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Fighting Heart Disease and Stroke

Fundamentals of BLS for Healthcare Providers

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Preface

The AHA offers a variety of courses on basic life support (BLS) and cardiopulmonary resuscitation (CPR) for healthcare providers. With the knowledge and skills you learn in these courses, you can save the life of a family member, a friend, a coworker, a citizen in your community, or a patient in the hospital or clinic where you work.

The BLS for Healthcare Providers Course is intended for participants who must have a credential (a card) documenting successful completion of a course in CPR and BLS for healthcare professionals. Such credentials are typically required for people who provide healthcare to patients in a wide variety of settings, both in-hospital and outside the hospital.

This course will teach you how to recognize and respond to life-threatening emergencies such as cardiac arrest, respiratory arrest, and foreign-body airway obstruction (choking). You will learn to recognize heart attack and stroke in adults and breathing difficulty in children. This course teaches the skills needed to respond to the emergencies you identify. You will learn the skills of CPR for victims of all ages (including ventilation with barrier devices and bag-mask devices), use of an automated external defibrillator (AED), and relief of foreign-body airway obstruction. These skills will enable you to recognize emergencies and provide the first three links in either the AHA adult Chain of Survival or the pediatric Chain of Survival. With these skills you may save the life of a patient, a member of your community, or a loved one.

Participants in this course will use one of two manuals, *BLS for Healthcare Providers* or this manual, *Fundamentals of BLS for Healthcare Providers*.

BLS for Healthcare Providers is intended for use by licensed and certified healthcare professionals. It

assumes that the reader has a healthcare education, and it contains a stronger emphasis on anatomy and physiology and on scientific rationale for actions and recommendations than is included in *Fundamentals of BLS*. You will also find information about reducing risk of heart disease and injury prevention that you may wish to use for patient education.

This manual is designed to provide information that will be useful to you before, during and after the BLS for Healthcare Providers Course. It contains several features designed to help you learn CPR, ventilation with a barrier device and a bag-mask device, and use of an AED. Each chapter includes *learning objectives*, a *learning checklist*, and *review questions*. These features will make learning easier. At the start of each chapter, carefully read the learning objectives. Reading them carefully will help you focus on the essential information. When you finish reading the chapter, review the learning checklist. Then answer the review questions. If you cannot answer a question or if you choose the wrong answer, review the parts of the chapter related to that question.

Throughout the manual you will see colored boxes. These boxes highlight important and useful information. **Critical Concepts** presents essential information for mastering the knowledge and skills taught in this course. Critical signs and symptoms included in these boxes and in the text are called **red flags**. A **red flag** says “Warning! This is vital information about critical signs and symptoms.”

Foundation Facts further explains the recommended actions and provide important supportive information.

FYI boxes present background material for your information only. These boxes contain information about various topics, such as different types of 911 systems, that may be useful or interesting to some participants. You

are *not required* to know the information presented in FYI boxes to fulfill the core learning objectives.

The skills performance sheets (“Performance Criteria”) in the appendix of this manual list the skills you will practice in class. To obtain a course completion card, you must satisfactorily demonstrate the skills listed on each sheet to your instructor, and you must score at least 84% on a written examination. Review each skill, read each chapter in this manual, pay attention to the details, and practice carefully. It is easy to forget some CPR skills, so practice the skills and reread this manual after you complete the course.

The appendix also contains case scenarios. These scenarios will help you learn to apply your knowledge of CPR to realistic situations. Take advantage of this learning opportunity. It will do more than prepare you for the course. It will prepare you to save a life.

To obtain more information about ways to reduce the risk of heart disease, stroke, and injury and updated information on CPR, visit the AHA website at www.cpr-ecc.org. This site also contains links to other sites with useful information.

We wish you success as you learn CPR. When you complete the course, you will be prepared to recognize emergencies in adults, to prevent many causes of cardiac arrest in infants and children, and to respond to emergencies using the skills of CPR.

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The Chain of Survival and Warning Signs of Heart Attack, Cardiac Arrest, Stroke, and Foreign-Body Airway Obstruction

Overview

What are the signs of heart attack, stroke, cardiac arrest, and foreign-body airway obstruction (FBAO) (that is, choking) in adults? Why is early recognition so critical to these patients? Why is it important to phone the emergency response number as soon as you detect signs of heart attack or stroke? After reading this chapter, you will be able to answer these questions and more.

Cardiovascular Disease and How YOU Can Help

Cardiovascular disease is the leading cause of death in the United States. Every year more than 480,000 adult Americans die of a heart attack or related complications. About half of these deaths (225,000) result from sudden cardiac arrest. Sudden cardiac arrest occurs when the heart suddenly stops beating. Most often it is caused by an arrhythmia (an abnormal heart rhythm) called *ventricular fibrillation* (VF) that prevents the heart from pumping blood.

Sudden cardiac arrest can complicate a heart attack. Sudden cardiac arrest is most likely to occur during the *first hour* after the onset of symptoms of a heart attack, typically before the victim arrives at the hospital. Sudden cardiac arrest will result in death unless emergency treatments, including cardiopulmonary resuscitation (CPR) and defibrillation, are provided immediately. Although CPR doubles the victim's chance of survival, the definitive treatment for VF is *defibrillation* with a medical device called a *defibrillator*. Some computerized defibrillators, called automated external defibrillators (AEDs), can be used by healthcare providers and lay rescuers alike.

The victim of an emergency such as a heart attack, cardiac arrest, stroke, or FBAO (choking) can be saved if people at the scene begin the Chain of Survival. In this chapter you will learn the critical actions that comprise

Learning Objectives

After reading this chapter you will be able to

1. Name the links in the AHA adult Chain of Survival and discuss the role you play in the Chain of Survival
2. List the warning signs of 4 major emergencies in adults:
 - Heart attack
 - Cardiac arrest
 - Stroke
 - Foreign-body airway obstruction (choking)

the 4 links in the American Heart Association (AHA) adult Chain of Survival. You will learn how to recognize the symptoms of a heart attack, cardiac arrest, stroke, and FBAO (choking). You will learn when to phone the emergency response number at your workplace (or 911), when and how to perform CPR and defibrillation, and when and how to relieve FBAO in adults.

AHA Adult Chain of Survival

The AHA adult Chain of Survival symbol (Figure 1) depicts the critical actions required to treat life-threatening emergencies, including heart attack, cardiac arrest, stroke, and FBAO (choking).

Once you recognize an emergency, *immediately* provide

- **Early access to the emergency response system** in your healthcare facility or community to ensure that additional rescuers and those capable of providing advanced life support arrive as quickly as possible.

- **Early CPR** to support circulation to the heart and brain until normal heart activity is restored.
- **Early defibrillation** to treat cardiac arrest caused by VF.

Early advanced care will be provided by EMS and hospital personnel with additional training and expertise.

You must know when to activate the Chain of Survival. You must recognize when an emergency exists. At the end of this course you will have the knowledge and skills needed to complete 3 of the 4 links in the Chain of Survival. When you recognize an emergency and phone the emergency response number, begin CPR, and use an AED, *you* are performing the actions that increase a victim's chance of survival. Skilled rescuers and healthcare professionals will respond to the emergency call. They will be trained and equipped to provide defibrillation (if it was unavailable to you) and advanced care to further increase the victim's chance of survival.

To save people with heart attack, cardiac arrest, or stroke, *each set of actions or link in the Chain of Survival must be performed as soon as possible.* If any link in the chain is weak, delayed, or missing, the victim's chance of survival decreases. The following sections describe each link in the Chain of Survival

The First Link: Early Access to the Emergency Response System

The first step in the treatment of any emergency is recognizing that an emergency exists and phoning the appropriate emergency response number. A healthcare facility may have an internal number (hospital extension) that activates the emergency response team. In the community 911 is the most common emergency response number.

You must recognize the warning signs of a heart attack, cardiac arrest, stroke, or FBAO (choking). *Anyone who is unresponsive* should receive emergency care. Heart attack,

cardiac arrest, stroke, and FBAO can cause unresponsiveness. Although many other conditions can cause unresponsiveness, *all* victims who suddenly become unresponsive will benefit from activation of the Chain of Survival.

In most healthcare settings an emergency response team is available on-site to respond quickly to emergencies. If such a response team is on-site, healthcare providers should contact that system instead of the EMS system (911). The operator who answers your call will determine your location and the nature of the emergency, notify the emergency response team, and send other trained rescuers to help you. If you work in a facility with an internal emergency response team, whenever this manual states "phone 911," you should phone the emergency response number at your workplace.

Your workplace may have AEDs available for use by you and other healthcare providers. If AEDs are available, the rescuer who phones the emergency response number should get the AED (usually located near the phone).

AEDs are also becoming more commonplace in public settings such as malls, airports, and casinos. As a healthcare provider trained in CPR and the use of AEDs, you may have the opportunity to save someone in your community. In most states healthcare providers and lay rescuers who function as "Good Samaritans" are provided limited immunity (legal protection) when they use an AED to help a victim of cardiac arrest outside a healthcare facility.

Often in an emergency you are not alone with the victim. Other rescuers or bystanders are nearby. If you find a person who is unresponsive, shout for help to bring other rescuers to help you. Then send another rescuer to phone the emergency response number while you begin CPR.

When you phone the emergency response number, the operator or dispatcher will ask questions and relay the

FIGURE 1. The AHA adult Chain of Survival. The 4 links or sets of actions in the chain are (1) early access to the emergency response system, (2) early CPR, (3) early defibrillation, and (4) early advanced care.



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information you provide to the emergency response team. Give short, specific answers. Give only the requested information. The dispatcher will probably ask the following questions:

- **“What is your emergency?”** You might answer: *“The patient in the CT scanner complained of chest pain and became unresponsive.”*
- **“What’s happening now?”** *“The lab tech is beginning CPR, and I’m getting the AED.”*
- **“Where is the victim located?”** *“We’re in CT scanner room B on the first floor in Diagnostic Radiology.”*
- **“What number are you calling from?”** *“Extension 2-1313.”*

At this point the operator will give you directions or ask more questions.

The Second Link: Early CPR

CPR is a set of actions that the rescuer performs in sequence to *assess and support* airway, breathing, and circulation as needed. CPR is performed in steps (Figure 2) so that the rescuer provides only the support the victim needs.

CPR is the critical link that buys time between the first link (early access to the emergency response system) and the third link (early defibrillation). CPR supports delivery of oxygen to the brain and heart until defibrillation or other advanced care can restore normal heart action.

Victims of out-of-hospital cardiac arrest who receive CPR from bystanders are more than twice as likely to survive as victims who do not receive CPR. The earlier you give CPR to a person in cardiac or respiratory arrest, the greater the victim’s chance of survival.

The Third Link: Early Defibrillation

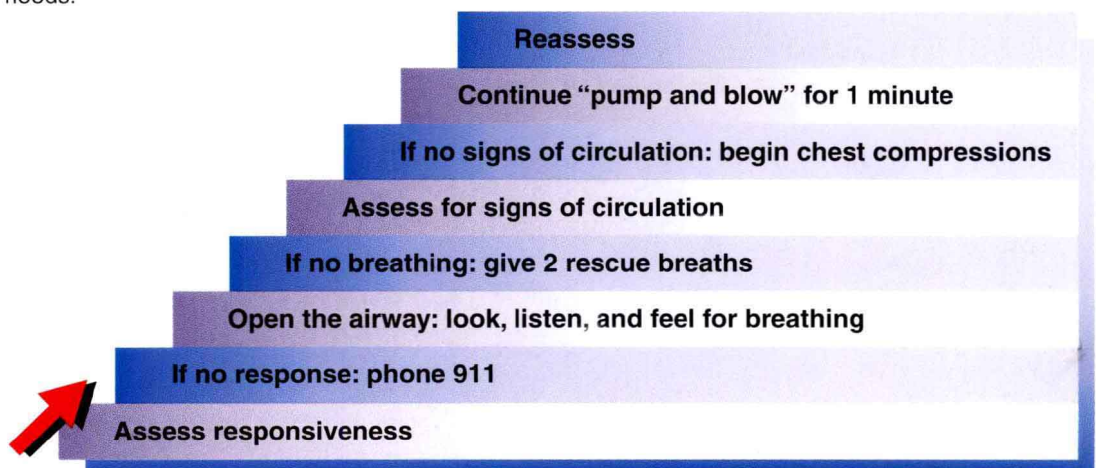
Most adult victims of witnessed sudden cardiac arrest are in VF. VF is an abnormal, chaotic heart rhythm that prevents the heart from pumping blood.

The treatment for VF is *defibrillation*. Defibrillation is the delivery of a shock to the heart that stops VF and allows a normal heart rhythm to resume. When VF occurs, prompt defibrillation will increase the victim’s chance of survival. With each minute that defibrillation is delayed, the victim’s chance of survival falls by 7% to 10%. If defibrillation is performed within the first 5 minutes of cardiac arrest caused by VF, the victim’s chance of survival is about 50%. After 10 to 12 minutes of cardiac arrest, there is little chance of survival *unless CPR has been provided*. CPR prolongs the time that defibrillation can be effective. To increase the victim’s chance of survival, you must provide CPR until defibrillation is performed.

Medical care facilities may have manual defibrillators, AEDs, or both. AEDs can be used to deliver a shock to the victim in cardiac arrest before the arrival of rescuers who can provide advanced care. If an AED is available, get the AED when you phone 911 (or other emergency response number). Then you or others trained in the use of AEDs will be able to provide early defibrillation if needed. Every medical professional must know how to operate an AED.

An AED is attached to the victim with 2 adhesive electrode pads. The AED analyzes the rhythm of the victim’s heart, determines if a shock is needed, and charges to the appropriate dose of energy. The rescuer presses a **SHOCK** button to deliver the shock when prompted by the AED.

FIGURE 2. The steps of CPR. CPR includes both assessment and support steps, performed in sequence. The rescuer provides only the support the victim needs.



This course will provide you with the knowledge and skills needed to use an AED. Chapter 3 of this manual describes use of an AED in more detail. Remember to ask your employer if an AED is available for your use and if a protocol exists for its use. Also check your state's laws on use of AEDs in public access defibrillation (PAD programs).

The Fourth Link: Early Advanced Care

The fourth link in the AHA adult Chain of Survival is early advanced care. Highly trained EMS personnel called *paramedics* provide advanced care outside the hospital. Inside the hospital teams of highly skilled providers of advanced cardiovascular life support (ACLS) give advanced care to victims of cardiac arrest.

Advanced care includes the administration of drugs and insertion of breathing (tracheal) tubes to (1) help the heart in VF respond to defibrillation, (2) maintain a normal rhythm after successful defibrillation, and (3) support oxygenation and ventilation. ACLS also includes use of numerous assessments and interventions to treat non-cardiac causes of respiratory and cardiac arrest. You can learn ACLS skills in the AHA Advanced Cardiovascular Life Support Course.

FYI: AEDs and PAD Programs

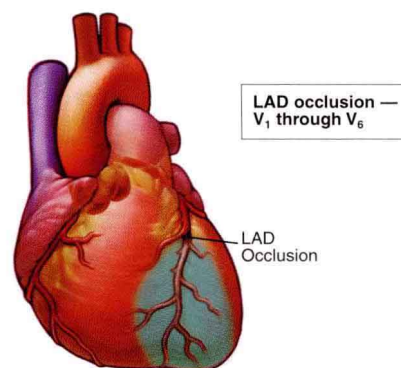
Automated external defibrillators (AEDs) are computerized defibrillators that may be safely operated by healthcare providers and lay rescuers who have only a few hours of training. AEDs are extremely accurate and relatively inexpensive. They can reduce the time to defibrillation if they are available to trained rescuers who use them before EMS or advanced healthcare personnel arrive.

Public access defibrillation (PAD) is a public health initiative developed by the AHA. PAD programs are designed to increase the number of AEDs available in a community and to increase the number of rescuers trained to provide CPR and use an AED.

AEDs can be used in the community by “Good Samaritan” healthcare providers, firefighters, police officers, airline personnel, and trained lay rescuers before EMS personnel arrive. AEDs will reduce the time to defibrillation if they are used before EMS personnel arrive. Prompt defibrillation increases the victim's chance of survival from cardiac arrest.

In this course you will be trained to provide CPR and operate an AED.

FIGURE 3. Blocked coronary artery. LAD indicates left anterior descending artery.



How to Recognize Life-Threatening Emergencies: Heart Attack, Cardiac Arrest, Stroke, and FBAO

How to Recognize a Heart Attack

A heart attack occurs when the heart muscle does not receive enough oxygen and heart muscle starts to die. A heart attack is caused by blockage in a coronary artery, one of the major blood vessels that supplies blood and oxygen to the heart muscle (Figure 3). *Acute myocardial infarction* is the medical term for heart attack. New drugs called clotbusters can unblock the coronary arteries of some patients if they are given within a few hours of the onset of signs of a heart attack.

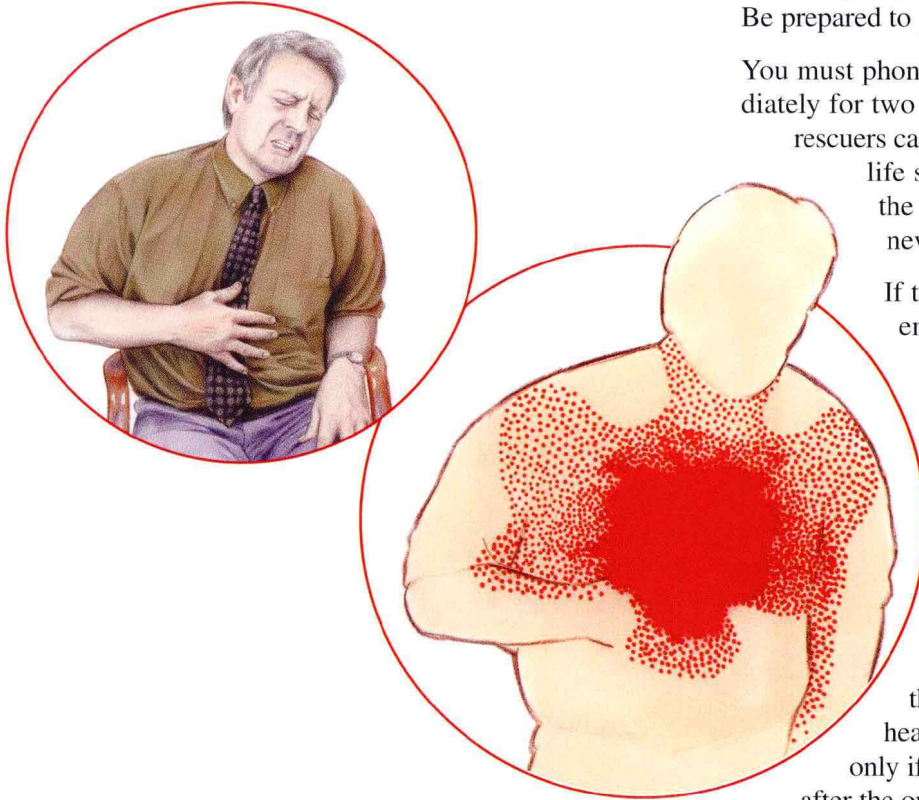
*The most important and most common symptom of a heart attack is chest discomfort, pressure, or pain. The pain develops in the center of the chest, behind the breastbone (sternum). The pain may travel to the neck, jaw, or down the arm (usually the left arm). It usually lasts more than 3 to 5 minutes. **Chest pain** is a **red flag**. The flag says **Warning! Think heart attack**.*

A person having a heart attack is usually awake and can talk but feels uncomfortable or is in pain. Time is critical. Clotbusters are most effective when given within 90 minutes after symptoms of a heart attack begin. If you think someone is having a heart attack, immediately activate the emergency response system (phone 911 or other emergency response number). Minutes count! Know the symptoms!

If you see someone with chest discomfort and you think the person is having a heart attack, ask these questions:

- **“What is the pain like?”** People describe the discomfort caused by a heart attack in many ways: as a pressure, fullness, squeezing, pain, or heaviness. The person may not feel pain but may say he or she feels pressure or *discomfort* in the chest. The discomfort may or may not be severe.
- **“Where is the pain located?”** People usually feel the discomfort right behind the breastbone, deep in the center of the chest (Figure 4). After a few moments the pain may spread to the shoulder, neck, lower jaw, or arm. The pain may be on the left side, right side, or both sides, but often it is located on the left side. Sometimes the pain or discomfort may be felt even in the back, between the shoulder blades.
- **“How long have you had the pain?”** The discomfort of a heart attack usually lasts more than a few minutes. Sharp, stabbing, knifelike pain that lasts only a second and then disappears is usually not the pain of

FIGURE 4. Typical locations of chest pain caused by a heart attack.



a heart attack. But chest pain caused by a heart attack sometimes “stutters.” This means the pain stops completely and then returns a short time later.

Not all warning signs occur in every heart attack. People who are having a heart attack may have vague signs. They may say they feel lightheaded, faint, short of breath, or nauseous. They may describe their chest discomfort as an ache, heartburn, or indigestion. Other signs include sweating, nausea, vomiting, or shortness of breath. These vague signs of a heart attack are more common in women, people with diabetes, and the elderly.

Many people will not admit that they may be having a heart attack. People react with a variety of statements or excuses. They may say “I’m too healthy,” “I don’t want to bother the doctor,” “I don’t want to frighten my wife,” “I’ll feel ridiculous if it isn’t a heart attack,” or “I hate red lights and sirens.”

When a person with symptoms of a heart attack tries to downplay what he or she is feeling, *you* must take responsibility and act at once. Tell the victim to sit quietly. Phone the emergency response number (or 911) and get the AED. Be prepared to perform CPR.

You must phone the emergency response number immediately for two reasons. First, your call will bring other rescuers capable of providing both basic and advanced life support. Second, your call will increase the likelihood that the victim will receive the newest therapies for heart attack and stroke.

If the heart attack occurs outside the hospital, emergency personnel can rapidly transport the victim to the hospital and can provide medical care during transport. EMS personnel are prepared to treat potential complications of a heart attack, particularly abnormal heart rhythms and cardiac arrest. EMS personnel can also alert the hospital about the arrival of a patient with a potential heart attack. The hospital will then be better prepared to administer drugs such as clotbusters that may dissolve the clot and stop or reduce heart damage. These new drugs are effective only if they are given within the first few hours after the onset of symptoms of a heart attack.

After you phone 911 (or other emergency response number), have the person rest quietly and calmly. Help the person into a position that is comfortable and that allows the easiest breathing.

FYI: Emergency Medical Dispatch Assistance and Enhanced 911

In many areas of the United States emergency medical dispatchers (EMDs) are taught how to help callers give emergency care. The instructions are simple, and they will help you help the victim until EMS personnel arrive. Remember, early access to the emergency response system (phoning 911 or other emergency response number), early CPR, and early defibrillation with an AED are 3 critical links in the Chain of Survival that you *must perform immediately* to increase the victim's chances of survival.

Using a prepared list of instructions, the EMD will coach you through the basic steps of CPR and operation of an AED. If you can bring the phone to the victim's side, follow the dispatcher's instructions. If other rescuers are at the scene and the EMD provides instructions, remain on the telephone and do the following:

- Repeat the dispatcher's instructions loudly to the other rescuers and confirm that the rescuers are following each step.
- Tell the dispatcher if the victim vomits or other complications occur. Rescuers are not expected to perform perfectly in such a crisis.
- Ensure that rescuers follow each instruction, even if it takes extra seconds.
- Ensure the safety of the rescuers at all times.
- When EMS personnel arrive at the victim's side, the dispatcher will hang up after confirming their arrival.
- You hang up last. Stay on the line until the dispatcher hangs up or instructs you to do so. The dispatcher will hang up after confirming arrival of EMS personnel at the victim's side.
- Find out if your community has **enhanced 911**. Enhanced 911 operates in a manner similar to "caller ID." With enhanced 911 systems a computer automatically confirms the caller's *address* and phone number. This allows the dispatcher to locate the caller even if the caller is unable to speak or the connection is broken. If your community does not have enhanced 911, become a vocal advocate for such services in your community. Enhanced 911 can save precious seconds, minutes, and lives.

Critical Concepts:

Red Flags of a Heart Attack

People who are having a heart attack may have several or few warning signs, or they may have only vague signs. If *any* signs occur, don't wait. Get help immediately. Phone 911 or the emergency response number. Delay can be deadly.

Red flags of a heart attack include

- Chest *discomfort, pressure, or pain*
- *Lightheadedness* or "feeling dizzy" during the pain.
- *Fainting* or loss of responsiveness
- *Sweating* or "breaking out in a cold sweat all over" but without fever
- *Nausea*, usually without vomiting
- *Shortness of breath*, especially worrisome if the victim is short of breath during the pain, while lying still or resting, or when moving only a little

How to Recognize Cardiac Arrest

In cardiac arrest blood flow stops and the brain, heart, and other organs are deprived of oxygen. The victim will be unresponsive and will have no adequate breathing, no signs of circulation, and no pulse. The victim will have no signs of circulation (no adequate breathing, coughing, or movement) in response to rescue breaths.

Victims in cardiac arrest often gasp for breath. These gasps are called agonal respirations. They may occur early in cardiac arrest, and they are *not* effective breaths. Agonal respirations will not maintain oxygenation or ventilation, so a victim who is gasping is *not* breathing adequately.

Both healthcare providers and lay rescuers assess for breathing as a sign of circulation. Lay rescuers are generally taught to look for "normal" breathing. Healthcare providers should be able to distinguish between adequate and inadequate breathing, and they should provide rescue breathing if the victim's breathing is inadequate. Healthcare providers should also recognize agonal respirations.

Sudden unresponsiveness is a red flag of cardiac arrest.

Act immediately! The victim of cardiac arrest will have **3 red flags:**

1. **No response:** Victims of cardiac arrest do not respond when you speak to or touch them. If you are alone

Critical Concepts:**Red Flags of Cardiac Arrest**

The victim in cardiac arrest has the following red flags:

- No response
- No adequate breathing
- No signs of circulation (no breathing, coughing, or movement)

with someone who suddenly becomes unresponsive, immediately phone 911 or other emergency response number. If a second rescuer is present, send that rescuer to phone 911 and get the AED while you begin CPR.

2. **No adequate breathing:** Once you discover that the victim is unresponsive and the emergency response number has been called, begin CPR. Open the airway and look, listen, and feel for breathing. Victims of cardiac arrest do not breathe adequately. Give the victim 2 rescue breaths.
3. **No signs of circulation:** After you give 2 breaths to the victim, check for signs of circulation. Look for a response to the 2 breaths. If the heart is beating and delivering oxygen to the brain and body, the victim will respond to the 2 breaths. The response will be adequate breathing, coughing, or movement. Check for signs of circulation for no more than 10 seconds.
 - Put your head near the victim's nose and mouth, open the airway, and look, listen, and feel for breathing. Take about 5 seconds.
 - Look at the victim's body for coughing or movement.
 - If you do not see signs of circulation, begin chest compressions.

The steps of CPR are summarized in Chapter 2.

Critical Concepts:**Critical Actions to Take if You Are Alone**

If you are alone and find someone who is unresponsive:

- Phone 911 (or other emergency response number) and get the AED
- Begin CPR if needed

FYI: Heart Rhythms That Cause Cardiac Arrest

Cardiac arrest can be caused by the following heart rhythms:

- Ventricular fibrillation (VF)
- Ventricular tachycardia (VT)
- Pulseless electrical activity
- Asystole

VF is an abnormal rhythm that causes the heart muscle to quiver. This quivering prevents the heart from pumping blood. VT is a very rapid rhythm. The rhythm can be so rapid that the heart does not pump enough blood to create a pulse. VF and “pulseless” VT can develop as complications of a heart attack, even in men or women who have no chest pain. VF and sudden cardiac arrest may be the first and *only* signs of a heart attack in some victims. VT and pulseless VT are treated with defibrillation. Asystole and pulseless electrical activity are treated with CPR and advanced life support.

FYI: Respiratory Arrest

Respiratory arrest is present when the victim is not breathing at all or is breathing so slowly, shallowly, or irregularly that oxygenation of the blood cannot occur. The term *respiratory arrest* is used for victims who are not breathing adequately but who *still have signs of circulation*.

You will identify respiratory arrest as you perform the steps of CPR. A victim of respiratory arrest will be unresponsive. Open the airway and look, listen, and feel for breathing. You will observe no breathing or only occasional or very shallow breaths. Such breathing will not deliver oxygen to the brain and other organs. Give 2 breaths, watching the chest to see if it rises with each breath.

The victim in respiratory arrest will have signs of circulation (breathing, coughing, or movement) in response to the rescue breaths. These signs confirm that the victim has spontaneous blood flow (circulation) and that cardiac arrest is *not* present. If the victim does not have normal, adequate breathing, *respiratory arrest* is present. These victims require rescue breathing (give 1 breath every 5 seconds).

Case Scenario

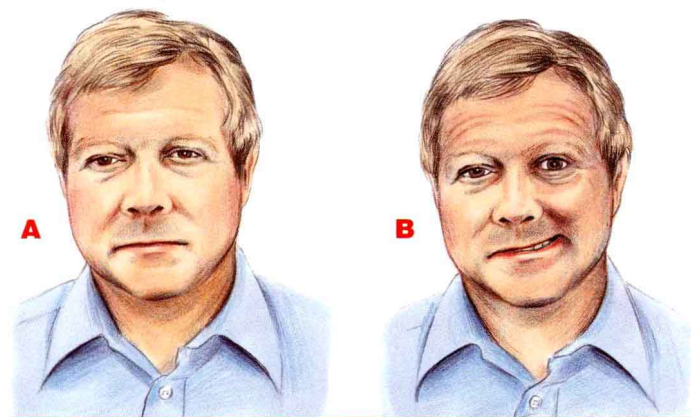
You are performing a home health visit for an elderly woman with hypertension and diabetes. When you arrive her husband tells you that 20 minutes ago his wife began slurring her words. Since then she has been unable to get up from her chair because of weakness in her left leg. You observe no problems with airway, breathing, or circulation, so you quickly assess the woman using the Cincinnati Stroke Scale.

You identify a droop on the right side of her face, weakness in the left arm, and slurring of speech. You strongly suspect a stroke. According to what the husband has told you, the symptoms began at 2:50 pm (27 minutes ago). Both the wife and husband ask you to drive them to the community hospital close to their home. You quickly explain the importance of early activation of the EMS system and then phone 911.

You tell the dispatcher you suspect that your patient has had a stroke. An EMS team arrives within a few minutes. They perform a stroke assessment, and they agree that your patient has probably had a stroke. The EMS team notifies the nearest hospital capable of providing acute stroke care that they are transporting the patient to that hospital. A stroke team is waiting for the patient when she arrives at the hospital at 3:30 pm (40 minutes after the onset of stroke symptoms).

The husband calls you 2 days later to thank you. He says his wife received fibrinolytic therapy shortly after she arrived at the hospital and that all her symptoms have resolved.

FIGURE 5. Facial droop in a victim of stroke. **A**, Normal. **B**, Facial droop.



How to Recognize a Stroke

A stroke is the rapid onset of neurologic problems.

A stroke can develop when a blood vessel in the brain becomes blocked so that an area of the brain receives no blood and no oxygen, or it can develop when a blood vessel in the brain ruptures and bleeds into the brain. Stroke is a leading cause of death and serious disability among Americans. Although most strokes occur in older people, *strokes can occur in people of all ages.*

Signs of stroke include (1) sudden numbness or weakness of face, arm, or leg, especially on one side of the body, (2) sudden confusion, trouble speaking or understanding, (3) sudden trouble seeing in one or both eyes, (4) sudden trouble walking, dizziness, loss of balance or coordination, or (5) sudden severe headache with no known cause.

Strokes sometimes damage areas of the brain that control breathing, and they may cause the victim to become unresponsive. If this occurs the victim may stop breathing or may develop airway obstruction. If these complications develop, you will need to perform some or all of the steps of CPR, particularly rescue breathing. Although breathing difficulty or respiratory arrest may develop as a complication of stroke, cardiac arrest does not often occur with a stroke in the out-of-hospital setting.

You must know the **signs of stroke** so that you can phone the emergency response number (or 911). Many signs of stroke are vague or ignored by the victim. If you think someone has had a stroke, look closely for the sudden onset of one of these **red flags**:

- 1. Facial droop:** This sign is most obvious if the victim smiles or grimaces. If one side of the face droops or the face does not move (Figure 5), a stroke may have occurred.
- 2. Arm weakness:** This sign is most obvious if the victim extends his arms with the eyes closed (Figure 6). If one arm drifts downward or the victim cannot move his arms, a stroke may have occurred.
- 3. Speech difficulties:** The victim is unable to talk or will slur words. Ask the victim to repeat a sentence such as “You can’t teach an old dog new tricks.” If the victim cannot repeat the sentence accurately and clearly, a stroke may have occurred.

Whenever you think someone is having a stroke, phone the emergency response number (or 911) immediately! If you are in a medical facility, shout for help immediately (other rescuers are likely to be nearby). The victim of stroke requires immediate medical evaluation and may be eligible for new therapies to reduce injury to the