

CARDIAC EMERGENCIES

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INTRODUCTION

One and a half million Americans will have a heart attack this year. Fortunately, two out of three will survive it, but that number could be much higher. Consider this: Of the 500,000 deaths that will occur, 300,000 will be within the first hour of the onset of symptoms. Most of these people will die before they reach a hospital. Almost three-quarters of these sudden deaths occur at home. A person who suffers a cardiac arrest outside a hospital has a 25 to 30 percent chance of surviving if cardiopulmonary resuscitation (CPR) is administered promptly; when CPR isn't started until an emergency medical team arrives, the survival rate is just 5 percent. Furthermore, the new clot-dissolving drugs used to treat heart attack, which can have a major impact on survival, must be administered promptly to be effective.

The conclusion is obvious: It is imperative for family members of cardiac patients (or of those at risk of developing coronary heart disease) to be able to recognize the warning signs of an impending heart attack, to know what to do in a cardiac emergency, and to learn the vital lifesaving skill of cardiopulmonary resuscitation.

During a heart attack, the heart is deprived of oxygen, but it may continue to function. A serious com-

plication of a heart attack is cardiac arrest, which occurs when the heart either stops beating or quivers (fibrillates) uncontrollably. When a person is in cardiac arrest, blood—and thus oxygen—is not pumped out of the heart to the rest of the body.

Cardiopulmonary resuscitation is a combination of breathing for the victim to supply oxygen and compressing the chest wall, which squeezes the heart and pushes blood out to vital organs. In this way, oxygen is delivered to the brain and to the arteries of the heart itself. Unless breathing and circulation are established within four to six minutes of a cardiac arrest, irreversible brain damage occurs, and eventually the individual dies. CPR cannot preserve life indefinitely, but it can keep a person alive until more effective medical intervention is available to restore normal heart function. For example, chest compression may help the heart muscle to pump blood, but it will not reverse fibrillation of the ventricles. The use of an electric shock to the heart maybe necessary for this. CPR can, however, preserve functions until the patient goes to a facility with a machine that can defibrillate the heart muscle.

CPR is a valuable lifesaving skill that can be used not only to revive victims of a heart attack, but also in cases of drowning, suffocation, electric shock, severe allergic reaction, trauma, and drug overdose. An easy mnemonic for remembering its key components is *ABC*: opening and maintaining an *airway*; provid-

Quick Rundown of CPR Procedures for Cardiac Events

1. Tap person and shout, "Are you okay?" Call for help.
2. Position victim supine on floor.
3. Tilt head back to open airway.
4. Look, listen and feel for breathing.
5. Pinch nostrils, make a mouth-to-mouth seal and give two breaths.
6. Check pulse on side of neck.
7. If possible, have someone call 911 or the local emergency number, or do it yourself.
8. If pulse is present, give 12 breaths a minute. Recheck pulse.
9. If there is no pulse, give 15 chest compressions; then two breaths. Give three more sets of 15 and two. Check pulse. If there is still no pulse, continue sets of 15 and two until help arrives or until pulse returns and breathing resumes.

ing artificial respiration with mouth-to-mouth breathing; and applying external chest compressions to provide artificial circulation. (See box, "Quick Rundown of CPR Procedures for Cardiac Events.")

This chapter will describe basic life support skills, but it should not be considered a substitute for a hands-on CPR course that will allow you to learn under the supervision of an instructor and to practice your skills on a specially designed mannequin. Lives have been saved by rescuers without formal training who attempted CPR, and few would argue that it is better to try something while waiting for medical help than to stand by helplessly. Nonetheless, CPR done incorrectly may cause injury to the victim's chest and, worse, may be ineffective. For these reasons, you are urged to take a course.

CPR courses range from three-hour sessions teaching single-rescuer techniques for use on adults to longer (generally 9- and 12-hour) courses, teaching two-rescuer CPR and techniques for use on infants and children. To locate courses in your area, check with your local American Red Cross or American Heart Association. In addition, many hospitals and YMCAs provide CPR training. Finally, some large corporations sponsor on-site CPR courses periodically; if your employer does not have such a program, you may want to inquire about whether one can be

initiated. The same organizations mentioned above may be able to provide teaching resources.

This chapter can, however, teach you how to assess an emergency and access the emergency medical care system, and you will develop some understanding of the techniques used in performing CPR. It will aid your comprehension if you visualize yourself performing each of the steps as you read about them. (You should never practice CPR on a person; instead, realistic dummies are used for practice sessions.)

WHO IS VULNERABLE TO A CARDIAC EMERGENCY

A person who has already suffered a heart attack, or who has had episodes of angina pectoris (chest pain that lasts for several minutes triggered by exercise, emotional upset, or other causes), is particularly vulnerable to a cardiac emergency. This emergency need not be a cardiac arrest. It may be an episode of severe chest pain, a sudden episode of shortness of breath, or the sudden onset of a rapid heartbeat.

A number of factors are associated with increased risk of a heart attack or other cardiac emergency. Some are uncontrollable—family history of heart disease at an early age, for instance, remains an unalterable fact in a person's risk profile. Others are controllable—for example, the effect of obesity or high blood pressure on overall risk can be eliminated by maintaining an ideal body weight and keeping blood pressure at normal levels. The more risk factors a person has, the higher the odds that he or she will have a heart problem. It is important to familiarize yourself with these risk factors. Knowing them will also help you to identify family members who may be in danger of experiencing a cardiac emergency and to make the rapid decisions and assessments that will increase chances of survival. Not all of those stricken experience the classic symptoms, while others may deny that they are having a heart attack. (See Chapters 3, 5, and 11 for more complete information.)

If a family member is under the care of a cardiologist, discuss with the doctor ahead of time what you should do in case of an emergency. The doctor may help you develop an emergency plan or may prefer to be notified at the time of the emergency to give instructions about what, if any, medication to give and to which hospital the patient should be taken. Of course, if a cardiac arrest occurs, you may have to act on your own, even before calling the doctor.

TYPES OF CARDIAC EVENTS

In coronary heart disease (also known as coronary artery disease), fatty deposits called plaque build up on the walls of the arteries that feed the heart muscle. Eventually, blood flow to the heart is reduced to the point where the heart muscle cannot get enough oxygen, a condition known as myocardial ischemia, which may result in such symptoms as angina (chest pain) and shortness of breath on activity. In many cases, coronary artery disease leads to a heart attack, or myocardial infarction (which literally means “heart muscle death”). (See Chapter 11.)

Heart attacks often occur without warning, but they usually have classic symptoms. (See box, “Warning Signs of a Heart Attack.”) Unlike angina, the pain associated with a heart attack does not diminish with rest and may last 30 minutes or longer. It may subside and return again (although it is never appropriate to delay getting help to see if it abates by itself). The pain may be experienced as a crushing pressure or a burning sensation in the middle of the chest. It may radiate to the shoulders or arms (typically on the left side, although either or both sides maybe involved) or to the neck, jaw, or back. The individual may also feel dizzy, nauseated, or faint; he or she will feel clammy to the touch. A person having a heart attack may simply report an impending sense of doom or a vague feeling that “something isn’t right.” Often, a victim will deny that he or she is having a heart attack, attributing the symptoms to another cause, such as indigestion or a hiatal hernia.

Warning Signs of a Heart Attack

- Steady, squeezing pressure or burning pain in the center of the chest that lasts two minutes or more
 - Pain that radiates from the center of the chest down one (usually the left) or both arms and to the shoulders, neck, jaw, or back
 - Sweating or clamminess
 - Dizziness, light-headedness, or fainting
 - Shortness of breath
 - Nausea or vomiting
- “ A sense of anxiety or impending doom

Arrhythmias are abnormalities in the electrical activity controlling the rate or rhythm of the heartbeat. (See Chapter 16.) Some types of arrhythmias maybe life-threatening, as when the heart, rather than contracting forcefully, just quivers (a condition called fibrillation). Symptoms of an arrhythmia include palpitations (an awareness of the heartbeat and, in some cases, the sensation that the heart is racing or “out of control”), shortness of breath, dizziness, fainting, and fatigue. Abnormalities of heart rhythm are quite common after a heart attack. The heart rate may become very slow (heart block), very rapid, or totally irregular.

Congestive heart failure is the inability of the heart to pump out all the blood that returns to it from the rest of the body. Symptoms will vary, depending on whether the left or right ventricle of the heart is most affected, but they may include shortness of breath, fatigue, cyanosis (blue tint to the skin), cough, swelling of the ankles, and sweating. Congestive heart failure is a chronic condition that usually develops slowly and can be managed with medication. One type, however, may come on suddenly and present a cardiac emergency. Acute pulmonary *edema* is a life-threatening situation in which the patient suffers extreme shortness of breath, cyanosis, pallor, fainting, restlessness, anxiety, a sense of suffocation, and, perhaps, wheezing or fainting. This situation may occur following a heart attack. Fortunately, it is reversible in most cases with proper treatment. Getting the patient to the hospital as soon as possible is a must.

GETTING EMERGENCY MEDICAL HELP

If symptoms of any of these cardiac events last longer than a few minutes or there is a medical history of heart disease, or several risk factors for heart disease exist, there is reason to suspect a cardiac emergency. Even in an apparently “healthy” person, if there is a pressing pain in the center of the chest, you should assume an emergency. In any case, prompt medical attention should be sought.

During a cardiac event, the victim may lose consciousness. If you have not witnessed the onset of symptoms, you must assume that immediate attention is necessary. It should be remembered, however, that shortness of breath or fainting can have several causes. If, for example, a person not known to have heart disease passes out in your presence in a warm

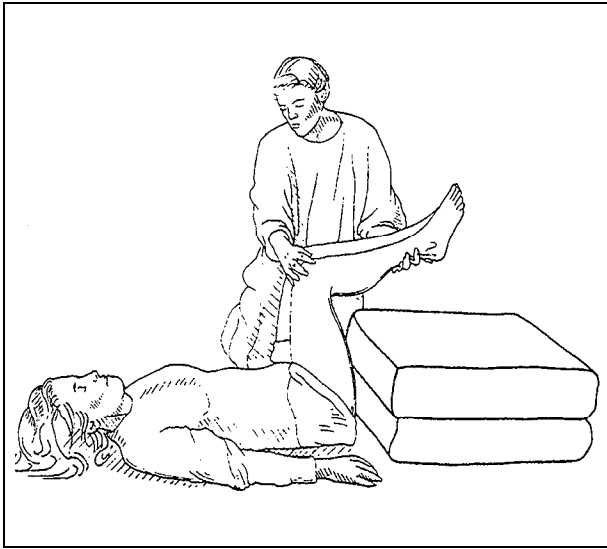


Figure 27.1
An unconscious person who has a pulse and is breathing has simply fainted. Placing him or her in a reclining position with legs slightly elevated in a cool environment is all that is needed.

room, or after a few drinks or a heavy meal, this is probably an instance of simple fainting. As long as the person is breathing, just letting him or her lie down for a few minutes maybe all that is necessary. (See Figure 27.1.)

If a person experiencing cardiac symptoms is under the care of a cardiologist, call the doctor or follow your prearranged emergency plan. If the person does not have a cardiologist or if you cannot reach the doctor immediately, call the Emergency Medical Service (EMS)—accessible in all parts of the country by dialing 911. If possible, have someone else make the call while you stay with the patient.

Tell the EMS dispatcher that you suspect a heart attack. Give your exact location—street address with cross streets and, if applicable, floor and room or apartment number. Do whatever possible to make it easy for EMS technicians to get to the patient quickly. At night, turn on outside lights; if possible, have someone go to the edge of the driveway or to the lobby to keep the elevator free and to escort emergency personnel to the scene.

While you are waiting for medical help to arrive, keep the person calm and try to be reassuring. Make sure the individual is comfortable—for example, loosen tight clothing—but do not force him or her to lie down (unless he or she has fainted). It may be better in some instances for the person to be sitting up, because if vomiting occurs, the contents of the stomach may get into the lungs and cause an infection if the person is lying down. It is best not to allow the individual to drink anything, except for some water.

Hot or cold liquids or caffeine-containing beverages should probably be avoided, especially if heartbeat irregularities are present. If the individual is acutely short of breath but is not feeling faint or having severe chest pains, it may be useful to open a window (if the room is stuffy) and have him or her stand up. Standing may help shift the blood from the lungs to the abdomen and legs, and symptoms may ease somewhat.

BASIC LIFE SUPPORT/ ONE-RESCUER CPR

If you come upon an apparently unconscious individual or if the individual loses consciousness while you are waiting for the ambulance, you may need to start cardiopulmonary resuscitation. Be assured that it is natural to doubt your ability to perform CPR effectively or to fear that your strength will give out after only a few minutes. But when faced with a life-and-death medical emergency, chances are that you will not panic or faint and you will tap reserves of stamina you did not know you had. The important thing is that by knowing the warning signs of a heart attack or other serious cardiac event and by learning CPR, you may be able to give someone a second chance.

Following are the basic steps of CPR.

1. ESTABLISH UNRESPONSIVENESS AND CALL FOR HELP

First determine whether the victim is unresponsive. Kneel at right angles to the victim with your knees at about the level of his or her shoulder. Shake the victim gently by the shoulders while shouting, “Are you okay?” two or three times. (Whether or not they speak English, most people know what “Okay” means.) CPR is unnecessary if a person is conscious, so it is important to be sure that he or she is not just sleeping.

If you cannot arouse the individual, shout for help. If someone responds, and you have not already called EMS, have that person do so. If you are alone, continue your assessment. (See Figures 27.2A-B.)

2. POSITION THE VICTIM

Next you will need to position the individual properly in anticipation of having to perform CPR. The person must be lying on his or her back on a firm, flat surface

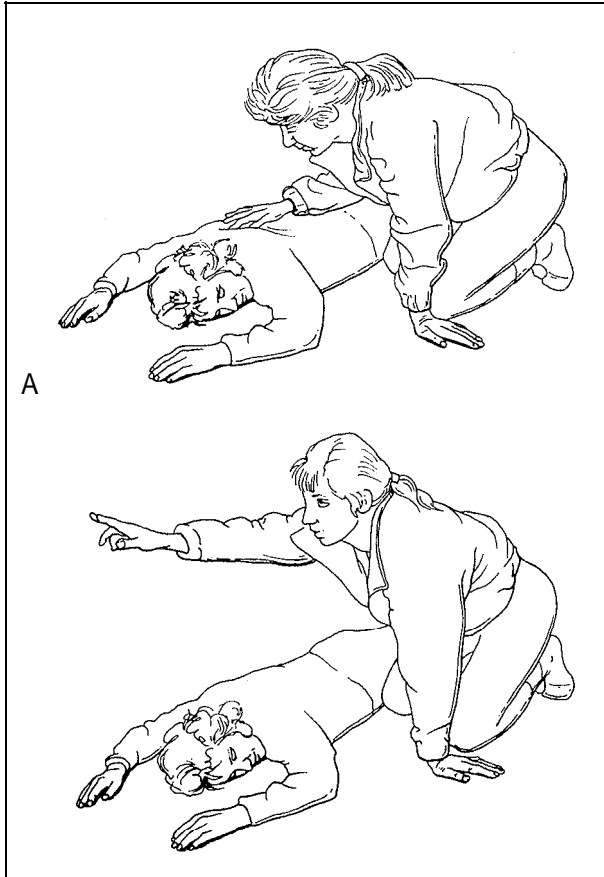


Figure 27.2A
Following the basic steps of cardiopulmonary resuscitation (CPR), first establish unresponsiveness. Gently tap or shake the victim and shout, "Are you okay?"

Figure 27.2B
If you cannot arouse the victim, shout for help.

in order for CPR to be effective. To turn over someone who is face down, first take the arm closest to you and stretch it out straight over his or her head. With one hand behind the victim's neck for support, grasp the other arm above the elbow and roll him or her toward you. Once the victim has been turned, place the arms alongside the body. (Positioning the victim should take four to ten seconds.)

3. OPEN THE AIRWAY

When a person loses consciousness, the tongue slackens, falling against the back of the throat, which cuts off the air supply from the mouth and nose to the lungs. To open the airway, place the hand that is closer to the top of the victim's head across the forehead and place the middle fingers of the other hand on the bony part of the jaw under the chin. Push down and back on the forehead while lifting the chin up. Since the tongue is attached to the lower jaw, this head-tilt/chin-lift maneuver lifts it away from the back

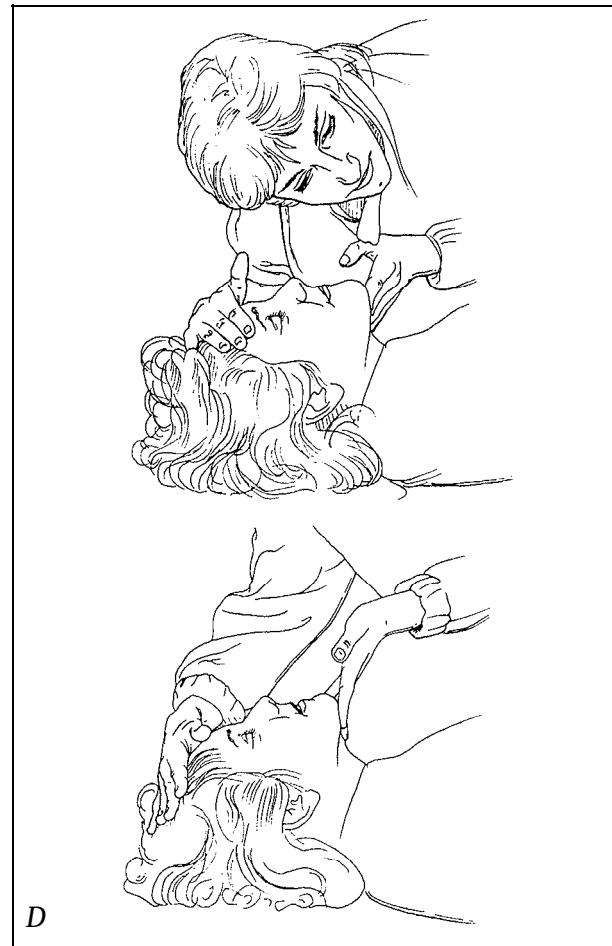
of the throat and will usually open the airway. (See Figures 27.2 C-D.)

4. CHECK FOR BREATHING

Keeping the head tilted, check for signs of breathing. Place your ear over the victim's mouth and listen for the sounds of breathing; at the same time, look to see whether the victim's chest is rising and falling and check for the feel of exhaled air on your cheek. You must hear or feel air to know that the person is breathing; chest movement alone is not always a reliable indicator. Sometimes just opening the airway will allow the victim to resume breathing. If breathing does not start spontaneously and immediately, go to the next step. (*Checking for breathing should take three to five seconds.*)

Figure 27.2C
An individual who is not lying on his or her back must be repositioned. This is done by stretching the arm over the head. While supporting the victim's neck, gently roll him or her over. To open the airway, place one hand across the forehead and the middle fingers of the other hand on the bony part of the jaw under the chin.

Figure 27.2D
Push down and back on the forehead while lifting up the chin. Then check for breathing.



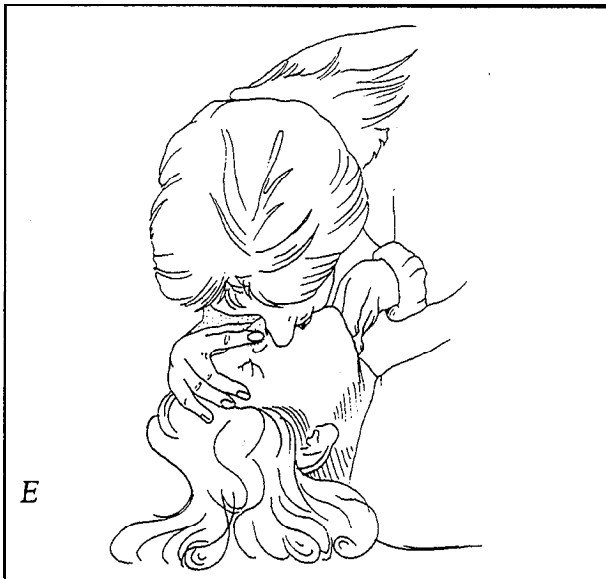


Figure 27.2E
 Keeping the head tilted, pinch the victim's nostrils with your thumb and forefinger. Place your lips around the victim's mouth to make a tight seal. Give two forceful breaths, each taking 1 to 1½ seconds.

5. GIVE TWO RESCUE BREATHS

Maintaining the head tilt, use the thumb and forefinger of your hand that is on the victim's forehead to pinch off his or her nostrils to keep air from escaping from the nose. Breathe deeply, open your mouth wide, and place your lips around the outside of the victim's mouth to make an airtight seal. (If the victim wears dentures, leave them in so that you can get a tighter seal.) Exhale forcefully—but not too quickly—into the victim's mouth. Remove your mouth, take another deep breath, reestablish the seal, and exhale into the victim's mouth again. Each breath should take one to one and a half seconds. (See Figure 27.2E.) Watch for the chest to rise or expand as you blow air into the lungs. The victim's lungs should deflate between breaths. (When this happens, you will see the chest fall).

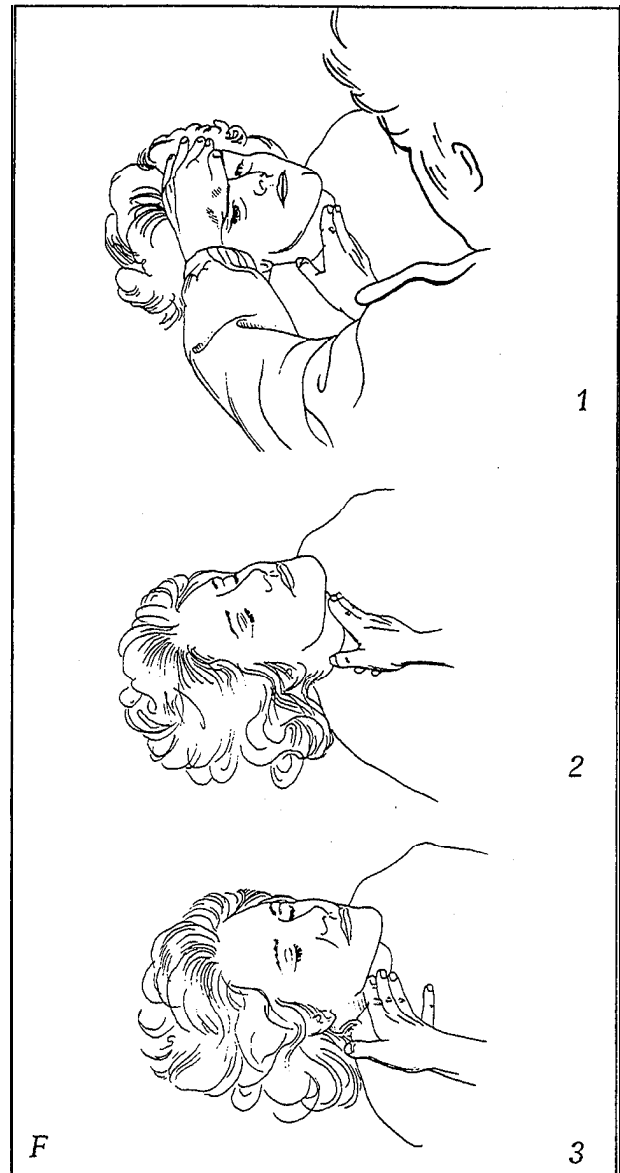
If you cannot feel the air going in as you blow and you do not see the victim's chest rise and fall, reposition the victim's head by attempting to open the airway again, and then repeat the two breaths. If you are still unsuccessful, assume the airway is obstructed and use the technique described later in the chapter for obstructed airways.

6. CHECK FOR CIRCULATION

To determine whether blood is circulating, you must check for a pulse. The best place to do this is on the carotid arteries, located on either side of the neck. While continuing to maintain the head tilt by keeping your hand on the victim's forehead, place two fingers

of your other hand on the voice box (Adam's apple). Then slide your fingers into the groove on the side of the neck nearest you and press gently. If you don't feel a pulse, move your fingers around a little. (See Figure 27.2F.) If you still cannot detect a pulse, your suspicions of cardiac arrest are confirmed, and you will need to initiate chest compressions to create artificial circulation of blood to the lungs, heart, brain, and other organs. (See box, "The Chest Thump.") If there is a pulse, performing chest compressions may result in serious medical complications. (Checking for circulation should take five to ten seconds.)

Figure 27.2F
 1) While checking the pulse, maintain the open airway by keeping the head tilted with your hand on the forehead.
 2) To check the pulse, place two fingers on the Adam's apple.
 3) Then slide fingers into the groove on the side of the neck, and press gently to find the pulse. If the victim has no pulse, start chest compressions.



The Chest Thump

When a patient is in complete cardiac arrest, the heart is not pumping any blood. Sometimes a quick thump on the chest with the fist can restart the heart spontaneously, obviating the need for chest compressions. The chest thump should only be done in cases of a witnessed arrest—when you have actually seen the patient slump over and become unconscious.

When CPR was first taught to laypersons in the early 1970s, the chest thump was included as part of the procedure. In order to simplify instruction and because the chest thump was on occasion misused, the American Heart Association and other organizations have now dropped it from the curriculum. At Yale, however, we feel that it is a useful lifesaving technique. It only delays the start of chest compressions by a few seconds and may, in fact, make them unnecessary. We teach it to our personnel and we are recommending it here. In the case of a witnessed arrest, make a fist with one hand, enclosing the thumb in the fingers. Hold your fist as if you were going to pound it on a table. Give a strong blow to the center of the chest across the bottom third of the breastbone. Check the pulse again. If the pulse does not return, begin chest compressions.

7. CALL 911 TO ACTIVATE THE EMERGENCY MEDICAL SERVICE (EMS) SYSTEM

If there is a pulse, but no breathing, continue rescue breathing. If there is no pulse, start compressions as well. In either case, if no one was around earlier to call EMS, the rescuer should stop now, call EMS, and return to the victim as quickly as possible.

8. PERFORM RESCUE BREATHING

If you detect a pulse but there is no breathing, start rescue breathing. Use the same technique as you did for the initial two breaths. Breathe for the victim at a rate of one breath every five seconds, or 12 breaths a minute. Although you will feel some resistance from the victim's lungs, you should be able to feel the air going in as you blow, and you should see the chest rise and fall. Continue until the victim resumes breathing on his or her own or emergency personnel arrive and are ready to take over.

After every 12 breaths, recheck for breathing and pulse. If the pulse disappears, start chest compressions.

9. BEGIN CHEST COMPRESSIONS

If the victim has no pulse, you must start chest compressions. (See also box, "The Chest Thump.") This is best done on a hard surface. If the victim is in bed and you have help or the victim is light enough for you to move, move him or her to the floor. Be sure to protect the head and neck while doing so. On the other hand, if the victim is very heavy and you are alone, it is better to attempt CPR on the bed than to try to move him or her and risk ending up in a position in which you cannot administer CPR at all. Quickly try to find something firm to slide under the victim's back. If nothing is immediately available, attempt CPR anyway.

To begin chest compressions, kneel at right angles to the victim with your knees at about the victim's shoulder level. Reestablish the head tilt by once again pushing down and back on the forehead with the hand closest to the victim's head while using the middle fingers of the other hand to lift the chin up.

Now move your hand from the chin to the abdomen. With the middle and index fingers, locate the bottom margin of the rib cage (on either side and just above the waist) and follow the edge of the rib cage up toward the center of the chest. You will feel a notch where the ribs meet the breastbone; this is the sternum. Place your middle finger on this notch with your index finger next to it. (See Figure 27.2 G.) Place the heel of your other hand on the sternum next to your index finger. Now place your first hand on top of the second (you can either extend the fingers of both hands or interlace them, but to avoid injury to the ribs, only the heel of your hand should come in contact with the chest). (See Figure 27.2H.)

Shift your weight forward on your knees until your shoulders are directly over your hands and your elbows are locked. Keeping your elbows locked, push down 1½ to 2 inches and come up again. To achieve the proper rate and rhythm for the compressions, count out loud: 1 and 2 and 3 and 4 and 5. The compression phase should be the same length as the time between compressions (about a half-second for each). Do not lift your hands from the victim's chest between compressions or you may lose the correct positioning. (See Figure 27.2I.)

After every 15 compressions (counting from 1 to 5 three times), give two breaths. Remove your hands from the chest, perform the head tilt as before, pinch the nostrils, make a tight seal over the victim's mouth with your lips, and give two quick breaths (remember to observe whether the chest is rising in response). Then reestablish the proper hand position for the chest compressions and do another set of 15.

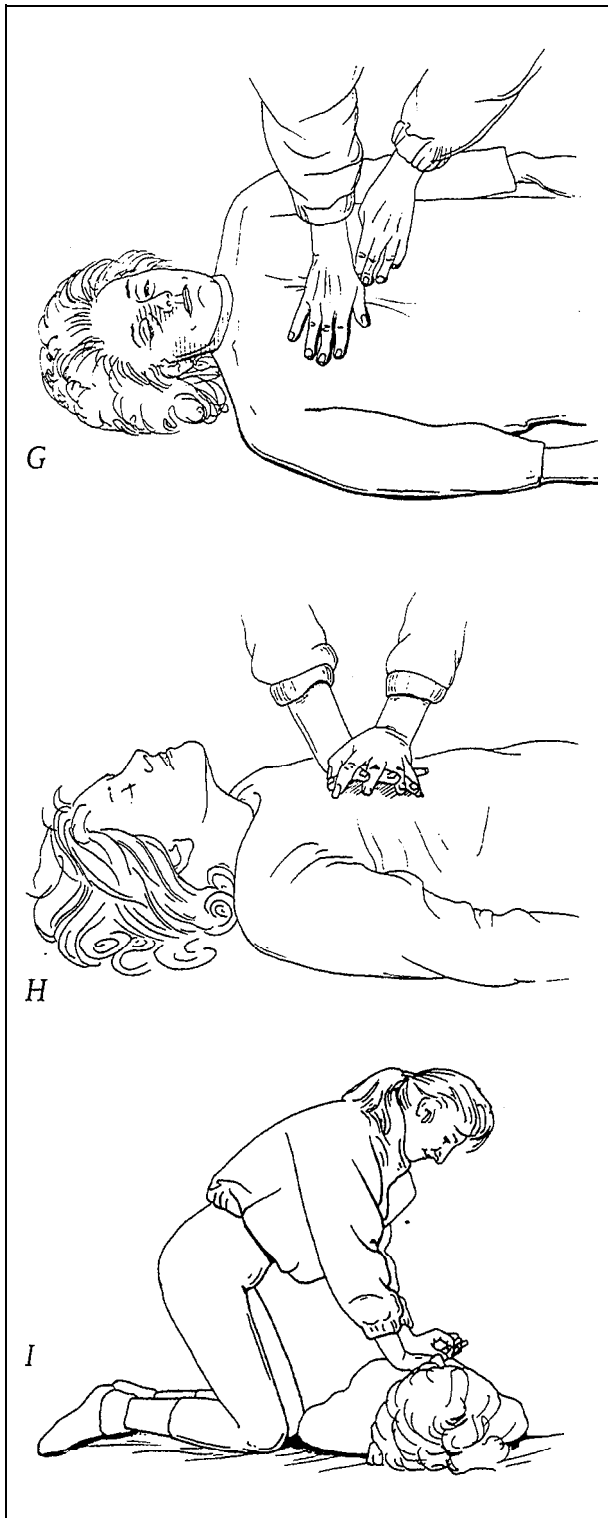


Figure 27.2G
To start chest compressions, position your hands by putting two fingers on the notch where the ribs meet the breast bone (sternum). Place the heel of your other hand next to your index finger.

Figure 27.2H
Now place your first hand on top of the second and either interlace fingers (as shown) or extend them to keep them off the chest.

Figure 27.2I
Shift your weight forward so that your shoulders are over your hands, keeping elbows locked. Push down 1½ to 2 inches with only the heel of your hand, and come up again.

Repeat this cycle of 15 compressions and two breaths four times (which should take about one minute), then reassess the victim for presence of pulse (which should take about five seconds).

If it is still absent, you must continue to perform CPR until:

- The victim regains consciousness (in which case he or she should be taken to the hospital immediately for evaluation and treatment).
- Another qualified lay rescuer or EMS personnel arrive to take over.
- You are too exhausted to continue your efforts.

OBSTRUCTED AIRWAY TECHNIQUES

Sometimes a person is unable to breathe because his or her airway is obstructed by foreign matter. (In adults, this is usually food.) This is not a cardiac emergency, but it may be interpreted as such because the individual may turn blue and may be gasping for air. At first the person is still conscious and may be clutching the throat. A simple way to determine if there is a blockage is to ask, “Are you choking?” If the person in distress cannot speak but can only nod, something is obstructing the windpipe, and you should perform the Heimlich maneuver. If the person can make sounds, then some air is getting through, and it may be better to let him or her clear the airway without your help by coughing or drinking liquids.

HEIMLICH MANEUVER

Stand behind the victim and encircle his or her waist with your arms. (See Figure 27.3A.) Make a fist with one hand, and place it, thumb side toward the victim, slightly above the navel. Grab your fist with your other hand and thrust your fist deliberately and forcefully inward and upward into the victim’s abdomen. (See Figure 27.3B.) Air should be forced upward into the windpipe with enough pressure to expel the foreign matter. If it doesn’t pop out, try again.

TECHNIQUE FOR UNCONSCIOUS PERSONS

If the person is unconscious and not breathing, and you have not already positioned him or her and attempted to open the airway and begin breathing, do

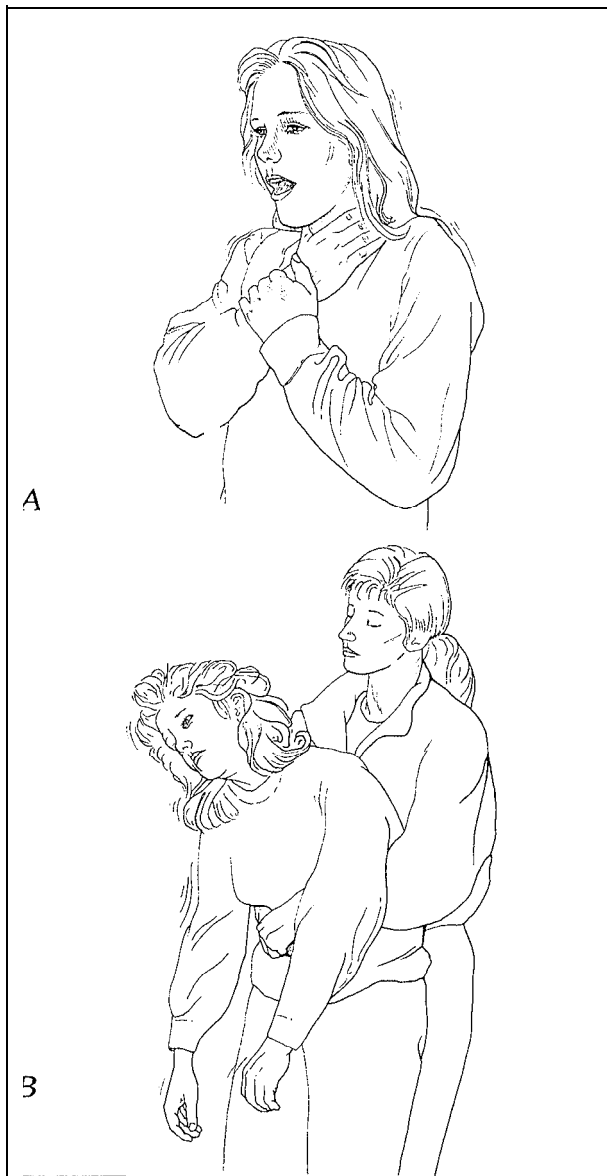


Figure 27.3A

A person who clutches the throat and cannot speak has an obstruction (usually food) in the windpipe. Performing the Heimlich maneuver will usually clear the airway.

Figure 27.3B

To perform the Heimlich maneuver, encircle the victim's waist with your arms from behind. Make a fist and place it slightly above the navel, thumbside toward the victim. Grasp the fist with your other hand and thrust forcefully inward and upward in the victim's abdomen to dislodge the foreign matter. Repeat if necessary.

so now. If you are unsuccessful, check for foreign objects by holding the tongue back and bottom jaw open with one hand while you use a hooked forefinger of your other hand to sweep the insides of the cheeks and throat. (Do not do this with a conscious person.)

Try rescue breathing again. If the airway remains blocked, use the Heimlich maneuver by straddling the victim on your knees and placing the heel of one hand on the person's abdomen just above the navel. With your second hand on top of your first, thrust both hands quickly upward into the abdomen. Give six to ten thrusts, then open the airway and attempt rescue breathing again. If the airway remains blocked, try the finger-sweep method again.

Keep repeating this sequence in rapid order: Heimlich maneuver, finger sweep, and rescue breathing. Without oxygen, the muscles relax; what was unsuccessful before may now work.

With pregnant or very obese persons, use the same technique but place your hands on the chest rather than the abdomen.

LEGAL ASPECTS OF CPR

Finally, a word about your legal obligations and liabilities. If you take a CPR course and become certified in basic life support, you may have a legal obligation to render assistance during a cardiac event or other medical emergency. However, "Good Samaritan" statutes will most likely protect you against legal action should the victim die, suffer irreversible brain damage before an EMS team arrives on the scene, or be injured as a result of the chest compressions or other lifesaving measures that may have been necessary. There are no known cases in which a layperson who performed CPR in good faith has been successfully sued.