

CPR and First Aid Study Guide

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 a gown when you have them available. The benefit of initiating lifesaving resuscitation in a child in cardiopulmonary arrest greatly outweighs the risk for secondary infection in the rescuer or the child. 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). This fear is not as prevalent when dealing with infants and children, who are less likely to be harboring serious bloodborne pathogens.

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 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 (or their parent/guardian would do so on their behalf).

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. Remember, anything you do is better than doing nothing at all!

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 respiratory or cardiac arrest. Children and infants are surprisingly resilient!



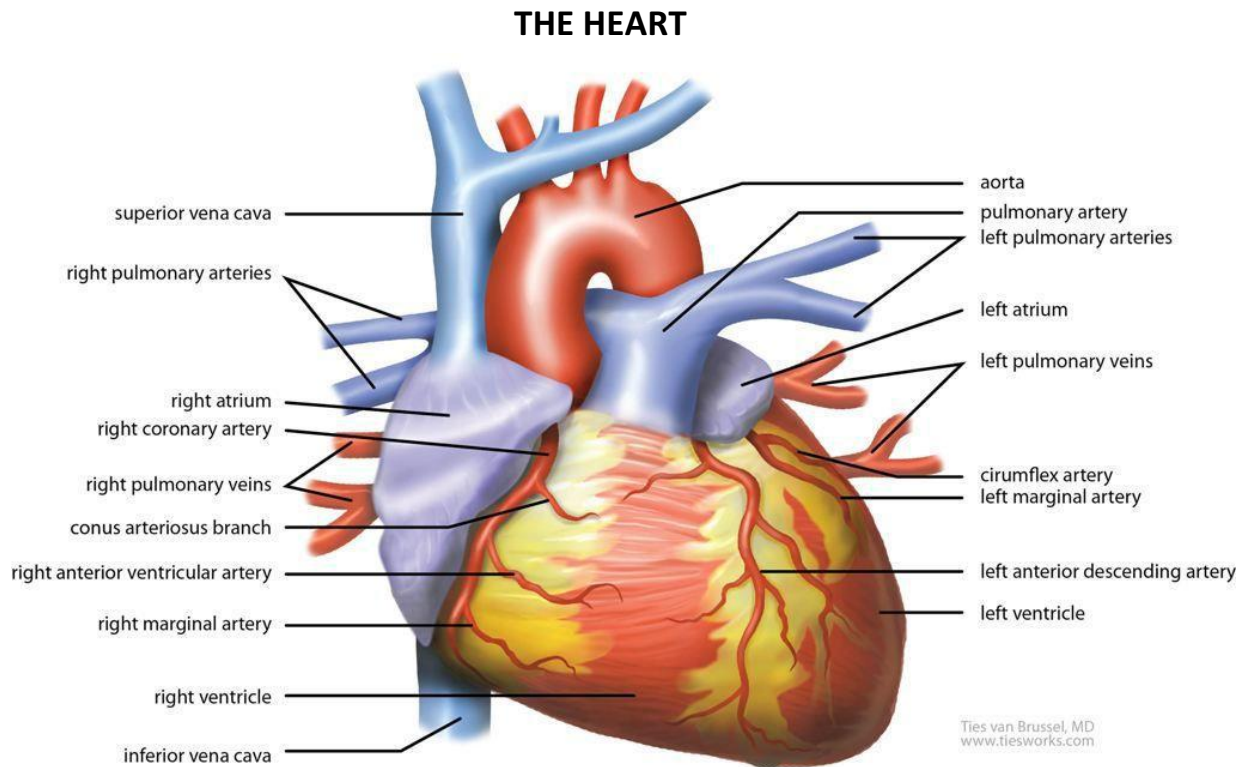
Fear of Injury to Self: As you will learn, scene safety is of utmost importance, and checking the scene for safety should be your first action when you come across an unconscious victim, even if the victim is a child. If the scene is not safe for you to enter, you must not enter. This will only result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

As a rescuer, you must always check to ensure the scene is safe before rendering assistance to any victim!



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 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). In children and infants, their hearts are about the size of their fists.

The heart pumps blood that has been deoxygenated by 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 tissues once again to provide live-giving oxygen.

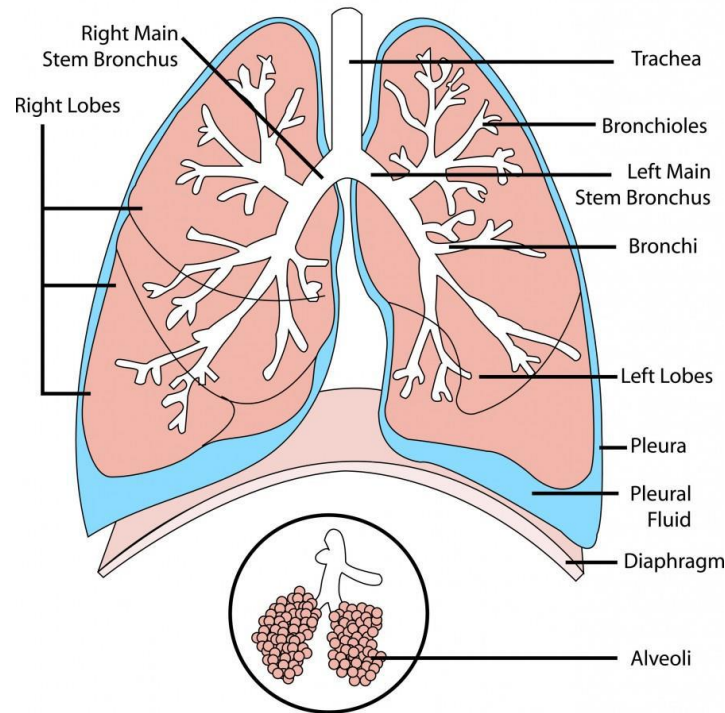
Your body has about 5 liters of blood, which circulate through this system approximately 3 times per minute. A child will have less circulating blood volume, depending on their age- a child of 80 pounds will have approximately half the circulating blood volume of an average-sized adult. Infants will have far less. This is why blood loss can be devastating to a child.

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 17% back into the atmosphere, along with carbon dioxide, when we exhale.

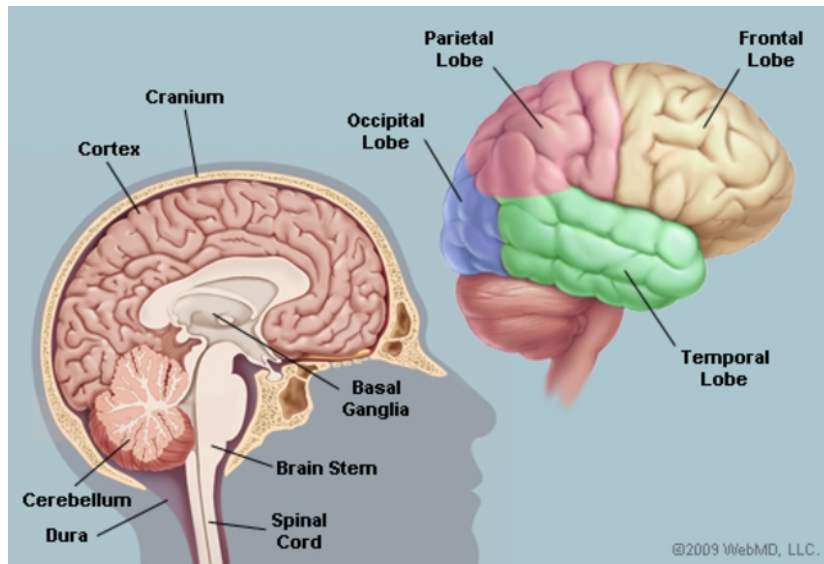
Children have higher respiratory rates than adults. Higher respiratory rates lead to proportionately higher minute volumes. As a result, children may be more susceptible to agents absorbed through the pulmonary route than adults with the same exposure. Children may also respond more rapidly to such agents. Because children's airways are much smaller, and they have a shorter trachea and a relatively larger tongue size than adults, they are more susceptible to breathing and airway problems. Respiratory arrest is a common cause of cardiac arrest in children.

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 adult brain weighs three pounds, and uses 20% of the body's oxygen. In children, the brain reaches 95% of adult size by the age of seven.

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



The Pediatric Chain of Survival

The pediatric chain of survival can be thought of as a sequence of events that must occur in order to restore health in a child or infant victim of sudden cardiac arrest. Because children are more prone to respiratory arrest and shock, it is essential to recognize and prevent airway and breathing problems before they occur to prevent cardiac arrest and to ensure survival and full recovery. For this reason, the most important link in the pediatric chain of survival is prevention. Unintentional injuries are the number one cause of death in children. Children's lives can be saved by focusing on prevention of emergencies. Knowing CPR is important, but even more important is ensuring that CPR is never needed in the first place!

Therefore, the Pediatric Chain of Survival includes:

- ☐ Prevention of respiratory/cardiac arrest
- ☐ Early high-quality CPR
- ☐ Activation of the Emergency Response System
- ☐ Early advanced life support
- ☐ Comprehensive post- cardiac arrest care

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 face mask or mouth-to-mouth, and one can prepare the AED. By working together, the most efficient care can be given to the patient. Of course, if you are the only rescuer present, you will have to do all of these things. For this reason, the steps to performing CPR are presented in a liner sequence.

Chest Compressions

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.



To perform compressions on a child victim (aged 1 to puberty*):

To perform compressions on a child, 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 and fatigue). Lock your elbows and press down hard, depressing the sternum at least 1/3 the depth of the chest, or approximately 2 inches (5 cm). If you find that you are pressing too deeply with two hands, use only one hand. 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 fatigued after providing compressions for just a few 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 unable to do so.



*Note that puberty, for the purposes of CPR, is defined as the presence of underarm hair in males or any breast development in a female.

One Rescuer Child CPR

If you are alone and come across a child who is down, follow the steps below. If someone else is immediately available to assist, use the 'Two Rescuer' sequence.

Stay Safe: If you come upon a child who may need CPR, look around and make sure you and the child are in a safe place. If the child is in water or on a road, try to move the child to a safer area. If you are in a safe area, do not try to move the child as he/she may have other injuries that you cannot see. Simply roll him/her over onto his back. Make sure the child 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), shout for help.

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/her to go find the AED. Make sure you tell the person to return to assist you as soon as possible. If you are alone and witnessed the child collapse, 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 dialing 9-1-1.

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 trachea (windpipe) and the neck muscles at the side of the neck. Alternately, you can check for a pulse in the femoral artery located in the groin. To do this, place two fingers in the inner thigh, part way between the pubic bone and the hip bone, just below the crease where the leg joins the abdomen. Remember, do not feel for a pulse for more than 10 seconds.
2. If there is no pulse or the pulse is less than 60 /minute with signs of poor perfusion* (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 one-third the depth of the chest or approximately two inches deep 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 fully 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 and use the jaw thrust maneuver if you have been trained to do so.
Instructions for performing a jaw thrust are provided later in the unit.
- g. If you have a barrier device to use between your mouth and the child's face, use it. Although the risk of infection from performing CPR is very, very low, it is recommended to use a barrier device when providing CPR. This includes the use of face masks. 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 breaths (2) until help arrives.

*Signs of poor perfusion: this refers to a lack of blood flow that results in certain visible signs, including pale skin color or bluish discoloration of the skin. Fingers, earlobes, lips and nail beds may look bluish or light gray. Sometimes there may be mottling, which is a mixture of a purplish or blotchy red-blue coloring on the extremities (arms or legs).



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 coming in contact with the rescuer's airway. These masks also prevent contact with vomitus and blood, which could pose an infection risk to the rescuer. These masks can be purchased online for minimal cost, and can be kept virtually anywhere- in a purse, car or at home. 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 3 to 5 seconds (12-20 breaths per minute). Check for a pulse every 2 minutes- if at any time the victim loses their pulse, start chest compressions along with ventilations at a rate of 30:2.



Mouth-to-Mouth Breaths

Although it is recommended to use a face mask to deliver breaths, there are times when these devices may not be necessary. Should a cardiac arrest occur at home, you would likely not hesitate to perform mouth-to-mouth breathing for your own child; you might choose to give mouth-to-mouth to a child in your care as well. In cases such as these, you will likely decide the benefit outweighs the risk to your own health, which is very, very small to begin with.

To provide mouth-to-mouth breaths to a child:

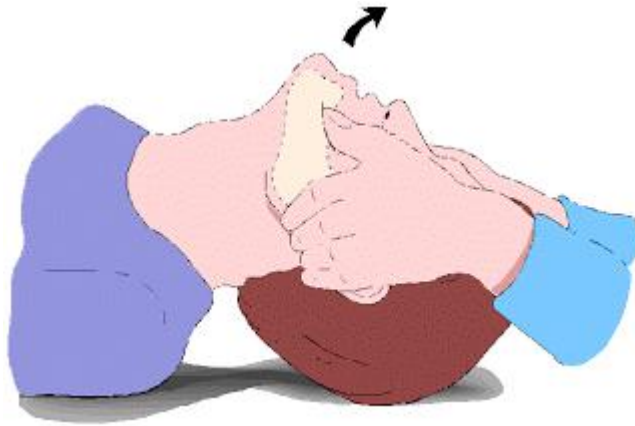
1. Use the head tilt-chin lift to hold the victim's airway open.
2. Using the hand on the victim's forehead that is maintaining the head tilt-chin lift, pinch the victim's nose closed using the thumb and index finger.
3. Inhale a regular breath, then cover the victim's mouth with your own, creating a 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.

The Jaw Thrust Maneuver

If you suspect that a child may have a neck or spinal cord injury (i.e., the child 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.



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.

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 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! If you work in a place that has an AED, make sure you are familiar with the AED should you ever need to use it.



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 child’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 using an AED are as follows:



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 child's bare chest. Expose the child's chest. Dry it off if wet. Choose adult pads for victims who are 8 years of age or older, and choose pediatric pads for children aged 1 year to puberty. 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). For defibrillators equipped with child-sized pads, there will be a picture on the front of the package to indicate whether the pads are for an adult or child.
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.** If the AED unit instructs you to, CLEAR the victim while the machine is analyzing the child's heart rhythm. This means you should ensure that no one is touching the child, 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 10-15 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 one that can be helped by delivery of a shock), 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. If two rescuers are present, the rescuers should switch positions each time the AED is analyzing the rhythm to prevent fatigue related to delivery of compressions.
 - ☐ Continue CPR alternating with analysis of the rhythm until help arrives (i.e. EMS)

For victims younger than 8 years of age, some AEDs are modified to deliver a lower dose of electrical energy and will come with child pads, as previously mentioned. Sometimes there is a special switch or key that must be used with the child pads. But what should you do if only adult pads are available? If adult pads are the only option, use them.

In terms of pad placement, pads should not touch or overlap. If the pads are too large for a smaller child's chest, place one pad on the front of the child's chest and the other on the child's back. The idea is to



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There are a few special circumstances to keep in mind when using an AED:

- ☐ **The victim is in water-** if the child 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 child’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 a child has one of these devices, it will have failed. Some children with severe congenital heart disease may have one of these devices. You will recognize these devices as a small lump under the skin on the chest, usually the upper chest on either side. 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.



Two Rescuer CPR for Children (aged 1 year to puberty)

When two rescuers are present, performing CPR on a child is the same as performing CPR on an adult, except that the compression ventilation ratio when 2 rescuers are present drops to 15:2. One or two hands may be used to compress the chest to a depth of 1/3 the diameter of the chest. Remember that compressions should be done when there is no pulse present or when the child's heart rate *is less than 60 beats a minute and there are signs of poor perfusion*. Rescuers should trade off performing compressions every two minutes to avoid fatigue.

CPR for Infants (up to 12 months of age)

CPR for infants is similar to CPR for adults and children. There are a few differences as follows:

- ☐ **Checking for responsiveness:** never shake an infant as this may cause brain damage. To check for responsiveness in an infant, tap the soles of the feet while calling to the infant in a loud voice.
- ☐ **Pulse check location-** for an infant, it is easiest to check for a pulse using the brachial artery. To locate the brachial artery, place 2 or 3 fingers on the inside of the upper arm between the shoulder and elbow. Press the fingers gently for 5 to 10 seconds to feel for a pulse. Pushing too firmly may occlude the infant's pulse.
- ☐ **Depth of compressions-** compress the infant's chest to one-third the depth of the chest, or approximately 1 ½ inches.
- ☐ **Compression delivery technique-** 2 finger technique: when one rescuer is present, the chest is compressed using two fingers on the lower half of the sternum, avoiding the xiphoid process (the very end of the sternum where it narrows and comes to a point). To landmark, place 2 fingers in the center of the infant's chest, just below the nipple line. Push down on the infant's chest one-third the depth of the chest, or approximately 1 ½ inches. Allow the chest to fully recoil (return to its neutral position) in between compressions. Compressions should be delivered at a rate of 100-120 compressions/minute.
- ☐ **2 thumb-encircling hand technique:** When two rescuers are present, the compression: ventilation ratio drops to 15:2, the same as for children. To perform this technique, position yourself at the infant's feet. Place your thumbs side by side on the center of the infant's chest just below the nipple line. Encircle the infant's chest so that the fingers of both hands support the infant's back. Use your thumbs to deliver compressions at the appropriate depth and rate (100-120 compressions/minute; 1/3 of the depth of the chest or approximately 1 ½ inches). This position allows another rescuer to support airway and breathing without getting in the way of the rescuer

performing chest compressions, and is therefore the preferred technique when two rescuers are present. This technique also allows for more consistent chest compressions and superior blood flow and blood pressure compared to the 2-finger technique.

- **Compression: ventilation ratio-** The compression: ventilation ratio for 1 rescuer CPR in infants is 30:2, the same as for two rescuer CPR children.

When to call EMS- it is far more common for infants to experience a respiratory arrest prior to going into cardiac arrest, unless the infant has a congenital heart problem; in adults the opposite is true- cardiac arrests are more common due to cardiovascular disease. Therefore, the goal is to intervene before the infant goes into cardiac arrest. For this reason, when to call EMS is dependent upon whether you witnessed the infant's arrest. If you did NOT witness the infant's arrest (unwitnessed arrest) and you are alone, you should provide CPR for 2 minutes prior to calling EMS and finding an AED. If you witness the arrest (i.e., the infant suddenly becomes unresponsive), you should call EMS and get an AED before returning to the child to start CPR.

One Rescuer CPR for Infants (up to 12 months of age)

If you are the lone rescuer of an infant:

1. Assess the child for responsiveness by tapping the soles of the infant's feet while calling his/her name loudly. Check for breathing- if there is no breathing or the infant is breathing abnormally or only gasping, call for help.
2. If someone responds to your call for help, ask them to call 9-1-1 (activate EMS) and find an AED. If you are alone and witness the infant go into arrest, perform CPR for 2 minutes before calling for help; if you come across an infant who has been "down" for an unknown period of time, call 9-1-1 first before beginning CPR.
3. Check the infant's brachial pulse for at least 5, but no more than 10, seconds. Place 2 or 3 fingers on the inside of the upper arm between the shoulder and elbow. Press the fingers down gently for 5 to 10 seconds to feel for a pulse. Remember: pushing too firmly may occlude the infant's pulse.





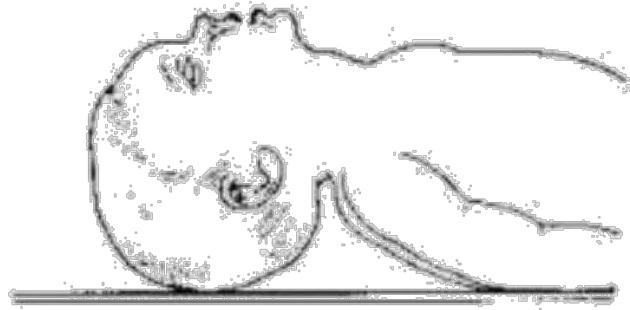
4. If you are not sure you can feel the pulse, the pulse is absent or the infant's heart rate is below 60 beats per minute with signs of poor perfusion (pale or bluish discoloration in the face, extremities or nail beds), start CPR, beginning with 30 compressions followed by two breaths.



- a. Place the infant on his back on the ground or on a firm surface.
- b. Place 2 fingers in the center of his chest just below the nipple line; do not press on the end of the breastbone.
- c. Provide 100-120 chest compressions per minute to a depth of $\frac{1}{3}$ the depth of the chest or approximately 1 $\frac{1}{2}$ inches.
- d. The principles of providing breaths for infants are the same as for children and adults. Use the correct sized face mask for the infant (the mask should cover the mouth and nose without extending past the chin or covering the eyes). Each breath should go in over 1 second and should cause visible chest rise. A breath should require only a small puff of air into the mouthpiece of the device to cause chest rise- avoid excessive ventilations. Lastly, perform a head tilt-chin lift maneuver to open the infant's airway; the infant's head should be placed in "sniffing position" with the infant's head tilted just enough that the nose appears to be sniffing the air. In this position, the external ear canal should be level with the top of the infant's shoulder. Avoid hyperextending the neck- you also want to avoid allowing the chin to fall down towards the neck. You can do this by placing one hand on the infant's forehead while you perform chest compressions. In this way, the infant's airway will remain open and will not close off. Placing a small towel under the infant's shoulders can help to maintain proper positioning.

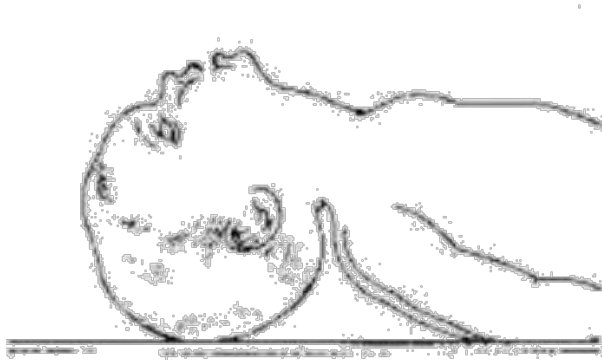


Correct

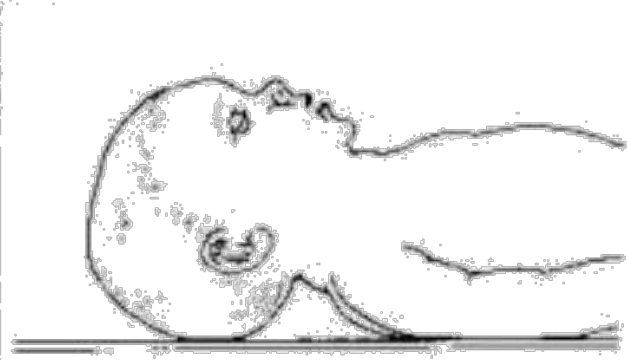


Neck Slightly Extended

Incorrect



Neck Hyperextended



Neck Underextended

5. After about two minutes of compressions (five cycles of 30 compressions and 2 breaths), leave the child to call 911 and get an AED if you know where one is (and you or someone has not already done so). Then return to the infant to continue CPR.
6. Use an AED as soon as it is available.

Two Rescuer CPR for Infants (up to 12 months of age)



1. **Rescuer 1**- Assess the child for responsiveness by tapping the soles of the feet and calling to him/her loudly. Check for breathing- if the infant is not breathing or is breathing abnormally or only gasping, send **Rescuer 2** to activate EMS and bring the AED (if one is available).
2. **Rescuer 1**- Check the infant's brachial pulse for at least 5, but not more than 10, seconds. Place 2 or 3 fingers on the inside of the upper arm between the shoulder and elbow. Press the fingers down gently for 5 to 10 seconds to feel for a pulse. Remember: pushing too firmly may occlude the infant's pulse.
3. **Rescuer 1**- If you are not sure you can feel the pulse, the pulse is absent or the infant's heart rate is below 60 beats per minute with signs of poor perfusion (pale or bluish discoloration in the face, extremities or nail beds), start CPR, beginning with 30 compressions followed by two breaths.
 - a. Place the infant on his back on the ground or on a firm surface.
 - b. Place 2 fingers in the center of the infant's chest just below the nipple line; do not press on the end of the breastbone.
 - c. Provide 100-120 chest compressions per minute to a depth of 1/3 the depth of the chest or approximately 1 ½ inches.
 - d. The principles of providing breaths for infants are the same as for children and adults. Use the correct sized face mask for the infant (the mask should cover the mouth and nose without extending past the chin or covering the eyes). Each breath should go in over 1 second and should cause visible chest rise. A breath should require only a small puff of air into the mouthpiece of the device to cause chest rise- avoid excessive ventilations. When the second person returns, change the ratio of compressions to ventilations to 15:2.
4. **Rescuer 2** should place the thumbs of both hands on the lower half of the infant's breastbone, while being careful not to press on the end of the breastbone (xiphoid process). Put the fingers of both hands around the infant's back to provide support. Use the thumbs to depress the sternum approximately 1/3 the depth of the chest, or approximately 1 ½ inches. Compress at a rate of 100-120 compressions per minute.
5. **Rescuer 1** should provide breaths as described above.



6. Continue CPR at a ratio of 15 compressions to 2 breaths and switch roles every 2 minutes to avoid fatigue.
7. Use the AED when available.

Mouth-to-Mouth-and Nose Breathing

To provide breaths to an infant when there is no face mask available:

1. Use a head tilt-chin lift to maintain an open airway (sniffing position), being careful not to hyperextend the neck, which could block the airway.
2. Place your mouth over the victim's mouth AND NOSE to create a tight seal.
3. Blow into the infant's nose and mouth over 1 second, with just enough volume and force to cause the chest to rise with each breath. Be careful not to ventilate too forcefully, as doing so may cause lung damage.
4. If the chest does not rise, repeat the head tilt-chin lift and try to ventilate the victim again. You may need to try to provide breaths at a few different positions before you achieve airway patency (airway is in an open position).
5. If the infant is older and you cannot cover both the infant's mouth and nose, pinch the nostrils closed and place your mouth over the victim's to form a tight seal- just the same as you would do for a child.

You may wonder how mouth-to-mouth or mouth-to-mouth-and-nose 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 for a brief period of time.

When providing mouth-to-mouth or mouth-to-mouth-and-nose 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 when there is 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 rescuers should intervene quickly to prevent this deterioration by providing *rescue breathing*. For children and infants, give one breath every 3-5 seconds (12-20 breaths per minute). Check for a pulse every 2 minutes- if the victim loses their pulse, begin chest compressions combined with breaths.



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

1. STAND (OR KNEEL) BEHIND THE VICTIM AND WRAP YOUR ARMS AROUND THE VICTIM'S WAIST.
2. IF STANDING, 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 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 VICTIM BECOMES UNCONSCIOUS. EACH THRUST SHOULD BE FORCEFUL, DISTINCT AND SEPARATE.

Choking in the Conscious Infant (less than 12 months of age)

1. SIT OR KNEEL WITH THE INFANT IN YOUR LAP.
2. IF NOT DIFFICULT TO DO, REMOVE THE INFANT'S CLOTHING TO EXPOSE THE INFANT'S CHEST.
3. REST THE INFANT'S BODY ON YOUR FOREARM WITH THE INFANT'S HEAD LOWER THAN THE BODY. SUPPORT THE JAW AND HEAD WITH YOUR HAND. REST YOUR FOREARM ON YOUR THIGH OR LAP TO PROVIDE SUPPORT.
4. GIVE 5 BACK BLOWS FORCEFULLY WITH THE HEEL OF YOUR HAND BETWEEN THE INFANT'S SHOULDER BLADES.
5. SUPPORT THE BACK OF THE INFANT'S HEAD WITH THE PALM OF YOUR HAND AND THE INFANT'S JAW AND HEAD WITH THE OTHER PALM WHILE TURNING HIM OVER (FACE UP) ONTO YOUR OTHER FOREARM. KEEP THE INFANT'S HEAD LOWER THAN ITS BODY. REST YOUR FOREARM ON YOUR THIGH FOR SUPPORT.
6. GIVE 5 CHEST THRUSTS, JUST AS YOU WOULD WHEN PERFORMING CHEST COMPRESSIONS IN CPR. CHEST THRUSTS SHOULD BE DELIVERED AT A RATE OF 1 CHEST THRUST PER SECOND AND SHOULD BE GIVEN WITH ENOUGH FORCE TO DISLodge A FOREIGN BODY.
7. REPEAT BACK BLOWS/CHEST THRUSTS UNTIL THE OBJECT COMES OUT OR THE VICTIM LOSES CONSCIOUSNESS.



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