

ADULT CPR with AED

FOLLOWS 2010 ECC/ILCOR GUIDELINES

Updated with 2015 Guidelines



Welcome!

We're excited that you've decided to take CPR, and that you've chosen us to direct your learning experience.

Despite technological advances and new scientific discoveries, heart disease remains the number one cause of death globally, with 17.3 million deaths per year; 38.7% of cases of out of hospital cardiac arrests (OHCA) are witnessed by a bystander (AHA, 2015). Learning CPR can save lives- you can save a life.

In this course, you will learn:

- The Chain of Survival and your place within the chain
- How to provide high quality chest compressions for adults
- How to initiate early use of an AED (automated external defibrillator)
- How to provide rescue breathing for victims of respiratory arrest
- How to provide CPR with 2 rescuers
- How to assist adult victims of choking

Let's get started!



The Five Fears

Many bystanders are reluctant to perform CPR. There are many reasons why bystanders are reluctant to get involved. Let's take a look at some of these reasons so that you can understand why they have no real basis of support.

Fear of Disease: Use universal precautions when the possibility exists of coming into contact with bodily fluids. Use gloves, mask, and/or gown when you have them available. The benefit of initiating lifesaving resuscitation in a patient in cardiopulmonary arrest greatly outweighs the risk for secondary infection in the rescuer or the patient. Nevertheless, use of simple infection-control measures during CPR and CPR training can reduce a very low level of risk even further (Mejicano & Maki, 1998).



Fear of Lawsuits: These laws state that a person acting in good faith who is rendering reasonable first aid will not be held accountable for damages to the person to whom the aid is rendered, unless gross and willful misconduct are involved. Good Samaritan laws may differ for professional health care providers versus lay rescuers from state to state. Implied consent means that there is an assumption that if an unconscious person were able to request care, they would do so.



Fear of Uncertainty: People sometimes fear that they won't remember what to do. Remembering the correct number of compressions or the number of compressions to ventilations is not as important as the willingness to respond and to push hard and fast. Hands-only CPR is designed to provide simple life support. No mask, no worry- performing compressions alone has been shown to be effective at saving lives.



Fear of Harming the Victim: A victim in need or clinically dead can only be helped by your intervention efforts. You can't hurt someone who is dead, and any injuries you may unknowingly cause (such as injured ribs) can be dealt with in a surviving victim of cardiac arrest.



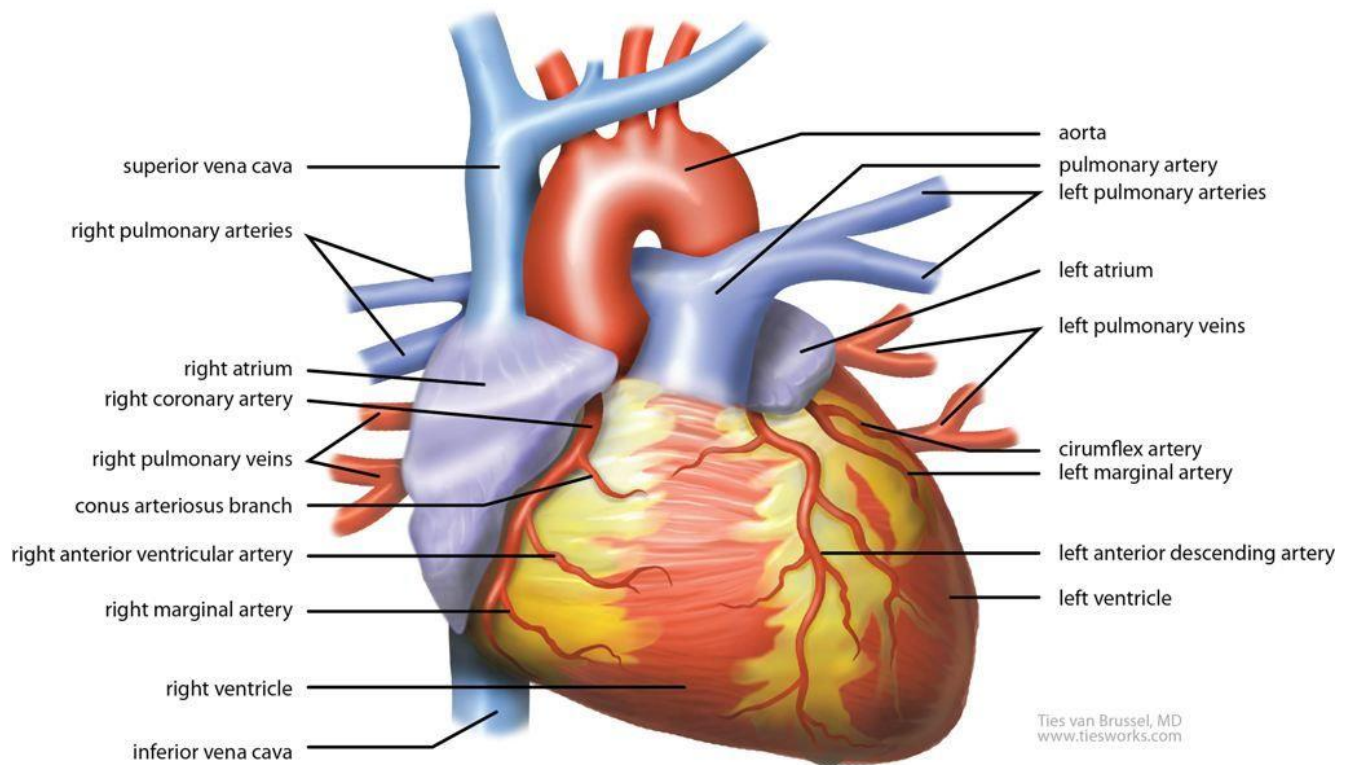
Fear of Injury to Self: As you will learn, scene safety is of utmost importance, and checking the scene for safety should be your first action when you come across an unconscious victim. If the scene is not safe for you to enter, you must not enter. This will only result in more victims. Under no circumstances should you risk becoming a victim. Instead, you should call for help (activate EMS).



BASIC ANATOMY AND PHYSIOLOGY

Before you learn how to perform CPR, it's important to understand how the heart, lungs, brain and cells perform. Here is a brief review of these systems.

THE HEART



The heart consists of four chambers, the right and left atria (singular: atrium) and the right and left ventricles. The atria are located above the ventricles, as can be seen in the above diagram. The heart is a muscular organ supplied by the coronary arteries. It is located below your breastbone (sternum) and, in an adult, is approximately the size of your fist.

The heart pumps blood that has been deoxygenated after supplying the body's tissues into the lungs, and when that blood has been oxygenated again in the lungs, it exits the lungs to the left

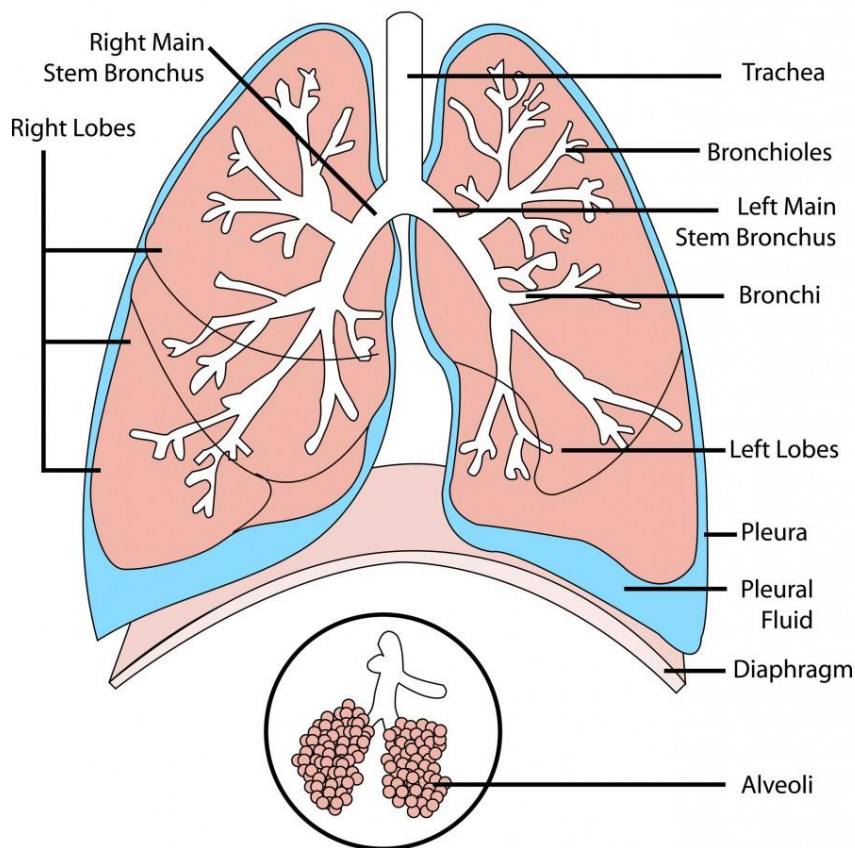
side of the heart, where it is pumped out into the body once again, to provide oxygen to the vital organs.

Your body has about 5 liters of blood, which circulate through this system approximately 3 times per minute.

What is known as the cardiovascular system is composed of the heart, arteries, capillaries, and veins.

THE LUNGS

Diagram of the Human Lungs



Your lungs are spongy, air-filled sacs, with one lung located on either side of the chest. The trachea, which is sometimes called the windpipe, conducts air down into the lungs through the

bronchi, which are smaller tubular branches. The bronchi then divide into smaller and smaller tubules called bronchioles. Air is exchanged in the alveoli, which are tiny sacs that allow oxygen and carbon dioxide to move between the lungs and the bloodstream via tiny capillaries.

Your lungs take in oxygen to supply your body's organs and tissues. They release carbon dioxide, a waste product, into the atmosphere when you exhale.

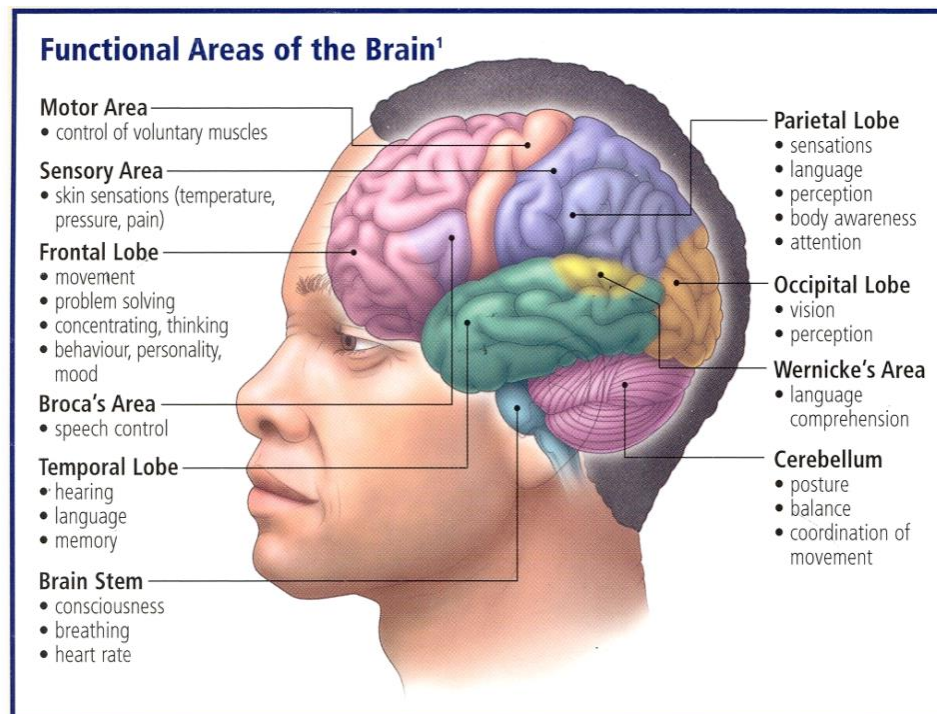
Room air at regular atmospheric pressure contains 21% oxygen. Our bodies utilize approximately 4-6% of that oxygen and release about 16-17% back into the atmosphere, along with carbon dioxide, when we exhale. This 16-17% that we exhale can provide just enough oxygen to sustain someone in cardiac arrest, at least for a short time.

THE BRAIN

Your brain needs a constant supply of oxygen. Without oxygen, brain cells begin to die in 4 to 6 minutes.

On average, the brain weighs three pounds, and uses a whopping 20% of the body's oxygen!

The medulla is located in the brain stem and controls automatic bodily functions, including consciousness and respiratory and cardiovascular function.



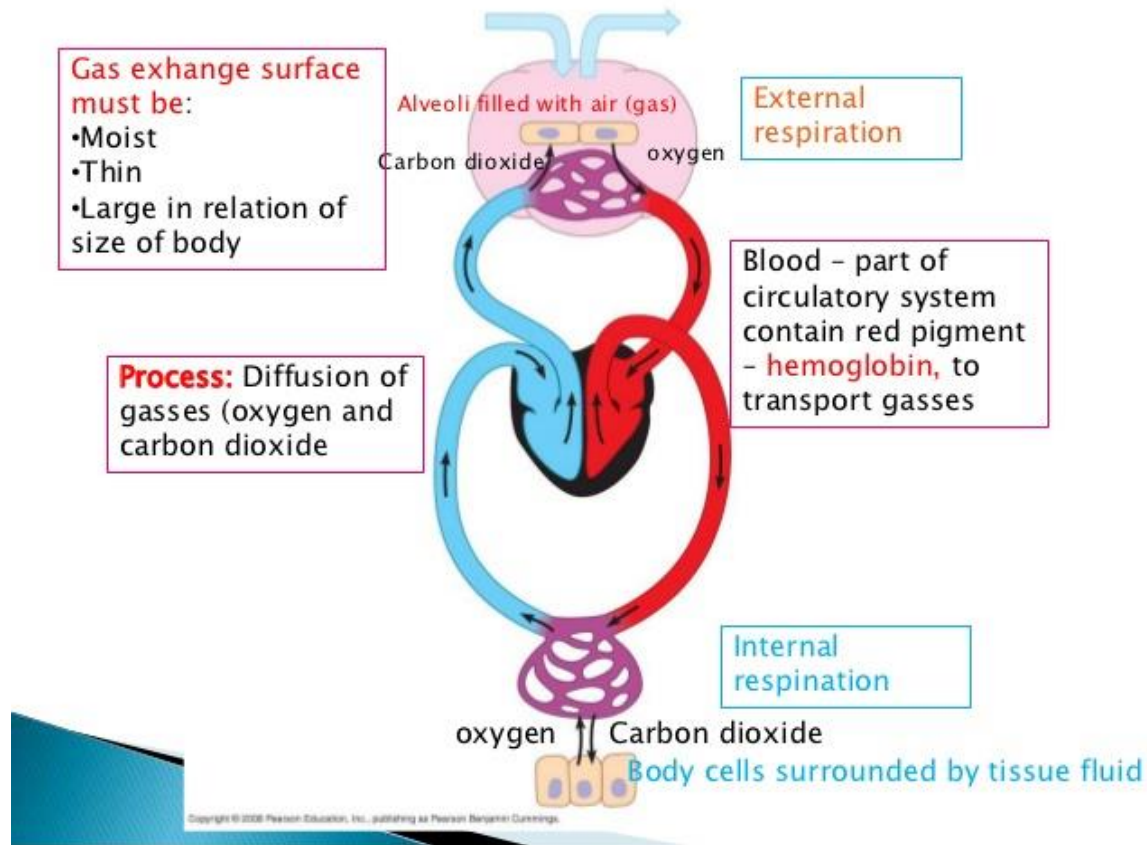
THE BODY'S CELLS

All of the body's tissues are made up of cells.

All cells require oxygen to carry out their normal functions. They also require nutrients. Oxygen deprivation, or hypoxia, will cause cells to die within a few short minutes.

The body's cells use oxygen and produce carbon dioxide as a waste product. Carbon dioxide must be eliminated via the lungs through ventilation.

Red blood cells transport oxygen throughout the body.



CARDIOVASCULAR DISEASE

As mentioned previously, cardiovascular disease is the number one cause of death worldwide. While it is important to learn what to do when cardiovascular disease leads to a heart attack or stroke, it is equally as important, if not more so, to understand how to prevent cardiovascular disease from occurring in the first place.

There are numerous factors that can increase an individual's risk of heart attack. Some of these factors can be controlled (modifiable risk factors), while others cannot (non-modifiable risk factors).

Modifiable risk factors, or factors that can be controlled to a certain degree by an individual, include:

- cigarette smoking
- hypertension
- obesity
- sedentary lifestyle (lack of exercise)
- high cholesterol
- high blood sugar (in diabetes)
- poor diet (diet high in sugar, fat)
- stress

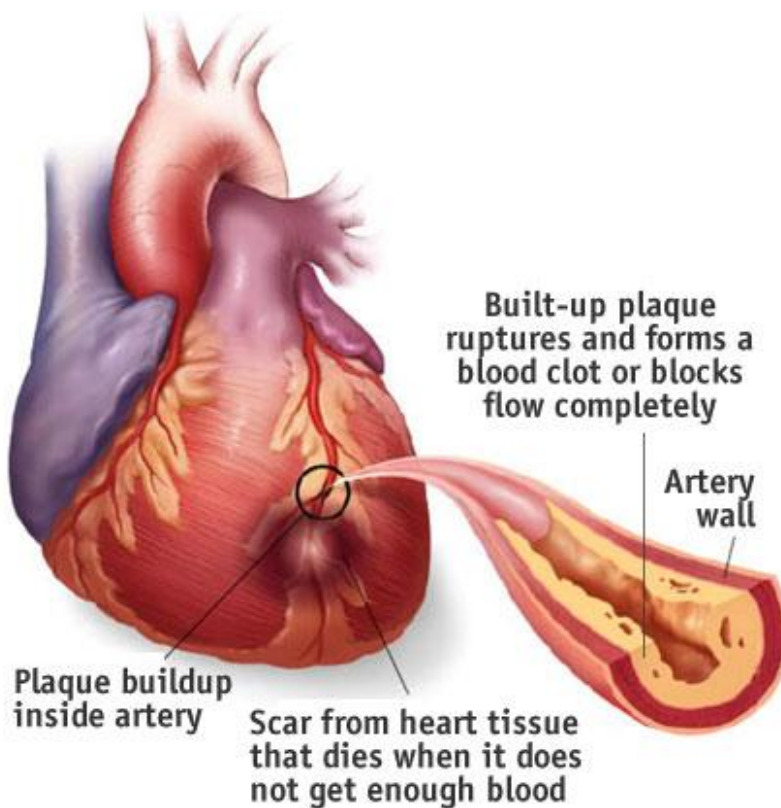
Non-modifiable risk factors, or risk factors that individuals cannot change, include:

- age
- sex
- genetics/hereditary factors (i.e. hereditary high cholesterol or hyperlipidemia)
- race (i.e., certain groups may be at higher risk for hypertension, or high blood pressure)

CARDIOVASCULAR DISEASE IS THE NUMBER ONE CAUSE OF DEATH IN THE UNITED STATES, ACCORDING TO THE CENTER FOR DISEASE CONTROL (CDC). THE CDC ESTIMATES THAT MORE THAN 650,000 AMERICANS DIE FROM CARDIOVASCULAR DISEASE (1 in 4 DEATHS) EACH YEAR IN THE UNITED STATES.

Cardiovascular disease damages the heart and blood vessels, and frequently causes heart attack and/or stroke. Americans of all ages should focus on prevention of cardiovascular disease by eating healthy foods, exercising 30 minutes (at least) each day, controlling weight, minimizing stress, consuming healthy fats and oils, and avoiding cigarette or cigar smoking.

Atherosclerosis, or hardening of the arteries, is a condition caused by the building up of plaque inside the body's arteries, the large blood vessels that carry blood away from the heart to the body's organs. Plaque is composed of fatty substances, cholesterol, fibrin (a clotting substance in the blood), calcium and cellular waste products. When plaque builds up, it can partially or totally block the flow of blood through an artery in the brain (which causes stroke), the heart (which causes a heart attack), the kidneys, the arms, the legs and other vital areas. Plaque may break off to block an artery, or a blood clot (thrombus) may form on the surface of the plaque—either of these two circumstances can lead to a heart attack or stroke.



HEART ATTACK

A heart attack often presents with one or more of the following symptoms:

- Chest tightness, pressure, or discomfort
- Nausea
- Sweating
- Shortness of breath
- Fatigue
- Weakness
- Pain in the jaw or arm
- Pallor (pale color of the skin)

Women and people with diabetes often present with atypical symptoms, such as nausea and vomiting or back pain. About one-third of patients report no chest pain at all.

WHAT CAN YOU DO?



- **Recognize** the symptoms and signs of a heart attack.
- **Call 911.**
- Don't let the patient drive him or herself to the hospital
- Keep the patient calm and seated in a position that is comfortable.
- **Offer 1 adult aspirin or 2 baby aspirin-** aspirin should be chewed before swallowing to speed absorption (Note: do not give if the patient has already taken aspirin or if the patient has an allergy to aspirin)
- Be prepared to start CPR if it becomes necessary

STROKE

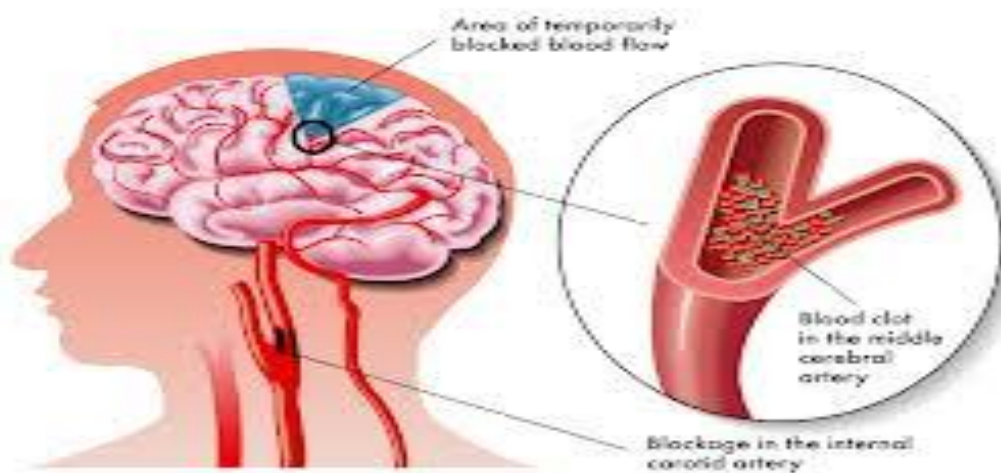
You should suspect stroke if a patient or victim presents with:

- Severe headache with no known cause
- Numbness or weakness of the face, arm or leg on one side of the body
- Drooping eyelid or mouth on one side
- Confusion or trouble understanding
- Difficulty speaking (slurred speech or difficulty finding words)
- Loss of balance or coordination
- Dizziness
- Trouble with vision (i.e. blurred or double vision, loss of vision in one eye)

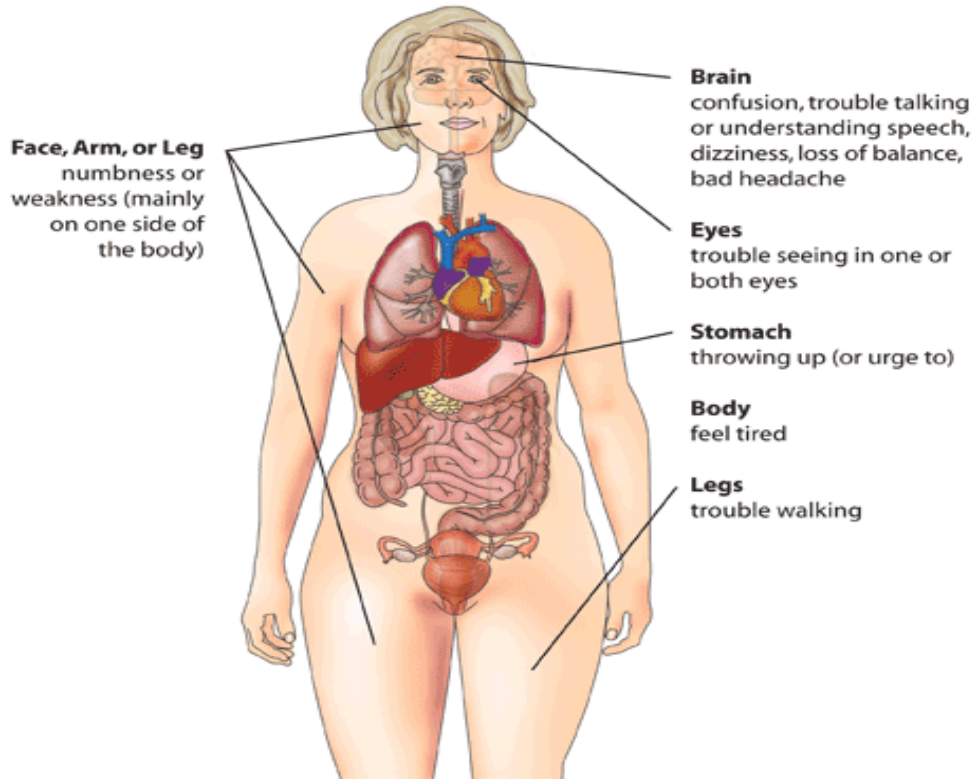
WHAT CAN YOU DO?

- **Know the signs and symptoms** of a stroke
- **Call 911**
- Don't give the patient food or drink
- Keep the patient calm and quiet
- Monitor the patient
- Be prepared to begin CPR if it becomes necessary

A stroke is caused by one of two mechanisms: it can be caused by a ruptured blood vessel in the brain (called a hemorrhagic stroke) or by a blockage in one of the arteries that causes loss of blood flow and oxygen to a part of the brain (called an ischemic stroke). Ischemic strokes are more common. Remember that "Time is brain," and act quickly. Stroke is the 3rd leading cause of death in the United States.



Signs of a Stroke



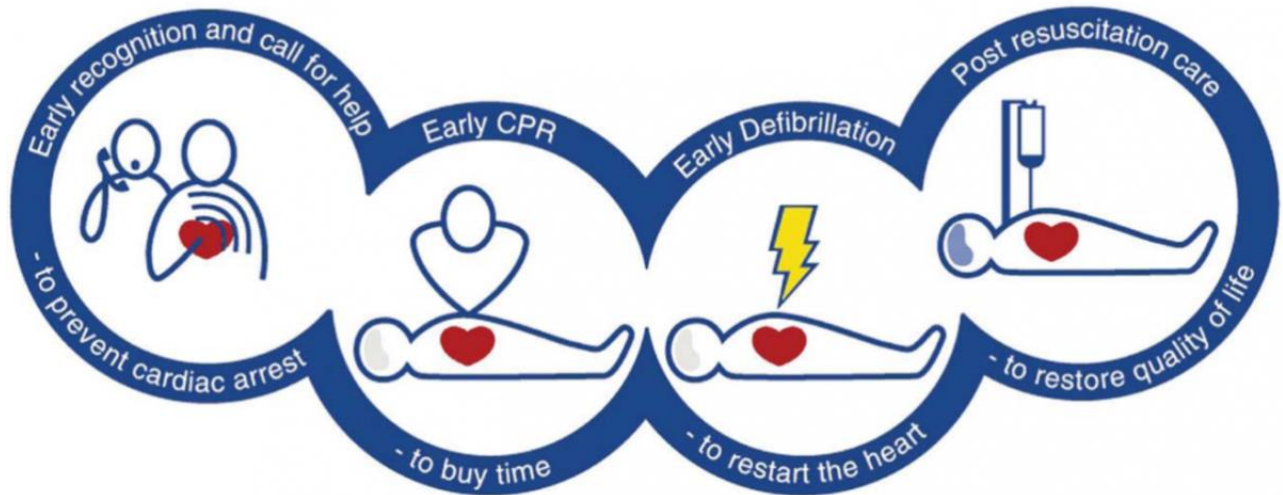
Guideline Changes

For anyone who has taken CPR prior to 2010, there have been a few key changes since the 2010 Guidelines were instituted. These changes include:

- Changing from the ABCs (Airway-Breathing-Circulation) to a C-A-B sequence of steps. This was one of the major changes that took place in 2010, when research showed that decreasing the delay in beginning chest compressions lead to a higher incidence of ROSC (return of spontaneous circulation). Rescuers are now trained to provide interventions in the following order: 1) Chest Compressions, 2) Airway, and 3) Breathing. Decreasing the delay in beginning compressions increases survival rates.
- The removal of “Look, listen and feel” for breathing. It is often hard for even trained providers to identify effective breathing. It is no longer recommended to look, listen and feel to determine whether a victim is breathing. Rather, if the victim is not responsive, has no pulse, and is not breathing or is breathing in an irregular fashion (i.e. only gasping), begin CPR immediately!
- Emphasis on high-quality CPR. High-quality CPR is defined as:
 - Compression rate of 100- 120 beats per minute on victims of all ages;
 - Compression depth of AT LEAST 2 inches in adults (but no greater than 2.4 inches). Allow the chest to completely expand (recoil) after each compression (do not lean on the chest between compressions);
 - Not interrupting CPR except to use an AED (keep interruptions in chest compressions to less than 10 seconds);
 - Avoiding excessive ventilations;
 - Above all else, PUSH HARD AND FAST!
- Since many responders (even professionals) are unable to feel or palpate a pulse quickly, the recommendation is to feel for a pulse for NO MORE THAN 10 seconds. If you can't feel a pulse or if you're not sure you can feel a pulse, begin CPR.
- It has been recognized that health care professionals should call for assistance when they come upon an unconscious victim, but they may also simultaneously assess breathing and check for a pulse before fully activating the emergency response system. This may encourage efficiency in assessment and response, rather than following a step-by-step response.
- Health care professionals may tailor their response to an unconscious victim by altering the response sequence to fit the situation or scenario (using an AED immediately when one is close by and the arrest is witnessed, or providing ventilations first when the cause of arrest is known to be an anoxic event (i.e. drowning).

- Rescuers should provide 1 breath every 6 seconds when an advanced airway is in place and compressions are ongoing continuously (rather than trying to remember a range of ventilations for adults, children and infants).

The Adult Chain of Survival



The Adult Chain of Survival represents a continuum of care, from early recognition of the victim in cardiac arrest to post-resuscitation care to provide the best chance of survival from cardiac arrest. The five links in the Adult Chain of Survival include:

- Early recognition of cardiac arrest
- Activation of the Emergency Response System
- Early CPR, with an emphasis on high-quality chest compressions
- Early defibrillation
- Comprehensive post- cardiac arrest care

Note that in the diagram above, the first two of the five steps (early recognition of cardiac arrest and activation of the emergency response system) have been combined to acknowledge the fact that these steps often occur simultaneously when multiple rescuers are present.

THE TEAM APPROACH

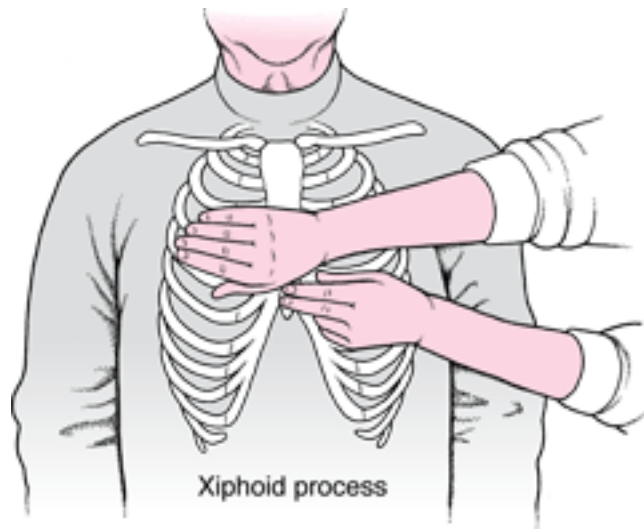
In many situations, there may be only one rescuer who will carry out the normal sequence of assessments and actions. However, in many situations, there is often more than one rescuer trained and willing to help.

This is when a team approach can be used. The first rescuer should take the role of team leader and delegate tasks. One rescuer can provide compressions, one can prepare to give breaths with a bag-valve mask, and one can prepare the AED. By working together, the most efficient care can be given to the patient.

Chest Compressions for Adults

Chest compressions are the most important component of CPR. Chest compressions are an attempt to mimic the normal activity of the heart. When a rescuer presses down on a victim's chest, blood is forced out of the heart and into the arteries. When pressure on the chest is released, blood is allowed to return to the heart. A small amount of oxygen will be present in the bloodstream for several minutes after the heart ceases to beat, just enough to keep the brain alive. Compressions can keep vital organs functioning until higher level care is available.

Adult Chest Compressions



To perform compressions on an adult, place the heel of your non-dominant hand on the victim's chest between the nipples. Then place your other hand on top of the first and interlace your fingers. The heel of your hand should be pressing on the bottom two-thirds of the sternum, avoiding the xiphoid process (the small bony prominence at the very bottom of the sternum (breastbone)). You should be as close to the victim's side as possible, with your knees against the victim's side (this will help prevent back injury). Lock your elbows and press down hard, depressing the sternum at least 2 inches (5 cm), but no more than 2.4 inches (6 cm). Your shoulders should be positioned directly over your hands in a straight line. Push hard and fast 100 to 120 times per minute, counting out loud as you do so. It's important that you allow the chest to recoil (return to its normal, relaxed position) in between compressions. If you do not allow the chest to recoil, the heart will not fill completely, which means that less blood (and therefore oxygen) will be pumped out of the heart to vital organs with the next compression.



Performing compressions is exhausting. Most people find that they become very tired after providing compressions for 2 or 3 minutes. When a person performing compressions becomes fatigued, there is a tendency to compress less firmly and more

slowly; for this reason, it is recommended that rescuers trade off doing compressions every 2 minutes to prevent fatigue and optimize the quality of compressions. If you are alone, you will have to do the best you can- keep performing compressions until help arrives or you are physically so exhausted that you cannot continue.

One Rescuer Adult CPR

If you are alone and come across an individual who is down, follow the steps below. If someone else is in the area to assist, use the 'Two Rescuer' sequence.

Stay Safe: If you come upon an individual who may need CPR, look around and make sure you and the victim are in a safe place. For example, if the victim is in water or on a road, try to move the victim to a safer area. If you are in a safe area, do not try to move the victim as he/she may have other injuries (i.e., to the head or neck) that you cannot see. Simply roll him over onto his back. Make sure the victim is on a firm surface, in case compressions are needed.

Assess the Victim: To quickly assess the victim, shake his shoulder and yell at him. Check for breathing. If he/she is not breathing, or is not breathing normally (i.e., only gasping), you must summon help. Note: *Agonal breathing* is breathing that is very slow, shallow and/or gasping. Agonal breathing is a sign that the victim is dying. It is important not to mistake agonal breathing for normal breathing!

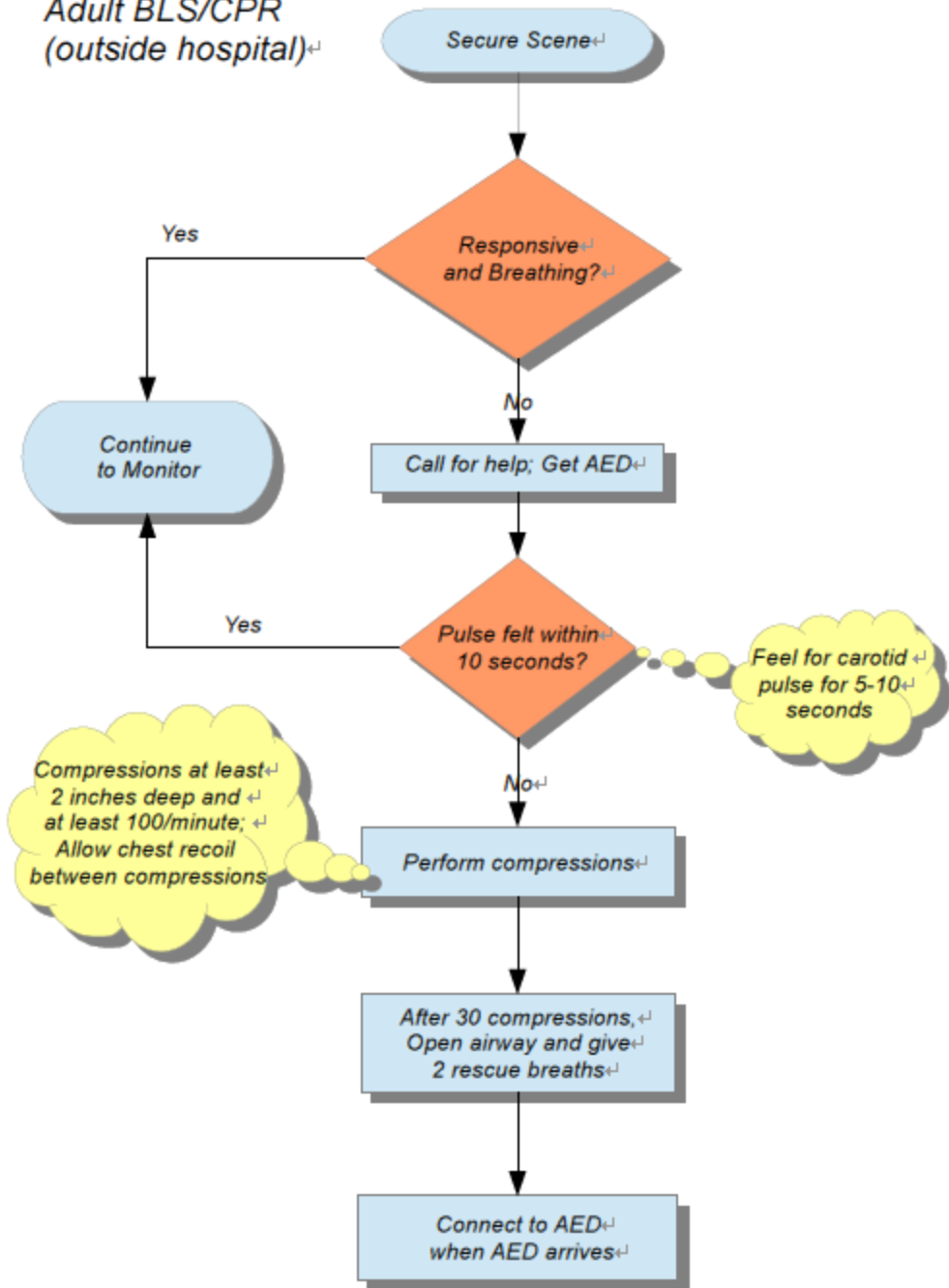
Activate the Emergency Response System and Find an AED: Yell for help. If someone responds, tell him/her to call for help by dialing 9-1-1. If you are in an area where an AED may be available, tell him to go find the AED. Make sure you tell the person to return to assist you as soon as possible. If you are alone, call for help by dialing 9-1-1 and run to get the AED if you know where one is nearby. If you do not know where an AED is, begin CPR immediately after calling for help. Mobile phones have made activating the emergency response system much easier- you can call 9-1-1 and put your phone on speaker while you start CPR.

Begin CPR

1. Check for a pulse on the side of the neck. Feel for a pulse for at least 5 seconds but NO MORE THAN 10 seconds. To check for a carotid pulse, slide 2 or 3 fingers into the groove between the windpipe and the neck muscles at the side of the neck.
2. If there is no pulse (or if you are unsure if there is a pulse), begin CPR starting with chest compressions. Provide 30 chest compressions, followed by two breaths. NOTE: If you are not comfortable giving rescue breathing and/or you do not have a mask available, do 'Compression Only' CPR.
 - a. Use the heel of one hand on the lower half of the breastbone in the middle of the chest.
 - b. Place the other hand on top of the first hand.
 - c. Straighten your arms and lock your elbows so that your body weight is over your hands.

- d. The most important part of CPR is to remember to push HARD and FAST. Each compression should be AT LEAST two inches deep (but no more than 2.4 inches) and the rate should be 100-120 compressions per minute.
- e. Be sure to let up on the pressure on the sternum after each compression (chest recoil) so the chest can re-expand and blood can flow back into the heart. The purpose of CPR is to help the blood flow through the heart and into the rest of the vital organs; if you allow the chest to re-expand, more blood will flow into the heart and will be available to deliver to the rest of the body.
- f. Count out loud as you do compressions. When you have done 30 compressions, try to open the victim's airway by doing a head tilt/chin lift. Note that if you are doing 'Compressions Only' CPR, you can skip this step.
 - i. With your non-dominant hand, push on the victim's forehead to tilt the head back.
 - ii. With your dominant hand, place your fingers under the bony part of the lower jaw and gently lift the jaw to bring the chin forward. Be sure you lift up on the bony part of the jaw and not the soft tissue under the jaw so you don't block the victim's airway. Do not use your thumb to lift the jaw. Allow the victim's mouth to remain slightly open.
 - iii. If you think the person's neck may be injured, avoid the head tilt/chin lift. Use the jaw thrust maneuver if you have been trained to do so.
- g. If you have a barrier device to use between your mouth and the victim's face, use it. Although the risk of infection from performing CPR is very, very low, it is expected that healthcare workers use a barrier device when providing CPR. This includes the use of face masks or bag-mask devices (see next section). Give each breath slowly – each breath should last one second. Make sure the chest rises with each breath. Repeat, giving a second breath.
- h. Start another cycle of chest compressions. Remember, push HARD and FAST. Alternate chest compressions (30) and giving breaths (2) until help arrives.

Adult BLS/CPR
(outside hospital)



Airway/ Breathing

Face masks provide a barrier between the rescuer and the victim. Some masks are equipped with a one-way valve that allows the rescuer's breaths to enter the victim's airway, but prevents the victim's expired air from entering the rescuer's airway. These masks also prevent contact with vomitus and blood, which could pose an infection risk to the rescuer. It takes practice to learn how to use these masks effectively to provide ventilations.

Using a Face Mask:

- a) Position yourself at the victim's side. If you are a lone (single) rescuer, positioning yourself at the victim's side will allow you to provide both ventilations and compressions without having to move.
- b) Position the mask on the victim's face. Masks are usually triangular in shape, and you will notice that the mask has a "pointy" end- this end goes over the bridge of the victim's nose.
- c) Seal the mask against the victim's face. To do this, take the hand that is closest to the top of the victim's head and place it along the edge of the mask. Some people find it easier to form a 'C' with their index finger and thumb and use these digits to grasp the mask around the base of the mouthpiece. With the thumb of your other hand, apply pressure along the bottom edge of the mask. Then place the remaining fingers of your second hand along the bony edge of the jaw and lift the jaw upwards. Open the airway by performing a head-tilt chin-lift procedure. While you lift the jaw, ensure that you are sealing the mask all the way around the outside edge of the mask to obtain a good seal against the victim's face.
- d) Deliver air over 1 second, ensuring that the victim's chest rises.
- e) If the victim's chest does not rise, reposition the mask and try to get a better seal. Remember, you should be lifting the victim's jaw into the mask, rather than simply pushing the mask down onto the victim's face.
- f) Provide 2 ventilations over 1 second each with the mask after every 30 compressions.
- g) If the victim has a pulse but is *not breathing*, provide rescue breathing by providing 1 breath every 5 to 6 seconds (10-12 breaths/minute). Check for a pulse every 2 minutes- if there is no pulse, start chest compressions along with ventilations at a rate of 30:2.



Using a Bag-Mask Device:

A bag-mask device (or BVM, bag-valve mask) consists of a mask attached to a reservoir bag. They are commonly used to provide positive-pressure ventilations during CPR. They can be attached to an oxygen source to provide 100% oxygenation during resuscitation. As with the face mask, it takes practice to be able to use a bag-mask device. It can also be very difficult for one person to use a bag-mask device; therefore, it is recommended that use of a bag-mask device be used only when there are two rescuers available.

The steps to using a bag-mask device are as follows:

- a) Position yourself at the top of the victim's head- this allows room for the second rescuer to provide compressions.
- b) Place the mask of the bag-mask device on the victim's face, using the bridge of the patient's nose as a guide to correct positioning.
- c) Use the E-C clamp technique to hold the mask in the correct position while you lift the jaw to obtain an open airway. To perform the E-C clamp technique, take the index finger and thumb of your non-dominant hand and form them into a 'C' around the top of the mask. Your other fingers of the same hand are used to lift the jaw (the 'E' part of the E-C clamp technique).
- d) Squeeze the bag to deliver a breath- each breath should be delivered over 1 second. Watch for chest rise. If you do not observe chest rise, you do not have a tight seal. If this occurs, reposition the mask and try again. Be careful not to overinflate the lungs- each breath should result in visible and *natural* chest rise.
- e) Provide 2 ventilations after every 30 compressions. If the patient has a pulse but is not breathing, provide one breath every 5-6 seconds (10-12 breaths/minute) and check for a

pulse every 2 minutes. If the victim loses their pulse, you will need to begin chest compressions.



The Jaw Thrust Maneuver

If you suspect that a victim may have a neck or spinal cord injury (i.e., the victim has fallen, been in a motor vehicle accident or suffered another mechanism of injury that could result in injury to the neck or spinal cord), you should not use the head tilt-chin lift maneuver to open the victim's airway. This could further damage the neck or spinal cord. Instead, you should use the jaw thrust maneuver to open and maintain the victim's airway.

To perform this maneuver:

- a) Place your hands on either side of the victim's head. Rest your elbows on the surface that the victim is laying on.
- b) Put the fingers of both your hands under the angle of the victim's lower jaw and lift so that the jaw slides forward.
- c) Use your thumb to push the lower lip away from you if the victim's lips close.

Two Rescuer Adult CPR (without an AED)

If you come across a victim who is down and another person is available to help, send that person to activate the Emergency Response System and find an AED while you assess whether the victim needs CPR. When you have determined that the victim requires CPR, start CPR beginning with compressions. When the second person returns (without an AED in this case):

- You should continue chest compressions and count the compressions aloud each time you compress the victim's chest.
- The second rescuer should keep the person's airway open using the head tilt-chin lift maneuver. The second rescuer should give two rescue breaths after every 30 compressions, using a face mask or a bag-mask device.
- You and the second rescuer should switch positions/roles about every two minutes so neither one of you gets tired. If you are counting out loud, two minutes is about 5 cycles of thirty compressions and two breaths. You should change positions sooner if the person doing compressions becomes too tired to perform high-quality compressions.
- Continue switching roles as above until EMS arrives to relieve you or the victim regains consciousness.

Using an AED



An AED, or automated external defibrillator, is a device that has the ability to detect and treat, through electrical energy, the lethal arrhythmias known as ventricular fibrillation and ventricular tachycardia. These rhythms are a common cause of sudden cardiac arrest.

Ventricular fibrillation is a condition in which the lower chambers of the heart, the ventricles, quiver in an unorganized fashion, which renders them incapable of pumping blood to the rest of the body. Untreated, ventricular fibrillation rapidly causes cardiac arrest. Ventricular tachycardia is a rapid rhythm also originating in the ventricles. In ventricular tachycardia, the ventricles contract so quickly, albeit in a somewhat organized fashion, that inadequate blood flow is produced. Ventricular tachycardia often precedes ventricular fibrillation. Both rhythms are lethal if not treated.

An AED sends electrical energy (a 'shock') through the heart, which stuns the heart and allows the normal pacemaker of the heart, usually located in the right atrium, to take over and restore a normal heart rhythm.

Early defibrillation is key to survival in cardiac arrest. For each minute that defibrillation is delayed, the chance of survival is reduced by 10%. (after 10 minutes, few people are successfully resuscitated.)

Early defibrillation can increase survival rates to greater than 50%. Rescuers should immediately begin chest compressions, and use the AED as soon as it is available and ready to use.

AEDs can be found wherever crowds of people gather- swimming pools, airports, malls, sporting arenas, schools, hotels...More and more businesses are also investing in these life-saving machines. In some communities, private AED owners are registering their AEDs with ambulance dispatch, so that they can be easily located by bystanders when needed. Make it a point to learn where the AEDs in your neighborhood or town are located- you never know when you might need one!



AEDs have been designed to be extremely “user friendly”. All you need to do as a rescuer is turn on the machine (the most important step) and listen as the machine guides you through the steps to use the AED safely and effectively. Although there are many brands of AEDs on the market, they all work in a similar fashion and are designed to be used by lay rescuers.

When an AED becomes available (i.e., when you or another rescuer have retrieved it), place it at the victim's side, closest to the rescuer who will operate it. In this way, the other rescuer can continue performing CPR until the AED is ready to analyze and deliver a shock (if needed).

There are four universal steps to using any AED. These will be highlighted in the following list of steps so they are easily recognizable.

The steps to use an AED are as follows:

1. **Turn on the machine.** This is the most important step- turning on the machine will enable the AED unit to guide you through the next steps. To turn on the AED, open the top of the carrying case and push the ON button. Note: some models will turn on automatically when you lift the lid of the carrying case.
2. **ATTACH AED pads** to the victim's bare chest. Expose the patient's chest. Dry it off if wet, shave excessive hair if possible. Use adult pads for victims who are 8 years of age or older. Peel off the adhesive backing. Place one pad on the upper right chest just below the collarbone. Place the other pad on the patient's lower left ribcage, a couple of centimeters beneath the armpit. Some pads are marked- there will be a red heart on the pad that is to be placed on the victim's left side (the heart side). Press pads firmly onto the patient's chest. Then attach the connecting cables to the AED unit. Note: some cables will come preconnected.
3. **Analyze the rhythm.** When the AED unit instructs you to, CLEAR the victim while the machine is analyzing the victim's heart rhythm. This means you should ensure that no one is touching the victim, including yourself. The rescuer performing chest compressions or giving breaths will need to stop at this point. Note: some AEDs will begin to analyze the victim's rhythm independently; for others, you will need to push the ANALYZE button. Analyzing the victim's rhythm will take up to 10 seconds, so don't be alarmed by this.
4. **Push to shock.** If a shock is advised, the machine will clearly state "SHOCK ADVISED, STAND CLEAR". You should ensure that no one is touching the victim, including yourself. You need to look around to make sure no one is touching the victim's body while stating "CLEAR" or some similar message that warns others a shock is to be delivered. Once you are certain that no one is touching the victim, push the SHOCK button. You will notice that the victim's muscles contract strongly.
 - If a shock is not necessary (the rhythm is not ventricular fibrillation or pulseless ventricular tachycardia), the AED will state NO SHOCK ADVISED and tell you to resume CPR
 - After approximately 5 cycles of compressions and ventilations, or 2 minutes of CPR, the AED will instruct you to repeat steps 3 and 4- analyze the rhythm and push to shock if the rhythm requires a shock and the AED instructs you to do so.
 - Continue CPR alternating with analysis of the rhythm until help arrives (i.e. EMS).

Special Circumstances

There are times when using an AED may present special challenges. Here's what to do when faced with one of the following:

- **The victim has a hairy chest-** ideally, you should use a razor to shave the areas that will be covered by the AED pads. If a razor is not available and the AED machine is prompting you to CHECK PADS or CHECK ELECTRODES, try pressing down firmly on the AED pads to ensure good contact with the skin. If the machine continues to prompt you, quickly pull off the pads- this should remove enough hair to allow a new set of pads to adhere firmly to the victim's skin. Many AED machines are coming equipped with a razor in the carrying case to combat this problem. If you happen to own an AED, ensure that a razor is included in the case.
- **The victim is in water-** if the victim is in water, pull the victim to a dry area. You are not in danger of getting a shock if the victim is in water. Water is a great conductor of electricity, so if the victim is in water, the shock will be dispersed across the skin of the victim, and the victim will not receive the full dose of electrical energy required to convert them to a normal rhythm. If the victim's chest is wet, quickly dry the chest with a towel or your sleeve; however, the chest does NOT need to be completely dry. If the victim is lying in a small puddle or in snow, you can safely use the AED without moving the victim.
- **The victim has an implanted pacemaker or defibrillator-** obviously, if the victim has one of these devices, it must have failed! You will recognize these devices as a small lump under the skin on the chest, usually the upper chest on either side. Some older models may be implanted in the abdomen. They are generally about the size of a deck of cards or smaller. You will also be able to see a scar over the area. If the victim has one of these devices, avoid placing the AED pad directly over it; doing so may block delivery of the shock.
- **The victim has a medication patch on their chest-** many medications can now be delivered transdermally (through the skin). These includes pain medications, hormones, smoking cessation drugs, nitroglycerin and others. Do not place an AED pad over one of these patches. If it won't delay delivery of a shock, remove the patch and wipe the skin before applying the AED pad. These patches may cause the skin to burn under the AED pad if left in place, or they may block delivery of the shock.

Now you know what to do should you encounter one of these special circumstances.

Two Rescuer Adult CPR with an AED

We've learned a lot so far! Thus far, we've learned how to perform compressions, maintain the airway and use an AED on an adult victim. Now it's time to put it all together. The following steps outline how to perform CPR with an AED when there are two rescuers present.

When you come across a victim who is down and there are two rescuers present:

- **Rescuer 1** checks for response and breathing- tap the victim on the shoulder and ask if they are okay. At the same time, observe the victim's chest for breathing. If the victim is not breathing, or is breathing abnormally or only gasping, stay with the patient and prepare to perform the next steps.
- **Rescuer 2** activates the emergency response system and leaves to retrieve an AED.
- **Rescuer 1** checks for a carotid pulse for 5 to not more than 10 seconds. If a pulse is not felt, or the rescuer is not sure if there is a pulse, the rescuer will expose the chest (in preparation for AED use) and begin CPR, starting with chest compressions. **Rescuer 1** will continue cycles of chest compressions and ventilations with a pocket mask or bag-mask device until Rescuer 2 returns with an AED.
- **Rescuer 2** arrives with an AED and places it on the side opposite to **Rescuer 1**, who is performing chest compressions. **Rescuer 2** powers on the AED and attaches the pads to the victim's chest, also attaching the cables to the AED unit if necessary. **Rescuer 1** should continue CPR while the pads are being placed, right up until it is time to analyze the victim's heart rhythm.
- **Rescuer 2** CLEARS the victim, ensuring neither rescuer is touching the victim, and waits for the AED to ANALYZE, or pushes the ANALYZE button when prompted by the AED to do so.
- **Rescuer 2** pushes the SHOCK button if a shock is indicated, making sure that the victim is CLEAR beforehand.
- If no shock is needed, or after the victim has been shocked, **Rescuer 2** should resume chest compressions (as Rescuer 1 may be fatigued by this time) while **Rescuer 1** manages the victim's airway and delivers breaths using the face mask or bag-mask device.
- After approximately 5 cycles of CPR, or 2 minutes, the AED will state that the victim's rhythm should be ANALYZED. During analysis, which can take up to 10 seconds, **Rescuer 2** and **Rescuer 1** should switch positions, so that **Rescuer 1** CLEARS the victim, pushes SHOCK if a shock is advised, and immediately resumes chest compressions (or performs chest compressions if no shock is advised). **Rescuer 2** then takes over management of airway and breathing. Rescuers should switch positions every 2 minutes when it is time to ANALYZE the victim's heart rhythm. This will prevent rescuer fatigue and ensure that rescuers are able to provide high-quality chest compressions at the proper rate and depth. CPR and analysis with the AED should continue until EMS arrives.

CPR with an Advanced Airway

When there is no advanced airway in place, rescuers must pause compressions to deliver breaths using a face mask or bag-mask device. Once an advanced airway is in place, there is no longer a need to pause compressions to deliver breaths.

Why is this? If the chest is compressed during ventilations, most of the air (and thus oxygen) delivered would be forced out of the victim's mouth before it could enter the lungs. An advanced airway means that air is reliably delivered to the lungs, regardless of whether a rescuer is applying force to the chest at the same time a breath is being delivered.

Advanced airways include:

- Laryngeal mask airways (LMAs)
- Supraglottic airway (Combitube or King LT)
- Endotracheal (ET) tube

When an advanced airway is in place, compressions are delivered at a rate of 100-120 compressions per minute. Breaths are delivered over 1 second ***simultaneously*** at a rate of 1 breath every 6 seconds (10-12 breaths per minute).

Mouth-to-Mouth Breaths

Although it is necessary to use a pocket mask or bag-mask device to deliver breaths in the healthcare setting, there are times when these devices may not be available. Should a cardiac arrest occur at home, you would likely not hesitate to perform mouth-to-mouth breathing for a relative or loved one; you might choose to give mouth-to-mouth to a friend as well. In cases such as these, you will likely decide the benefit outweighs the risk to your own health.

To provide mouth-to-mouth breaths to an adult (or child aged 1 to 8 years):

1. Use the head tilt-chin lift to hold the victim's airway open.
2. Using the hand on the victim's forehead that is maintaining the head tilt-chin lift, pinch the victim's nose closed using the thumb and index finger.
3. Inhale a regular breath, then cover the victim's mouth with your own, creating a tight seal.
4. Give one breath over 1 second, watching to see if the chest rises.
5. If the chest doesn't rise as you give the breath, repeat the head tilt-chin lift.
6. Give a second breath over 1 second and watch for chest rise.
7. If the second breath fails to go in, go immediately to chest compressions.

You may wonder how mouth-to-mouth breathing can sustain the victim. In actual fact, your expired air contains about 17% oxygen- this is just enough oxygen to meet the victim's needs.

When providing mouth-to-mouth breathing, it is important not to provide breaths that are too forceful or too rapid. Doing so may cause air to enter the stomach rather than the lungs, which can cause gastric inflation. Gastric inflation may result in vomiting, and an unconscious victim may develop pneumonia if vomitus makes its way to the lungs. To avoid gastric inflation, give each breath slowly over 1 second and deliver just enough air to make the chest rise.

Rescue Breathing

Respiratory arrest is defined as the cessation of breathing. During respiratory arrest, as well as inadequate breathing, the victim will still have some amount of cardiac output, which you will be able to detect as a palpable pulse.

It is important to be able to recognize respiratory arrest, or impending respiratory arrest, which may be seen as slow, irregular or gasping respirations. These abnormal respirations are inadequate to support life. Respiratory arrest inevitably leads to cardiac arrest if not treated, therefore healthcare providers should intervene quickly to prevent this deterioration by providing **rescue breathing**.

To provide rescue breathing when the victim has a pulse, give **1 breath every 5 to 6 seconds**.

Treatment of Choking



Choking in the Conscious Adult or Child (older than 1 year of age)

1. STAND (OR KNEEL) BEHIND THE VICTIM AND WRAP YOUR ARMS AROUND THE VICTIM'S WAIST.
2. PUT ONE FOOT IN BETWEEN THE VICTIM'S FEET AND ONE FOOT BEHIND YOU-THIS POSITION PROVIDES STABILITY SHOULD THE VICTIM BECOME UNCONSCIOUS AND YOU NEED TO EASE THE VICTIM TO THE GROUND.
3. PLACE YOUR FIST WITH THE THUMB SIDE IN JUST ABOVE THE VICTIM'S BELLYBUTTON AND WELL BELOW THE STERNUM (BREASTBONE).
4. GRAB YOUR FIST WITH YOUR OTHER HAND.
5. ADMINISTER ABDOMINAL THRUSTS, PULLING INWARD AND UPWARD UNTIL THE FOREIGN OBJECT COMES OUT OR THE PATIENT BECOMES UNCONSCIOUS. EACH THRUST SHOULD BE FORCEFUL, DISTINCT AND SEPARATE.

NOTE: FOR PREGNANT OR OBESE PATIENTS, GIVE CHEST THRUSTS INSTEAD OF ABDOMINAL THRUSTS.

Choking in the Unconscious Adult or Child

1. IF YOU ARE CARINIG FOR SOMEONE WHO IS CHOKING AND THEY LOSE CONSCIOUSNESS, LOWER THE VICTIM GENTLY TO THE GROUND.
2. ACTIVATE EMS/CALL 9-1-1
3. BEGIN CPR, STARTING WITH CHEST COMPRESSIONS- DO NOT CHECK FOR A PULSE.
4. EACH TIME YOU OPEN THE AIRWAY TO PROVIDE VENTILATIONS, OPEN THE VICTIM'S MOUTH AND CHECK FOR THE OBJECT. IF YOU CAN SEE THE OBJECT, TURN THE VICTIM'S HEAD TO THE SIDE AND SWEEP IT OUT OF THE VICTIM'S MOUTH WITH YOUR INDEX FINGER. NEVER PERFORM A BLIND FINGER SWEEP- THIS MAY FORCE THE OBJECT FARTHER DOWN THE VICTIM'S AIRWAY.
5. IF YOU DO NOT SEE THE OBJECT, ATTEMPT TO PROVIDE BREATHS. IF BREATHS WILL NOT GO IN, RESUME CHEST COMPRESSIONS.
6. AFTER APPROXIMATELY 5 CYCLES OF COMPRESSIONS AND (ATTEMPTED) VENTILATIONS, ACTIVATE EMS/CALL 9-1-1 IF NOT ALREADY DONE.
7. IF THE OBSTRUCTION IS RELIEVED, CHECK RESPONSIVENESS, BREATHING AND PULSE. PROVIDE RESCUE BREATHING OR CPR AS REQUIRED. IF THE VICTIM IS RESPONSIVE, THEY SHOULD BE TAKEN TO HOSPITAL TO RULE OUT ANY INJURY CAUSED BY ABDOMINAL OR CHEST THRUSTS.

MOVING VICTIMS

It is generally not recommended that a rescuer move a victim unless there is a direct danger to the victim's (or rescuer's) life, or if it is necessary to provide care. Try to immobilize the spine and protect the head, neck, and back if it is necessary to move a victim.

Recovery position

An unconscious victim who is breathing and has a pulse should be assisted into the recovery position to protect the airway.



This position keeps the airway open, prevents aspiration of fluids into the lungs and allows fluid (such as saliva or blood that could occlude the airway) to drain from the mouth.

1. Extend the victim's arm that is closest to you above the victim's head.
2. Place the victim's leg that is farthest away from you over his other leg.
3. Place the victim's arm that is farthest from you across his chest.
4. Supporting the head and neck, roll the victim towards you.
5. Position his or her top leg so the knee props up the victim's body
6. Place the victim's hand or arm under his/ her chin to aid in keeping the airway open.

CPR CERTIFICATION SKILLS REVIEW

| Skill | Adult |
|---|---|
| Check scene safety | Ensure the safety of the scene before entry |
| Determine patient responsiveness | Tap on the shoulder and shout, "Are you OK?" Look for gasping, abnormal breathing, or absence of chest movement. |
| Activate EMS – Call for help! | If alone with no mobile phone, leave the victim to activate EMS and retrieve AED before returning to victim. If another person is available, ask them to activate EMS, get an AED and return to provide assistance. |
| Check pulse | Check for a pulse for no more than 10 seconds in the carotid artery of the neck. |
| Compressions: Hard and Fast | 30:2 at 100- 120/minute. Use both hands. Depth of compressions 2" minimum to 2.4" maximum. |
| Airway | Head tilt/chin lift. Check mouth for obstruction, foreign matter for choking victims. Use jaw thrust if suspected neck/spinal cord injury |
| Breathing | 2 breaths over 1 second each, following 30 compressions. Watch for chest rise. When an advanced airway is present, give 1 breath every 6 seconds while continuous chest compressions are being performed. |
| Rescue breathing: Patient with pulse and not breathing or gasping | 1 breath every 5-6 seconds, reposition airway if breaths aren't going in, recheck pulse every 2 minutes |
| AED | Give CPR until AED is available and charged- use AED as soon as it is available. |