not breathing or only gasping, continue to step 2.



2. Place the infant on their back on a firm, flat surface. Stand or kneel next to the infant.

3. Give 30 chest compressions.

- Place one hand on the infant's forehead.
- Place the pad of two fingers on the center of the infant's chest, just below the nipple line.
- Compress the chest about 1½ inches, and then let the chest return to its normal position.
- Push hard and push fast! Give compressions at a rate of between 100 and 120 compressions per minute.



4. Give 2 rescue breaths.

- Place the breathing barrier over the infant's nose and mouth.
- Open the airway. (Put one hand on the forehead and two fingers on the bony part of the chin and tilt the head back to a neutral position.)
- Make a complete seal over the infant's nose and mouth with your mouth.
- Take a normal breath and blow into the infant's nose and mouth for about 1 second, looking to see that the chest rises.
- Take another breath, make a seal, then give the second rescue breath.



Note: If the first rescue breath does not cause the chest to rise, retilt the head and ensure a proper seal before giving the second rescue breath. If the second breath does not make the chest rise, an object may be blocking the airway. After the next set of chest compressions and before attempting rescue breaths, open the mouth, look for an object and, if seen, remove it using a finger sweep. Continue to check the infant's mouth for an object after each set of compressions until the rescue breaths go in.

(Continued)

Skill Sheet 6-3

Giving CPR to an Infant *Continued*

5. Continue giving sets of 30 chest compressions and 2 rescue breaths until:
 - You notice an obvious sign of life.
 - An AED is ready to use and no other trained responders are available to assist you with the AED.
 - You have performed approximately 2 minutes of CPR (5 sets of 30:2) and another trained responder is available to take over compressions.
 - You have performed approximately 2 minutes of CPR (5 sets of 30:2), you are alone and caring for an infant, and you need to call 9-1-1 or the designated emergency number.
 - EMS personnel take over.
 - You are too tired to continue.
 - The scene becomes unsafe.

Skill Sheet 6-4

Using an AED

Note: Do not use pediatric AED pads on an adult or on a child older than 8 years of age or weighing more than 55 pounds. However, adult AED pads can be used on a child younger than 8 years of age or weighing less than 55 pounds if pediatric AED pads are not available.

1. Turn on the AED and follow the voice prompts.

2. Remove all clothing covering the chest and, if necessary, wipe the chest dry.

3. Place the pads.

- Place one pad on the upper right side of the chest and the other on the lower left side of the chest below the armpit.
- If the pads may touch (e.g., on an infant or small child), place one pad in the middle of the chest and the other pad on the back between the shoulder blades.



4. Plug the connector cable into the AED, if necessary.



(Continued)

Skill Sheet 6-4

Using an AED *Continued*

5. Prepare to let the AED analyze the heart's rhythm.

- Make sure no one, including you, is touching the person. Say, "EVERYONE CLEAR!" in a loud, commanding voice.
- If the AED tells you to, push the "analyze" button to start this process.



6. Deliver a shock, if the AED determines one is needed.

- Make sure no one, including you, is touching the person. Say, "EVERYONE CLEAR!" in a loud, commanding voice.
- Push the "shock" button to deliver the shock.



7. After the AED delivers the shock, or if no shock is advised:

- Immediately begin CPR, starting with compressions. Continue giving CPR (about 2 minutes, or 5 sets of 30:2) until prompted by the AED.
- Continue giving CPR and following the AED's prompts until you see an obvious sign of life or EMS personnel arrive.