The Healthcare Medicine Institute presents

CPR #3

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CPR #3

Overview

This course packet was designed to help you remain knowledgeable regarding the steps and processes for helping someone experiencing sudden cardiac arrest (SCA). This information is covered in the CPR sections of this course.

This course includes all of the valuable information found in the courses entitled *CPR #1 and CPR #2*. This course in the CPR series presents new sources of information. **There is a new presentation of three additional medical emergencies: drowning, snake bite, and scorpion sting.**

The following is a summary from the National Institutes of Health (NIH) on the topic of CPR:

> When someone's blood flow or breathing stops, seconds count. Permanent brain damage or death can happen quickly. If you know how to perform cardiopulmonary resuscitation (CPR), you could save a life. CPR is an emergency procedure for a person whose heart has stopped or is no longer breathing. CPR can maintain circulation and breathing until emergency medical help arrives.
>
> Even if you haven't had training, you can do "hands-only" CPR for a teen or adult whose heart has stopped beating ("hands-only" CPR isn't recommended for children). "Hands-only" CPR uses chest compressions to keep blood circulating until emergency help arrives. If you've had training, you can use chest compressions, clear the airway, and do rescue breathing. Rescue breathing helps get oxygen to the lungs for a person who has stopped breathing. To keep your skills up, you should repeat the training every two years.

Drowning

Drowning is a broad classification of water-related emergencies in which a victim is ultimately unable to breathe oxygen. This can lead to extensive brain damage and death if the cause is not quickly reversed. Drowning emergencies can be divided into three types: wet drowning, dry drowning, and delayed drowning.

To best understanding the types of drowning, it is important to understand some of the physiology behind breathing. When a person takes a breath, air is drawn into the nose and mouth, through the larynx where the vocal cords reside, and into the trachea, or wind pipe. The trachea then branches into the left and right bronchi which lead into their respective lungs. At the very end of these pathways, the air enters small grape-like sacs called alveoli. The walls around the alveoli are extremely thin and are covered with a mesh of similarly thin blood vessels called capillaries. When the capillaries touch the alveoli, the oxygen contained in the air can pass

between them resulting in oxygen entering the blood stream to be used by the body.

In dry drowning, a victim inhales water instead of air. When the water contacts the larynx, the muscles spasm and close the opening to the trachea. This reaction, called a laryngospasm, prevents the victim from inhaling air. This ultimately leads to suffocation and death. This is called dry drowning because, during autopsy, no water is found in the lungs due to the laryngospasm.

Wet drowning is very similar to dry drowning and is what most people associate with a drowning emergency. In wet drowning, the larynx does not spasm and water is inhaled into the lungs instead of air. With the alveoli full of water instead of air, the blood is unable to receive oxygen. The victim eventually becomes unconscious due to a lack of oxygen in the blood and death closely follows.

Delayed drowning is a phenomenon caused when a victim who suffers a near drowning event and is rescued but does not seek appropriate medical attention and experiences severe complications or death in the hours following the event. In these situations, a victim inhales water in a manner like wet drowning but is rescued. However, the water in the lungs can cause severe damage to the lungs that can go unnoticed immediately following the event. This damage can lead to the lung's inability to move oxygen into the blood causing death up to eight hours after the initial event. **Because of the risk of delayed drowning, it is imperative for any victim of a water rescue to seek medical attention.**

Another phenomenon related to drowning is called the mammalian dive reflex. While the specifics of this reflex are not completely understood, it is usually associated with complete submersion in very cold water during which all body processes slow down considerably. In these situations, a victim can survive a prolonged submersion and still survive. While these situations are rare in humans compared to other mammals, resuscitation efforts should be attempted on all victims removed from the water unless other signs of obvious death are present.

First aid care for a suspected drowning victim who has been removed from the water should focus on getting oxygen back into the lungs. First, turn the victim's head to the side to remove any water remaining in the mouth. Next, check to see if the victim is breathing. Sometimes the victim will

spontaneously begin breathing again once there is no longer water in the mouth. If the victim is breathing, turn the victim onto his or her side to keep the tongue from falling back and blocking the airway. Call 911 and stay with the victim until help arrives.

If the victim is not breathing, check quickly for any other signs of life such as muscle movement or a pulse. If the victim shows signs of life but is not breathing, call 911 and administer rescue breaths. To do this, place one hand on the victim's forehead and the other on the boney part of the chin. Using both hands, tilt the head backward using a head-tilt, chin-lift motion. Pinch the nose closed and place your mouth over the victim's mouth giving one breath. Watch for the chest to rise showing that air went in. Continue providing rescue breaths once every five seconds until the victim begins to breath or further help arrives.

In cases where the victim is neither breathing or showing other signs of life, call 911, get an AED, and begin CPR. Start by placing the palm of one hand in the middle of the chest, between the nipples. Place your other hand on top, interlocking your fingers and pulling them slightly up and off the chest. Push down hard and fast, at least two inches and at least 100 times per minute. After 30 compressions, stop and give two breaths in the same way rescue breaths were administered. Immediately return to compressions. Continue this cycle of 30 compressions and two breaths until more help arrives, stopping every 2 minutes to check for breathing.

Rescuing a victim from drowning can be very dangerous and must be approached carefully. Victims who are still conscious are often scared and in a state of panic. There have been many documented cases in which a panicked victim has caused injury to a would-be rescuer or even caused the rescuer to drown. Predicting how a victim will respond to an attempted rescue can be very difficult so only trained rescuers should enter the water to attempt a rescue.

Rescues should be approached using the saying, "reach, throw, row, go". First, attempt to reach the victim from dry land. This can be as simple as reaching out and grabbing hold of the victim or using a longer object for the victim to grab onto such as a shepherd's crook or rescue pole. These tools can often be found near a pool and can be easily used to reach a victim without ever entering the water.

If you are unable to reach the victim, try throwing a flotation device to the victim. A device such as a life ring with a long rope attached is best, but anything that floats can be useful. If the device has a long rope attached to it, stand on one end of the rope before throwing so that you can pull the victim to safety. Do not delay using a device that does not have a rope as the flotation device will still help the victim avoid drowning while more help is on the way.

When a victim is too far to be reached and a flotation device is not nearby, it may be possible to reach them by boat. “Rowing” towards the victim keeps the rescuer from entering the water and becoming another possible victim. The boat itself is also a flotation device of sorts that the victim can hold onto to prevent drowning. Rescuing a victim by boat is still dangerous; however, and great care should be taken by the rescuer to further injury to the victim or becoming another victim. Specialized training is recommended.

Finally, if no other option exists, consider entering the water to conduct a rescue. As already discussed, it is very easy for a well-meaning rescuer to become another victim during a water rescue. It can be very difficult to safely approach a panicked swimming and bring them back to safety. Training in water rescues, such as lifeguard training or swift-water rescue training, is strongly advised for those considering conducting a water rescue.

While many people associate drowning with beaches and pools, it is important to understand that a person can drown in as little as 2-3 inches of water. Water is also very powerful, and a typical adult can be swept off his feet in water that is only ankle deep. Whenever you are near water, making safe decisions to prevent an incident is the best rescue option. Do not enter the water when you alone, swim near lifeguards when at the beach, ensure pools are child-proof, and never drive through moving water or water too deep to still see the lines on the road. By following these simple guidelines, you can prevent a situation in which you or someone you know may fall victim to drowning.

Knowledge Check

(Answers on following page)

1) The type of drowning in which a muscle spasm prevents water from entering the lungs is known as:

A) Wet drowning

B) Dry drowning

C) Delayed drowning

D) Potential drowning

2) The order in which a water rescue should be attempted is:

A) Go, Throw, Reach, Row

B) Reach, Row, Throw, Go

C) Go, Row, Throw, Reach

D) Reach, Throw, Row, Go

3) The best rescue option for drowning or water rescues is to make safe decisions to prevent an incident.

A) True

B) False

Knowledge Check Answers

1) The type of drowning in which a muscle spasm prevents water from entering the lungs is known as:

A) Wet drowning

B) Dry drowning *correct answer

C) Delayed drowning

D) Potential drowning

2) The order in which a water rescue should be attempted is:

A) Go, Throw, Reach, Row

B) Reach, Row, Throw, Go

C) Go, Row, Throw, Reach

D) Reach, Throw, Row, Go *correct answer

3) The best rescue option for drowning or water rescues is to make safe decisions to prevent an incident.

A) True *correct answer

B) False

Snake Bites

Snake bites, though a concern for many, are uncommon in the United States, with an estimated 8,000 reports of bites each year. Death from a snake bite is extremely rare with only about five reported deaths per year in the U.S. It is not surprising that many of these reports come from the southwest region of the country where the population of venomous snakes is highest.

Snakes can be broadly classified into two categories: venomous and nonvenomous. Venomous snake bites can usually be recognized by the presence of two distinct puncture wounds from the snake's fangs. These fangs inject the venom that causes most of the complications from the bite. Nonvenomous snakes also bite but leave a more horseshoe-shaped bite pattern similar to a bite mark from a human bite. While there is no venom in these bites and a full-body reaction is rare, local reactions such as inflammation and infection are possible.

The danger from a venomous snake bite comes from the toxins in the snake's venom. These toxins are generally neurotoxic, or toxic to the human's neurologic system. Symptoms can include muscle spasms or paralysis, severe pain, and even organ failure and death. Usually these symptoms begin soon after the bite, but in some species such as certain sea snakes, the symptoms may not present for several hours. It is important to seek medical treatment if you are bitten by a venomous snake.

The first step in treating a snake bite is to remove yourself from the environment in which the bite occurred. While some snakes will immediately retreat after a defensive bite, some are more aggressive and may still be nearby, especially if the snake is protecting a nest. If you can safely do so, try to identify the snake to aid medical professionals in treating you correctly. Do not attempt to capture or kill the snake for identification purposes.

Once you are safely away from the snake, have the victim lie down with the bite site positioned below the level of the heart if possible. This allows gravity to help slow the progression of the venom. It is also important that the victim lie still and attempt to remain calm. Movement stimulates blood flow and excitement increases heart rate, both of which will speed up the movement of the venom in the body. The wound should be covered with loose, sterile bandages to prevent infection and all restrictive clothes and jewelry such as rings or watches should be removed. A snake bite often causes significant swelling and removing these items will prevent further complications.

It is important to seek professional medical attention as soon as safely possible. Most venomous snake bites can be treated with anti-venom; however, the success of those treatments is sometimes affected by the time since the bite. While it is helpful for medical providers to know the type of snake, do not bring the snake, dead or alive, with the patient.

Along with the helpful treatments, there are several actions that should be avoided. Using ice or tourniquets is often avoided as they can cause irreversible damage to the limb. You should also avoid attempting to remove the venom by cutting or other means. This practice is rarely effective and can cause more harm than good. Avoiding caffeine or alcohol is also recommended as they can increase the speed in which the body absorbs venom.

Treating snake bites from non-venomous snakes should focus on keeping the wound clean to prevent infection. Loosely wrap the wound in a clean, sterile dressing. Keep the wound clean and seek medical attention if any signs of infection develop such as purulent discharge, off-putting smell, or severe pain. If a victim exhibits signs of a severe allergic reaction to the bite, such as wheezing or an itchy throat, seek immediate medical attention and administer an epinephrine pen, if one is available.

Scorpion Sting

Scorpions are usually small arthropods with a curved tail containing a stinger. When scared or threatened, a scorpion may sting the victim, injecting venom. Scorpion stings are rarely fatal and, because a scorpion can regulate the amount of used venom, may not contain any venom at all. Both young children and the very old are at most risk for a life-threatening event.

A scorpion sting site can be very painful and the area around the site may turn red and warm. Unlike a bee sting, there is no stinger to remove. Symptomatic care is often the best with ice or elevation to help reduce the pain. Unless symptoms remain localized to the sting site, there is usually not a need to seek additional medical attention in adult victims.

Children and old adults may be at higher risk for more complications. If the victim begins exhibiting symptoms such as difficulty breathing, irregular heartbeat, or muscle twitching, seek immediate medical attention. Keep in mind that these symptoms may take several hours to develop, so continued observation of the victim, particularly those in this age group, is important.

Victims who have experienced a scorpion sting before may also be at risk for a severe allergic reaction called anaphylaxis. Symptoms of anaphylaxis include a rapid onset of diffuse hives, difficulty breathing, and nausea/vomiting. Victims exhibiting these signs and symptoms should seek immediate medical attention as anaphylaxis can be life threatening. If the victim has an epinephrine pen, assist them in administering it if you have been trained to do so.

CPR Case Studies Questions

In this section, we are going to present six case studies. These case studies have been written to provide a review of CPR material you have previously learned and will learn in this course. Each case presents with a victim requiring your help as a CPR provider.

Read the case and think about how you would respond. It is also helpful to discuss your steps with other CPR providers. This collection of cases is a great review tool between CPR classes to refresh your knowledge on the steps of CPR for adults, infants, and children. **The questions are presented at the beginning of this course so that you may think about them while reading the CPR material that follows this section** (you are not expected review answers until later in the course)**.**

The following are the six case studies with questions. **Towards the end of the course, there is a *CPR Case Studies Answers* section with the answers to all of the questions.** Use the answer section to check your responses and review CPR material as needed until you feel comfortable with the steps for each case.

Case 1

You are working in a warehouse when you hear cries for help in the next room. Since you know First Aid and CPR, you walk into the room to see if you can help. You find several co-workers standing near your friend, an electrician, lying on the floor. You notice a pair of wire cutters lying near your friend's hand and several arching wires near his head. He does not respond to you calling his name. How would you respond?

The answer is in the *CPR Case Studies Answers* section of this course.

Case 2

You are at a local swimming pool when lifeguards pull an unconscious middle-aged male from the water. You inform the lifeguards that you know CPR and can help. They begin the steps of CPR and direct you to call 911 and get the AED. After calling 911, you return with the AED. The lifeguards

ask you to apply the AED, but you notice the patient is still wet from the pool. Another bystander yells out that you can't use an AED on a wet victim. What should you do?

The answer is in the *CPR Case Studies Answers* section of this course.

Case 3

You are enjoying dinner with your family at a local restaurant when the woman next to you abruptly stands and grabs her throat with both hands. She is not making any noise and her face is beginning to turn blue. Her husband begins yelling for a doctor while one of the members of the wait staff runs to the phone to call 911. You tell the husband you know CPR and can help. What should you do?

The answer is in the *CPR Case Studies Answers* section of this course.

Case 4

You are working at a preschool when one of the children collapses outside in the grass field and does not get up. You run to the child, checking the area for any hazards and find none. When you get to the child she does not respond to you as you call her name and you do not see any signs of life. You call for help from your co-workers, but no one is around to hear you. The child is five years old. What should you do.

The answer is in the *CPR Case Studies Answers* section of this course.

Case 5

You are playing a round of golf when your partner tells you he isn't feeling well. He clutches his chest and falls to the ground. He does not respond to you calling his name and you do not see any signs of life. Another golfer nearby saw what happened and comes over to help. What should you do?

The answer is in the *CPR Case Studies Answers* section of this course.

Case 6

You are standing in the checkout line at your local supermarket. The woman behind you has an infant in a carrier. While waiting for your groceries, the woman begins to frantically call her baby's name, and pulls him from the carrier. You notice that the baby is blue and is limp in his mother's arms. The mother begins yelling that her son is not breathing and needs help. You tell her you know CPR and she hands her son to you. What should you do?

The answer is in the *CPR Case Studies Answers* section of this course.

CPR & First Aid Sections

The next section will cover CPR. This information is a review of the CPR information in the courses *CPR #1 and CPR #2*. After completion of the CPR sections of this course is a *First Aid* section.

The *First Aid* section (towards the end of the course materials) will cover the following:

- **First aid legal concerns**
- **Safety Issues**
- **Personal Protective Equipment**
- **Assessments**
- **Medical Emergencies**
- **Chest Pain**
- **Asthma**
- **Choking**
- **Allergic Reactions**
- **Diabetes**
- **Seizures**
- **Stroke**
- **Injuries (bleeding, broken bones, impalement, burns)**
- **Environmental Emergencies (cold, heat, bites, stings)**

Sudden Cardiac Arrest

Before we can begin consider how to care for a person in cardiac arrest, let's first review the definition of sudden cardiac arrest.

Like every muscle in your body, the heart muscle moves when stimulated by an electrical impulse. The heart, however, does not rely on your brain to send these impulses like all other muscles; it creates its own electrical current from nodes located inside the heart. The sinoatrial node, located in the upper right portion of the heart, is primarily responsible for creating this impulse that then travels through conduction pathways through the muscle in an organized manner. As this impulse travels it stimulates the different areas of the heart to contract, pumping blood through the body. When these impulses become disorganized or do not not pass through the muscle in the correct manner, called an arrhythmia, the heart muscle can have trouble pumping effectively.

The most common cause of SCA is an arrhythmia called ventricular fibrillation (VF). In VF, the impulses become erratic and causing the heart muscle to quiver instead of pump, stopping the flow of oxygen and nutrients through the body. This arrhythmia can be caused by an electric shock, drugs, or trauma.

According to the NIH, the following is the definition of ventricular fibrillation:

> **Ventricular Fibrillation**
> V-fib occurs if disorganized electrical signals make the ventricles quiver instead of pump normally. Without the ventricles pumping blood to the body, sudden cardiac arrest and death can occur within a few minutes.
> To prevent death, the condition must be treated right away with an electric shock to the heart called defibrillation.
>
> V-fib may occur during or after a heart attack or in someone whose heart is already weak because of another condition. [1]

A myocardial infarction (i.e., a heart attack) occurs when the arteries that feed the heart with oxygen become blocked, which can also cause SCA.

1 nhlbi.nih.gov/health/health-topics/topics/arr/types

According to the NIH, the following is the definition of a heart attack:

What Is a Heart Attack?

A heart attack happens when the flow of oxygen-rich blood to a section of heart muscle suddenly becomes blocked and the heart can't get oxygen. If blood flow isn't restored quickly, the section of heart muscle begins to die.

Heart attack treatment works best when it's given right after symptoms occur. If you think you or someone else is having a heart attack, even if you're not sure, call 9–1–1 right away. [2]

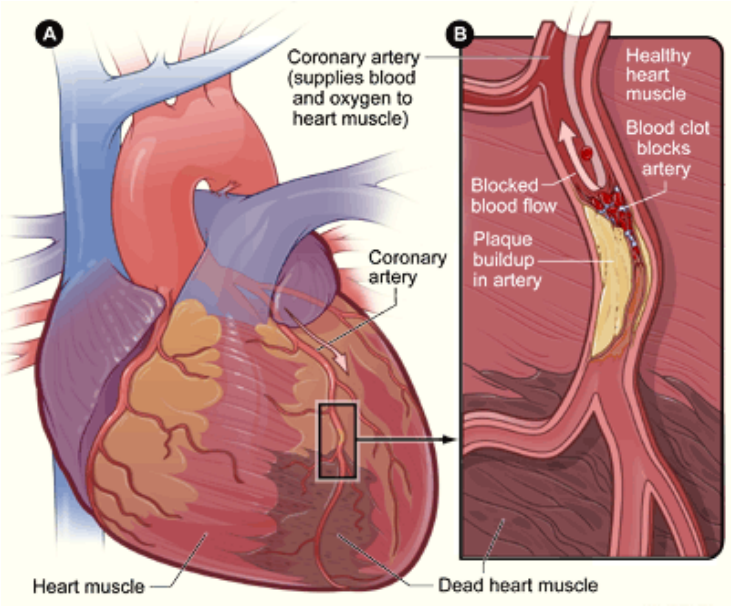


Figure A is an overview of a heart and coronary artery showing damage (dead heart muscle) caused by a heart attack. Figure B is a cross-section of the coronary artery with plaque buildup and a blood clot. (credit: NIH – National Heat, Lung, and Blood Institute)

It is important to note that vital organs begin suffering immediate damage during SCA. The goal for treating SCA is to correct the arrhythmia to regain

2 nhlbi.nih.gov/health/health-topics/topics/heartattack/

blood flow throughout the body before these organs suffer irreversible damage. Studies have shown that immediate bystander cardiopulmonary resuscitation (CPR) and the use of an automated external defibrillator (AED) offer the best chance of survival for the patient.

Know when to help

Recognizing a person is suffering from sudden cardiac arrest is an important step in beginning appropriate treatment. If sudden cardiac arrest is suspected, it is important to complete a quick assessment to determine if the patient requires CPR or other advanced care.

Assessing the patient

A patient suffering from SCA will appear unconscious and unresponsive. This does not mean that someone who is awake is not suffering from another medical emergency. If you suspect that a person is experiencing a medical emergency for any reason, call for help. In the USA, calling 911 activates the emergency response system. Stay with them until medical help arrives if possible.

Check for Safety

The most important first step in any emergency is to make sure the area is safe. Do not put yourself in a dangerous situation, which could result in you also being a patient. Check the area for dangers such as electrical shock, violence, or traffic. If possible, move the patient to a safe location before providing any care. If you are unable to move the patient to safety, immediately leave and call for help.

Check for Responsiveness

Once you are sure you are in a safe environment, attempt to wake the patient. **Shake or tap the patient and shout, “Are you ok?”**

- If the patient responds, try to determine if additional help is needed. If you have any doubt as to whether or not the patient requires further assistance, call 911 for help.

- If the patient does not respond, get help. If bystanders are available, send one to call 911 for help and to look for an automated external defibrillator (AED). If no bystanders are available, immediately leave the patient and call 911 (or use a cell phone) and attempt to find an AED. Return to the patient as soon as possible.

Image 2: Check the patient for signs of life such as chest rise or other movement. *Credit: Virginia State Parks CC / BY*

Check for Signs of Life

After you or a bystander has activated the emergency response system by calling 911, return to the patent. Take at least 5 seconds, but no more than 10, to closely watch the patient for any signs of life (image 2). Look for chest rise (indicating breathing), listen for grunting, groaning, or sounds of heavy breathing, or place your hand on the patient's chest to feel for rise and fall. If any of these signs of life are present, the patient is not experiencing SCA but may be experiencing a life-threatening medical emergency. Stay with the patient until help arrives and continue to check for these signs of life. Note, gasping is not a sign of normal breathing.

Some advanced-level providers are trained to check the patient for a pulse and more thoroughly check the patient's airway and breathing. These steps are not wrong but can be difficult to perform and are time consuming if not practiced regularly. It is also possible for untrained rescuers to misinterpret these signs, causing them to inappropriately withhold CPR. It is therefore not recommended that lay-rescuers perform these steps.

If no signs of life are present, the patient is most likely in cardiac arrest and immediate action is required.

Calling for Help

It is important to call for help as soon as you suspect that the patient is requires help. While a patient in cardiac arrest needs CPR, most cases of SCA cannot be solved by CPR alone. CPR is also a physically-demanding activity and rescuers will quickly tire when correctly performing chest compressions. Once you activate the emergency response system, help is on the way. It is also possible to begin further care while calling for help, if mobile phones are available.

Self-Knowledge Check

What is the most important first step in helping in any emergency?

(Answer located at the bottom right corner of this exercise box.)

A) Check for Safety
B) Immediately call 911
C) Check a pulse
D) Check for signs of life

Answer: A

Know how to help

Compressions

Once you have identified that an adult is in SCA and requires CPR (and the emergency response system has been activated), the next step is chest compressions. In review, identification of SCA involved two major steps:

1. *Check for Responsiveness*
   Attempt to wake the patient: Shake or tap the patient and shout, “Are you ok?”

2. *Check for Signs of Life*
   Look for chest rise (indicating breathing), listen for grunting, groaning, or sounds of heavy breathing, or place your hand on the patient’s chest to feel for rise and fall. Advanced provider: check for pulse, airway, and breathing issues.

Chest compressions squeeze the heart, building up pressure within the heart’s chambers to begin pumping blood. Good compressions circulate oxygenated blood throughout the body, slowing the damage to the heart and other organs caused when these organs have stopped receiving blood from the heart. **It is important to provide good, quality chest compressions during CPR** to maximize blood flow and increase the chances of survival. Let’s look how to perform chest compressions for adults. According the the NIH, adults are defined as 9 years and older for purposes of CPR distinctions.[3] Later, we will go over how to provide help for children and infants.

Next is a photo example of chest compressions. Later, we will show many alternate and close-up views of this same procedure to better illuminate the techniques involved.

3 medlineplus.gov/ency/article/000013.htm

Image 3: Position your body directly over the patient, locking your elbows to provide chest compressions. *Credit: Betsy Weber CC / BY*

Expose the Chest

First, quickly expose the adult patient's chest. This allows rescuers to ensure proper hand placement and prepares the patient for use of the AED without having to stop compressions when one becomes available. If the patient is not on their back, carefully place the SCA victim on their back. In some cases, their may be the possibility of a spinal injury. If another person is available to help, the two of you can turn the patient onto the back without twisting the head or neck. This helps to prevent further complications relating to spinal injuries.

Compression Technique

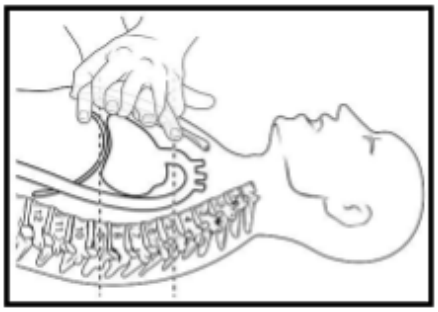


Image 4: Proper hand placement during CPR compresses the heart forcing blood flow. *Credit: OpenStax College CC / BY*

- To perform compressions, position yourself at the patient's side.
- Place the heel of one hand on the sternum in the center of the chest between the nipple line.
- Place your other hand on top of the other, interlocking your fingers. Slightly pull your fingers back so that only the heel of your hand is on the patient's chest.
- Lean over the patient so that your shoulders are directly over your hands and lock your elbows (image 3).
- Begin by pushing straight down onto the chest hard and fast. Press down approximately at least two inches (5 cm).
- Lift up, bringing your weight completely off the chest but keeping the hands in place. Let the chest completely rise.
- **Continue to do this at a rate of 100 per minute.**

It is important to ensure that your compressions are hard and fast. With each compression you are building pressure inside the chest to help push blood to vital organs (image 4). Compressions that are too shallow or too slow do not build the necessary pressure and will not improve the chance of survival. It is also important to release the pressure on the chest so that the heart can refill with blood before your next compression. In review:

- The hard and fast compression move the chest downward approximately 2 inches to push blood to vital organs.
- The release of pressure refills the heart with blood and is accomplished by letting the chest completely rise.

Some rescuers have been trained to provide ventilations to a patient after 30 compressions. If you have not received hands-on training to do this, do not stop compressions. Continue providing compressions, at least two inches deep, at a rate of at least 100 per minute or until help arrives or until you can no longer physically continue.

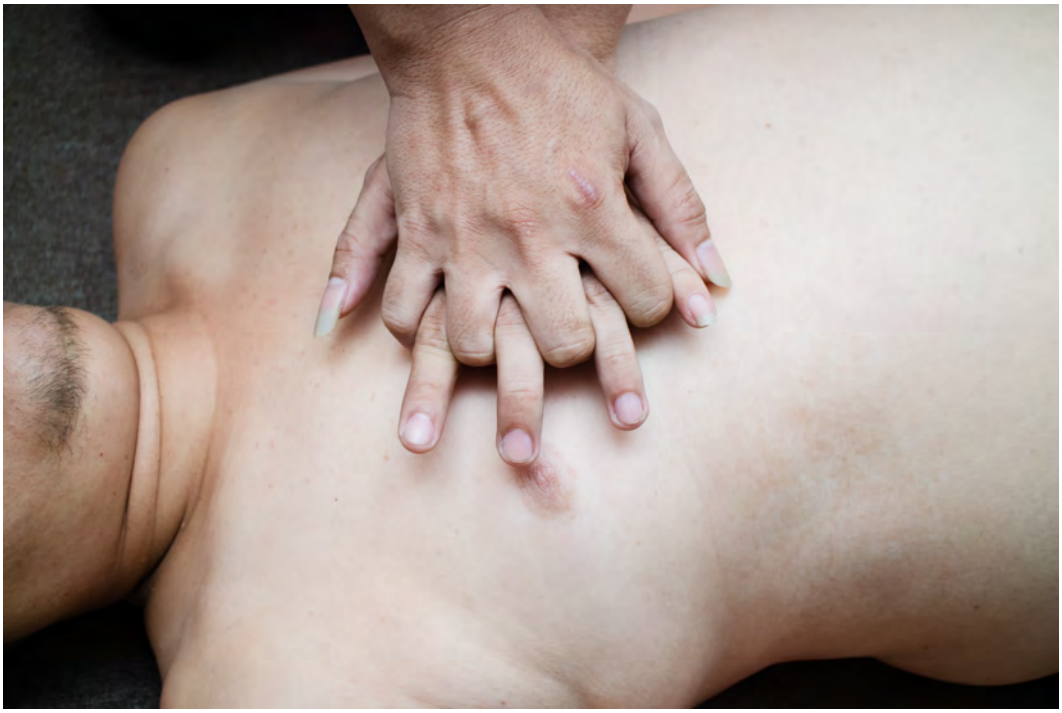
Compressions can be very physically demanding. If other help is available, try switching rescuers every two minutes until advanced care arrives. This ensures that compressions remain effective and improve the chance of

survival. Remember, if there is movement, breathing, coughing, do not apply chest compressions.

Chest Compressions

Chest Compressions

Chest Compressions



Chest Compressions

Chest Compressions

Ventilations

CPR is most effective when the rescuer can increase the level of oxygen available in the blood by providing ventilations. This can be accomplished by advanced methods such as endotracheal intubation, a bag-valve mask with supplemental oxygen, or even the use of a pocket mask or other barrier device during mouth-to-mouth. While these methods do provide some benefit during CPR, they can be difficult to perform properly. **If you are uncomfortable providing ventilation to a patient, skip this step and provide compression-only CPR.** Sometimes, compression-only CPR is termed hands-only CPR.

30 Compressions, 2 Breaths

When providing ventilations, first perform 30 quality chest compressions. Then, perform a head-tilt chin-lift by placing two fingers of one hand under the patient's chin and the other hand on the patient's forehead. Tilt the

head backward, extending the neck. This movement opens the patient's airway by moving the tongue from the back of the throat. In review, two fingers place under the chin lift up the head. Pushing on the forehead helps the two finger chin lifting technique to adequately tilt the head to open the airway.

Place your barrier device on the patient's face. Provide a breath, stopping when you notice chest rise. Chest rise is the best indication that the ventilation was deep enough to enter the lungs. If the chest does not rise, reposition the airway by completing another head-tilt chin-lift. Provide a second breath following the same steps.

During CPR, the goal is to stop compressions for as little time as possible. Rescuers should practice the skill of correctly providing two ventilations and returning to compressions in less than 10 seconds. **Continue this cycle of 30 compressions and two breaths until help arrives or the patient regains consciousness.**

Steps Review

- Check for safety of the scene. If needed, move the victim to safety.
- Check for responsiveness – Shake or tap, "Are you okay?"
- If someone else is present, have them call 911 and get AED. If no one else is present, shout for help.
- Check for signs of life to determine SCA: check for breathing. Advanced rescuers check for a pulse. No more than 10 seconds for this process is appropriate. Gasping is not normal breathing.
- Activate the emergency response system by calling 911 and retrieve an AED.

  For advanced rescuers: if there is a pulse but no normal breathing, provide rescue breathing ventilations at a rate of 1 breath every 5 – 6 seconds (10 – 12 breaths / minute). If not already done, call 911 after two minutes. Resume and check pulse every two minutes.
- If no breathing or only gasping and no pulse: Apply chest compressions and ventilations (30:2).
- Use an AED when it arrives on the scene.

Self-Knowledge Check
What is the appropriate compression to ventilation ratio for adult CPR? A) 15:2 B) 5:1 C) 30:2 D) 20:1 Answer: C

Youth

Children 1 – 8 Years

SCA in children is a rare event. While the ultimate goal of keeping blood flowing to the vital organs remains the same, the process changes slightly when helping children. The definition of a child for the purposes of CPR is any patient between 1 – 8 years of age. Under 1 is considered an infant. Some more advanced providers are taught to look for signs of puberty, such as chest or underarm hair for males, and breast development in females as the indicator for when a child has become an adult.

Two Minutes of Compressions

When assessing a child who appears to be in SCA, perform your assessment just as you would for an adult. If you find that the child is not showing signs of life, send someone to call 911 for help. **If there is no one else, it is recommended that you perform two minutes of CPR before leaving the child and calling 911 for help.** This is distinct from the recommendations for adults. For adults, call for help immediately if alone; for children in SCA, leave the child and call for help only after two minutes of CPR has been performed.

Press Down 1/3 – 1/2 Chest Depth

If you are alone, perform 30 compressions at a rate of no less than 100 per minute, just like the adult. **Because children are smaller than adults, use a depth of ⅓ to ½ the depth of the chest, do not exceed 2 inches.**

Ventilations

Open the airway with the head-tilt, chin-lift maneuver but only slightly extend the neck. The correct position looks as if the child is sniffing.

Provide two breaths by covering the child's mouth with yours while watching for chest rise, taking no more than 10 seconds to return to compressions. Pinch the child's nose closed while providing breaths.

Continue this 30:2 ratio until help arrives. If you are not alone and have someone able to help you, perform CPR as described but use a ratio of 15 compressions to 2 breaths. Remember to only provide enough breath to see visible chest rise. DO NOT overinflate the lungs. Repeat the process until the child is breathing on their own or until help arrives to provide emergency medicine.

Compression to Ventilation Ratio

- If alone, 30:2
- If assisted, 15:2

One Handed Compression

It is appropriate to use only one hand when doing compressions on a child. Place the other hand on the child's forehead to keep the head tilted back.

Steps

- Check for safety of the scene. If needed, move the victim to safety.
- Check for responsiveness – Shake or tap, "Are you okay?"
- If someone else is present, have them call 911 and get AED. If no one else is present, shout for help. (Do not leave the child until 2 minutes of CPR compressions have been performed. CPR starts after checking for signs of life in the next step.)
- Check for signs of life to determine SCA: check for breathing. Advanced rescuers check for a pulse. No more than 10 seconds for this process is appropriate. Gasping is not normal breathing.
- For advanced rescuers: if there is a pulse but no normal breathing, provide rescue breathing ventilations at a rate of 1 breath every 3 – 5 seconds (12 –20 breaths / minute) and call 911 after two minutes.

- If no breathing or only gasping and no pulse: Apply chest compressions and ventilations (30:2 unassisted, 15:2 assisted).
- If alone, after 2 minutes of CPR, activate the emergency response system by calling 911 and retrieve an AED. If alone and the the emergency response system is activated (by calling 911) and an AED is present, use the AED to analyze rhythm to see if there is a need for a shock.

Infants

Performing CPR on infants is very similar to the process with children. Continuing CPR for two minutes before leaving to call for help is identical as with children 1 – 8 years of age. Also, the depth of compressions (⅓ to ½ the depth of the chest) and the compression-to-ventilation ratios with two rescuers for children 1 – 8 are all appropriate for infants. The maximum depth for infants is approximately 1.5 inches. For infants, flick the bottom of the foot in an attempt to elicit a response to check for responsiveness.

The primary difference between children 1 – 8 and infants is the hand positioning used when performing compressions. When you are performing CPR by yourself, utilize the 2-finger technique by placing your index and middle finger on the center of the breastbone, between the nipples, pushing down on the chest. If you have another rescuer with you, use the two thumb encircling-hands technique by wrapping your hands around the baby's body, overlapping your thumbs on the center of the breastbone. Squeeze your hands together performing compressions.

2-finger technique

2-finger technique

Two thumb encircling-hands technique

Knowledge Check

What is the age-range for using child CPR?

A) Birth – 3 years
B) 3 – 5 years
C) 0 – 10 years
D) 1 – 8 years

Answer: D

Automated External Defibrillators

What are They?

Automated External Defibrillators, or AED, is a device that determines if a patient in SCA needs an electrical shock and then delivers that shock. Recent research has shown that the use of an AED nearly doubles the chance of survival in SCA. They are safe and easy to use and should be used whenever possible during SCA.

How to Use Them

Once you have determined in your assessment that a patient appears to be suffering from SCA (unconscious, unresponsive, and displays no signs of life), you should attempt to find an AED while calling for help. When returning to the patient, use the AED as soon as it is available

The first step in using an AED is to turn the device on. Some units have an obvious power button while others turn on automatically when you open the case. Once you power up the device, instructions from the unit will begin. These instructions can be through a verbal recording or flashing lights but all AEDs will direct you in the proper steps to serve as a reminder when using them in emergency situations.

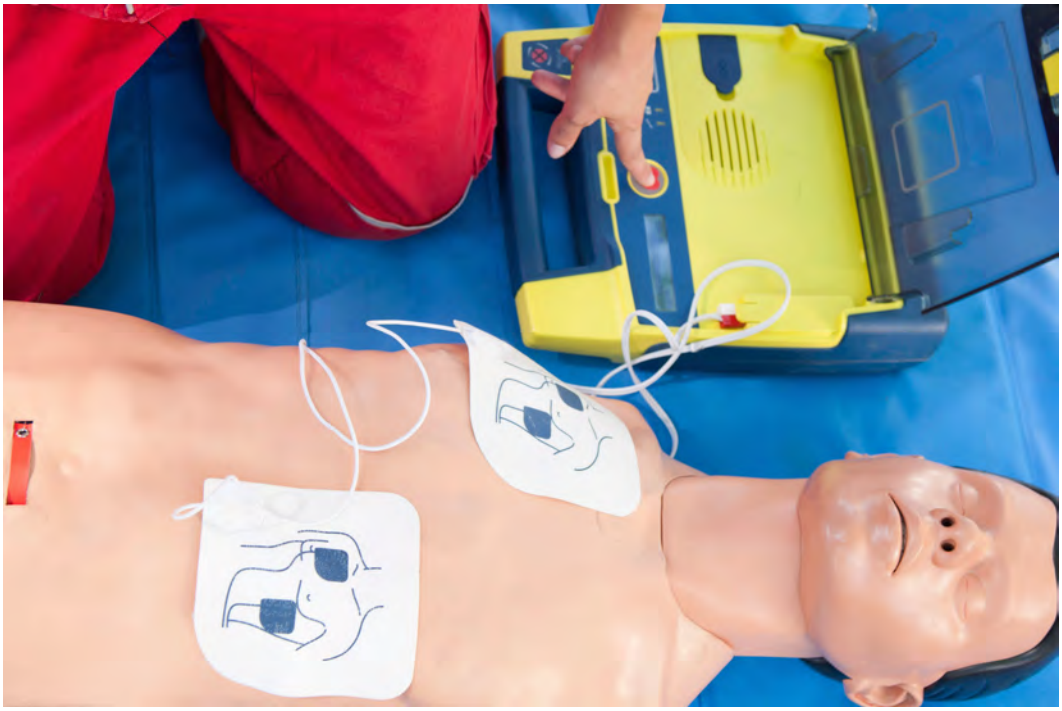
Once the device is on, you will be asked to apply the pads to the patient's chest. This requires you to expose the chest if you have not done so already during your assessment steps. Remove the backing from the pads and place one pad, sticky side down, on the right upper chest just below the shoulder. Place the other pad on the lower left chest just below the nipple (Image 5). Plug the pads into the device if they are not already plugged in. If there are multiple rescuers present, it is best to continue CPR while another rescuer applies the pads.

The AED will then direct you to clear the patient so it can analyze the heart rhythm. It is very important during this phase that you ensure that no one,

not even you, is touching the patient. During the pause, the computer inside the AED is reading the patient's electrical heart rhythm. If anyone is touching the patient during this it can cause the computer to misinterpret the rhythm and recommend an incorrect treatment.

Image 5: Place one pad on the upper right chest and the other on the lower left chest when using an AED. *Credit: Anita Hart CC / BY*

Once the AED has interpreted the patient's heart rhythm it will indicate whether a shock is advised or not. If a shock is advised, most AEDs will begin charging immediately (don't worry, it won't shock you during this). Other units require that you push a button to begin charging. Charging times differ for every unit with some newer units now pre-charging immediately once turned on. Recent research suggests that compressions be initiated during this charging time to reduce the amount of time compressions aren't being performed.



AED

The AED will sound an alarm when charging is complete and ready to shock. This provides you a reminder to ensure that everyone clears the patient. It is imperative that you look up and down the patient to be absolutely sure no one is touching the patient before pushing the shock button. Once you have ensured that everyone is clear, push the shock button on the AED. The AED will deliver an electric shock between the two pads to the patient. You will notice the patient's body arch upwards slightly or appear to jump. Once the patient's body has relaxed, the shock is over. Resume compressions immediately.

If the AED determines that a shock would not help the patient's current rhythm it will tell you that no shock is advised. Begin CPR for two minutes. This does not mean that your assessment of the patient and decision to start CPR was incorrect. It simply means that the patient's electrical rhythm would not be helped by an electrical shock and further treatment is necessary.

After delivering a shock or determining that no shock is needed, the AED will begin a two-minute countdown while you are performing CPR. At the end of two minutes it will remind you to check the patient. Check your

patient again for signs of life including evidence of breathing or movement. If no signs of life are present, allow the AED to analyze again and complete the process again. If signs of life are present, turn off the AED but leave the pads attached.

Special Considerations

Water

There is often a concern when using electricity around water. Modern AEDs are usually safe to use around water. It is not necessary to completely dry a patient wet from being exposed to water. Even wet pants are ok, though a wet shirt should be removed in order to apply the pads.

The largest concern when using an AED on a wet patient is the area where the pads will be applied. Using a towel, quickly wipe the chest to remove standing water on the chest where the pads will be placed. As long as the pads can firmly secure to the skin, the electrical current will flow through the patient between the two pads.

Medication patches

Sometimes you will notice medication patches on the patient's chest. The medicine under these patches is designed to absorb through the skin. If the location of the patches will make pad placement difficult, simply remove the patch and quickly wipe the area with a towel. If the patches do not interfere with pad placement, simply leave them in place.

When removing the patch, be careful not to touch the skin under the patch or the underside of the patch itself with your bare hands. The medicine, if it gets on your skin, can absorb through the hands and into your body causing unwanted effects.

Pacemakers

Some patients have had an internal pacemaker placed under their skin. These can often be seen by noticing a hard lump near one of the patient's shoulders about the size of a deck of cards. If the pacemaker is on the right side, do not place the AED pad on top of the device. Simply place the pad below or just to the side of the pacemaker.

Some pacemakers can also function as an internal defibrillator much the same way as an AED. You may even notice the patient jump slightly every few minutes as the internal defibrillator attempts to correct the patient's heart rhythm. This movement should not be considered a sign of life. In fact, it most often confirms your suspicion of SCA. When treating these patients, ignore these small jumps and follow the correct steps of CPR, using your AED when appropriate.

Body Hair

The presence of body hair itself does not present a problem when using the AED. In some patients, however, the amount of body hair prevents the pads from adhering to the patient's skin. When the pads do not make full contact with skin, the electrical shock is less effective and can cause burn injuries to the patient.

The most effective way to avoid this issue is to use a razor to quickly shave the area where the pads will go. Some AEDs come with a small response kit attached that includes a razor for this purpose. If there is no razor available but you have an extra set of pads available, place the first set of pads in the correct location, then quickly remove the pad. Discard these pads and use the second set with the AED.

Children

The use of AEDs in children and infants is acceptable. Many AEDs can be placed in a "pediatric" mode that decreases the amount of electricity delivered during a shock. This mode may be activated by a card you insert

into a designated slot. Some AEDs also recognize when a pediatric-sized pad has been plugged into the unit and automatically switches into pediatric mode. It is recommended that the pediatric mode be used for all patients under 8 years old.

If there is no pediatric mode available, or you cannot easily see how to use such a mode, you can continue to use the AED in the adult mode. While the amount of electricity delivered may be more than the patient needs, it is better than delivering no shock at all. When placing the adult pads on a pediatric patient, if the pads overlap when placed on the chest, place one pad on the right chest and the other on the patient's back directly behind the first pad.
It is important to understand that, while an adult unit or pads can be used on a pediatric, it is NOT acceptable to use a pediatric unit or pads on an adult. Only adult pads should be used for adults.

Knowledge Check

What is the first action you should take when arriving at the patient's side with an AED?

A) Turn the unit on
B) Place the pads on the chest
C) Call for help
D) Assess the patient

Answer: A

Knowledge Check

If you do are helping a child in cardiac arrest but do not have child AED pads with your AED, you should:

A) Wait for the ambulance
B) Use adult pads
C) Cut the pads down to size
D) Place one pad on the chest and the other on the abdomen

Answer: B

CPR Case Studies Answers

The follow presents all of the answers to the case studies questions.

Case 1

You are working in a warehouse when you hear cries for help in the next room. Since you know First Aid and CPR, you walk into the room to see if you can help. You find several co-workers standing near your friend, an electrician, lying on the floor. You notice a pair of wire cutters lying near your friend's hand and several arching wires near his head. He does not respond to you calling his name. How would you respond?

Answer

Based on the scenario, it is likely that your friend has suffered electrical shock and is possibly in cardiac arrest. Remember that before you can begin to assess the victim, you must first ensure the environment is safe for you to do so. Ignoring potential hazards can lead to you also becoming electrocuted. If it is not safe for you to approach the victim, don't, and wait for professional help to arrive.

In this case, your best initial course of action is to immediately order your co-workers away from the area. Have one of them call 911 and bring back the first aid kit and AED. If you were alone, you should leave the victim to call 911 and retrieve the first aid kit and AED. Make sure when calling 911 that you provide a clear location to the emergency dispatcher, especially if your work location is large with several entrances. You should also follow any workplace policies you have regarding emergencies such as notifying building security. Stay nearby until responders arrive, but ensure you remain a safe distance away from the live wires.

It can be tempting to attempt to turn off power to help. This is a risky decision. If you turn power off at the wrong location, it can cause additional problems such as loss of lighting. You may also believe power was secured when the wires remain live. The best thing for this patient is to get professional help as fast as possible.

Case 2

You are at a local swimming pool when lifeguards pull an unconscious middle-aged male from the water. You inform the lifeguards that you know CPR and can help. They begin the steps of CPR and direct you to call 911 and get the AED. After calling 911, you return with the AED. The lifeguards ask you to apply the AED, but you notice the patient is still wet from the pool. Another bystander yells out that you can't use an AED on a wet victim. What should you do?

Answer

It is pretty common knowledge that water and electricity don't mix, so you are right to be concerned. An AED is designed to pass an electrical pulse from one pad on the right upper chest to the other on the lower left chest. The pictures on the pads will help you with proper placement. The key to a proper functioning AED is proper adhesion of these pads to the victim's skin. Water, hair, and medication patches can all prohibit this adhesion, so you should take steps to correct these issues.

In this case, water on the victim's chest could very well keep the AED from functioning properly, not to mention creating a possible electrical hazard for you and the lifeguards. Before applying the AED pads, you should take a few seconds to quickly dry the chest in the areas the pads will be applied. It is not necessary that the chest be completely dry; only dry enough to ensure the pads stick.

Does it matter that the victim's swim suit is still wet? No, not really. Because the AED is designed to pass electricity from one pad to another, as long as the pads adhere, the fact that the rest of the victim is still wet should not hinder your efforts. Once the chest is dry, turn the AED on and apply the pads. Remember that, when applying the pads, you should work around the lifeguards performing CPR so that they don't have to stop. Follow the directions on the AED once the pads are in place.

Case 3

You are enjoying dinner with your family at a local restaurant when the woman next to you abruptly stands and grabs her throat with both hands. She is not making any noise and her face is beginning to turn blue. Her husband begins yelling for a doctor while one of the members of the wait staff runs to the phone to call 911. You tell the husband you know CPR and can help. What should you do?

Answer

You should begin by approaching the female and asking her if she is choking. If she is able to verbally answer you, she is not actively choking. If she is unable to answer, let her know that you are going to help.

Position yourself behind her, make a fist and place your fist, thumb side in, just above her belly button. Wrap your other arm around her wrapping your hand on top if your fist. Begin forcefully thrusting your fist upward and inward as hard as you can, attempting to dislodge the object lodged in the airway.

If the object is not dislodged and the victim becomes unconscious, lay her on the floor. Send someone to call 911 and get the first aid kit and AED if one is available. Begin the steps of CPR, starting with compressions. After 30 compressions, open the mouth and check for the object.

If you see the object and can easily reach it, remove it from the victim's mouth. DO NOT attempt to remove the object if you cannot easily see or reach it. If you are unable to see the object, position the airway using a head-tilt, chin-lift, and give a breath. If the breath doesn't go it, reposition the airway and try again. If the second breath is unsuccessful, return to compressions, repeating the process after 30 compressions.

Case 4

You are working at a preschool when one of the children collapses outside in the grass field and does not get up. You run to the child, checking the area for any hazards and find none. When you get to the child she does not respond to you as you call her name and you do not see any signs of life. You call for help from your co-workers, but no one is around to hear you. The child is five years old. What should you do?

Answer

Treating children is a difficult thing to do. It is important that you stay calm and think about the appropriate steps of child CPR. With an adult in this situation, you would immediately leave the adult to call 911 and retrieve the first aid kit and AED. With children, if no help is around, you should stay with the child, performing two minutes of CPR before leaving to call if no other help arrives. In most cases, children go into cardiac arrest because of breathing problems. Studies show that breathing and compressions early are very important to the chances of survival.

If, after two minutes, no other help has arrived, leave the child to call 911 and get the first aid kit and AED. When using the AED, remember that most AEDs are programmed for adults. Many have special child pads, a special key, or other way of switching the AED into child mode. If your AED has one of these features, use it for children under eight years old. These features lower the level of electricity the unit delivers during a shock. If your AED does not have a child feature, use the adult pads in adult mode. If the pads overlap on the victim's chest, place one pad on the front of the chest over the heart, and the other pad on the victim's back directly under the heart. It is acceptable to use the AED in adult mode on a child, but DO NOT use an AED in child mode on an adult.

Also, remember that CPR for children changes slightly from adults. Instead of a depth of two inches, the depth should be 1/4 to 1/3 the depth of the chest. When two people are performing CPR on a child, the ratio changes to 15 compressions to 2 breaths, unlike adult CPR and 1-person child CPR which is 30 compressions to 2 breaths.

Case 5

You are playing a round of golf when your partner tells you he isn't feeling well. He clutches his chest and falls to the ground. He does not respond to you calling his name and you do not see any signs of life. Another golfer nearby saw what happened and comes over to help. What should you do?

Answer

In this situation, the first step is to activate the emergency response system. Since you have another golfer to help, send him to call 911 and get the first aid kit and AED. If you were alone, you would leave the victim to call 911 yourself.

Next, begin the steps of CPR. Kneel beside the victim and place one hand on the middle of the victim's chest. Place your other hand on top, locking your fingers and pulling them off the chest. Being chest compressions, pushing down at least two inches at a rate of at least 100 per minute. After 30 compressions, open the airway by performing a head-tilt, chin-lift. Pinch the nose and provide a breath, watching for chest rise.

Give a second breath, then return to chest compressions, trying not to take more than 10 seconds to give both breaths. If you have a barrier device such as a face shield, use it. If you do not have a shield and do not want to give mouth to mouth, provide only compressions without stopping.

Remember that there is a difference between cardiac arrest and heart attack. A heart attack is a blockage in one of the arteries in the heart, causing damage to the heart muscle past the block. Cardiac arrest is when the heart completely stops. A heart attack can cause cardiac arrest if it is severe enough but doesn't always.

Case 6

You are standing in the checkout line at your local supermarket. The woman behind you has an infant in a carrier. While waiting for your groceries, the woman begins to frantically call her baby's name, and pulls him from the carrier. You notice that the baby is blue and is limp in his mother's arms. The mother begins yelling that her son is not breathing and needs help. You tell her you know CPR and she hands her son to you. What should you do?

Answer

In this situation, the first thing you should do is check the baby for signs of life. Seeing none, you should then instruct one of the bystanders to call 911 and get the AED. Begin performing 30 chest compressions. To perform chest compressions on an infant, lay the infant on a hard, flat surface. Place two fingers in the middle of the chest and press down 1/3 to ½ the depth of the chest. Do this at a rate of at least 100 per minute. After 30 compressions, position the airway by moving the head back slightly into a "sniffing" position. Provide two breaths with enough air to see chest rise. With mouth-to-mouth, you will need to cover the infants mouth and nose with your mouth.

If you do not want to give mouth-to-mouth, simply continue chest compressions until help arrives. If someone else knows CPR and can help, one person should perform compressions while another performs the breaths. In this case, only perform 15 compressions before giving two breaths.

Once the AED arrives, turn the unit on and apply the pads. Remember that you can use adult pads on an infant if pediatric pads are not available. When using adult pads, do not let the pads touch when applied to the chest. If they are too big to fit on the chest, place one on the front of the chest and the other on the back. Follow the AED directions.

First Aid

General Overview

First Aid consists of simple things one can do to help another experiencing an emergency. We separate these emergencies into two categories: medical emergencies consisting of a sudden sickness or illness, and injuries. This manual will cover these types of emergencies and cover some basic steps you can take to help in these emergencies.

Legal Concerns

It is appropriate that those involved in helping someone experiencing a possible life-threatening emergency have concerns about potential legal consequences if something is done incorrectly or the victim does not improve with the assistance provided.

When first approaching someone experiencing an emergency, you should first ask the victim if they need help. Receiving someone's permission before touching or helping them is called gaining consent. If the victim is unable to talk, it is appropriate to assume they would accept your help if they could talk. If they refuse your help but you still feel help is needed, call 911 and stay with the victim until help arrives.

Providing needed assistance to someone experiencing an emergency is generally covered by Good Samaritan laws. These can differ from state to state but generally provide protection for those who provide necessary aid so long as you provide help the help you have been trained to provide to the best of your ability. If you are still concerned over your liability, research your state's specific Good Samaritan law for further guidance.

Safety

While helping in an emergency it is important that you ensure your surroundings are safe for you and the victim. When first approaching the victim, take a moment to look around and identify any safety hazards present. Examples of safety hazards could be live electrical wires, traffic,

and violence. If the area is not safe, consider moving the victim to a safe area before providing care. If you are unable to safely move the patient, DO NOT touch the patient. Call 911 and follow the instructions from the emergency dispatcher. Your safety is very important. You cannot help if you also become a victim.

Personal Protective Equipment

Helping in an emergency has the potential to expose you to potentially infectious bodily fluids. Blood and other bodily fluids can transmit disease if you do not protect yourself appropriately. Most first aid kids contain protective gloves that should be worn when providing aid to a victim. Put protective gloves on before touching a victim to avoid exposing yourself to potentially infectious bodily fluids.

To remove soiled gloves, begin by pinching the palm on one hand with your other gloved hand. Pull the first glove off over the fingers, turning the glove inside out. Hold the loose glove in the palm of your gloved hand, making a fist. Insert two fingers under the glove at the wrist and pull the remaining glove off over the fingers, trapping the first glove inside. Place the soiled gloves in a biohazard bag or other container separate from regular trash and dispose of it properly.

Assessment

After making sure the area is safe, begin by talking to the victim. If the victim is unable to talk or communicate, or appears to be in distress, send someone to get the first aid kit, AED, and call 911 immediately. If there is no one around to help, leave the victim to retrieve the first aid kit, AED, and call 911 yourself.

If the victim is not responsive, shake and shout to try and wake them. If they do not wake up, check for signs of life such as breathing noises or chest movement. If neither are present, begin the steps of CPR, using the AED as soon as it is available. Make sure 911 has been called.

Knowledge Check (answers below this box on the right)	
1) When helping in an emergency, you should first assess the...	2) What laws provide general protection for you when assisting someone in an emergency?
A) victim's level of consciousness B) environment for safety C) location of the AED D) status of the nearest first aid kit	A) Do Not Resuscitate laws B) Due Regard laws C) Good Samaritan Laws D) National First Aid Act

Answers:
1) B
2) C

Medical Emergencies

Medical emergencies are those not caused by injuries. These can be life threatening and, because they are not often accompanied by blood, are not always obvious.

Chest Pain

There are many causes of chest pain. Coronary artery disease is a condition in which plaque buildup in arteries in the heart reduces the flow of oxygenated blood to areas of the heart muscle. This can cause occasional chest pain known as angina. A heart attack occurs when one of the arteries

in your heart becomes completely blocked, stopping the flow of oxygenated blood to areas of the heart past the blockage. This can cause the heart to be less effective in pumping oxygenated blood throughout the body. In severe cases, it can cause the heart to stop completely; a condition known as cardiac arrest.

When assisting a patient suffering from chest pain, begin by having the victim sit down and rest. If other people are around, have one of them leave to get the first aid kit, AED, and call 911; otherwise, leave the patient and to retrieve them and call 911 yourself.

Ask the patient if he or she takes any medicine for their chest pain. A common medicine used to treat chest pain caused by coronary artery disease is nitroglycerine. If the victim has nitroglycerine, help them take it by assisting them in placing one pill under their tongue, allowing it to dissolve. Aspirin is also effective in reducing the damage caused by a heart attack and should be chewed and swallowed.

Stay with the victim until help arrives. If the victim loses consciousness, lay the victim on the floor and begin the steps of CPR.

Asthma

An asthma attack occurs when the airway passages in a victim's lungs suddenly constrict reducing the amount of oxygen the victim's lungs receive. This causes severe difficulty breathing and often causes a whistling sound during breathing known as wheezing. DO NOT use the absence of wheezing as a method of determining if the victim is suffering from an asthma attack. In severe cases, the airway passages can become so narrowed that wheezing does not occur.

If a victim exhibits signs of an asthma attack, call 911 immediately. Have the victim sit down but allow them to sit in whatever position is most comfortable. Ask the victim if he or she takes any medicine for asthma. Often, a physician will prescribe an Albuterol inhaler to be used during an attack. If the victim has an albuterol inhaler, assist him or her in using it. To do so, shake the inhaler vigorously. Place the inhaler in the victim's mouth and have them exhale forcefully then inhale. As the victim begins to inhale, depress the medication cartridge on top of the inhaler. Have the victim hold

his or her breath as long as possible, keeping the medication in the victim's lungs. Repeat the process after one minute.

Remember that asthma is not always accompanied by wheezing. If the victim appears to be having a hard time breathing and you are in doubt about what to do, call 911 and stay with the victim until help arrives.

Choking

Another common breathing emergency, especially in children, is choking. Choking occurs when a foreign object such as a piece of food becomes lodged in the victim's throat, blocking air from entering the lungs. Choking is an immediately life-threatening emergency so act quickly.

A choking victim will not be able to talk, cough, or breathe. He or she may also place both hands around the throat giving the international choking sign. Immediately ask the victim if they are choking. If they indicate that they are and are unable to answer you verbally, inform them that you are going to help. Stand behind the victim and make a fist with your dominant hand. Place the fist, thumb side first, just above the victim's belly button. Wrap your other arm around the victim placing your hand on top of your fist. Provide abdominal thrusts by forcefully pulling your fist up and in to the victim's abdomen. Continue doing this until either the object is expelled, or the victim becomes unconscious.

If the victim becomes unconscious, carefully lower the victim to the floor. Have a bystander call 911 and retrieve the first aid kit and the AED. If there are no bystanders available, call 911 and retrieve the first aid kit and AED yourself. Begin the steps of CPR. Each time you attempt to give breaths, check inside the victim's mouth for the object. If you see it and can easily reach it, remove it from the victim's mouth. DO NOT insert your fingers into the victim's mouth if you do not see the object. If you do not see the object, perform checks compressions.

Allergic Reactions

An allergic reaction is the body's response to an allergen and is usually not an emergency. Minor reactions consist of red, itchy skin often at the site of the allergen such as a bee sting. Other common, non-life-threatening

responses include hives and minor swelling. In these cases, no emergency care is needed. If the cause of the reaction is an insect bite or sting, remove the stinger by scrapping a credit card or other small, hard object across the skin, and apply a cool wet compress to reduce discomfort. DO NOT use tweezers when removing a stinger as it will cause more toxin to be injected into the skin potentially worsening the reaction. Anti-itch cream can also be used to reduce discomfort.

Some people have significantly worse reactions with a condition known as anaphylaxis. This life threatening allergic reaction causes swelling in the victim's mouth and airway causing severe difficulty breathing. In these cases, immediate care is required.

To assist a person suffering from anaphylaxis, first ensure the environment is safe for you to provide care. Call 911 immediately or have a bystander call if available. If the reaction was caused by a bee sting, remove the stinger by using a credit card to scrap the stinger out of the skin. Doctors will often prescribe an epinephrine auto-injector pen to people with anaphylaxis. If the victim has one, get it immediately and help the victim administer it.

To administer an epinephrine auto injector, remove the safety cap from the end of the device. Be careful to avoid the other end as it contains a spring-loaded needle. Grasping the device firmly in your hand, push the needle end into the side of the victim's thigh until you hear the device click, releasing the needle. Hold the device in place for 10 seconds before removing it so that the medication can be injected. Remove the device, carefully avoiding the needle. Dispose of the device in a hard container such as a water bottle. Stay with the victim until professional help arrives.

Diabetes

A person with diabetes can have a hard time controlling his or her blood sugar. Large changes in blood sugar can cause a person to act confused, disoriented, and even violent or unconscious. If a person's behavior suddenly changes, ask him or her if they have diabetes. You may also want to look for a medical alert bracelet or necklace.

There are two types of diabetic conditions; high and low blood sugar. While both conditions have significant health implications, low blood sugar is the

immediate emergency as it causes a rapid change in consciousness and, when not addressed, will cause death quickly. High blood sugar causes organ problems over weeks and even months. If you are unable to determine which condition is present, assume it is low blood sugar.

If you suspect someone is suffering from a diabetic emergency, you can help by having them eat or drink something with sugar. Soda, fruit juice, or other sugary drink is a great option but be careful NOT to use a diet drink. The sugar substitute in diet drinks does not have the same effect as actual sugar. If the victim is unable to eat or drink, or does not quickly improve after eating or drinking, call 911 and stay with the victim until help arrives.

Seizures

A seizure is caused by abnormal activity in brain cells. This can cause a victim to suddenly begin experiencing severe muscle convulsions in an area of the body or even the entire body. In many cases the victim loses consciousness during the convulsions which can often continue for several minutes after the convulsions have stopped. Seizures can be caused by conditions such as epilepsy, a dramatic drop in blood sugar, and even simply due to a high fever especially in children under five.

When assisting a victim experiencing a seizure, if he or she is not already lying on the floor, assist them to the floor and call 911. Clear the area around the victim so that the convulsions don't cause further injury. Do not attempt to stop the convulsions. In most cases they will stop after a few minutes and attempting to hold the victim down will only cause injury to you and the victim. DO NOT put anything in the victim's mouth. The convulsions may cause the victim to break the item or their teeth causing a choking hazard.

Once the seizure has stopped, roll the victim to his or her side. Remember that the victim will likely remain unconscious for several minutes after the seizure ends. Stay with the victim until help arrives while continuing to check the victim for signs of breathing. If the victim stops breathing, begin the steps of CPR.

Stroke

A stroke, or a cerebral vascular accident, is caused when a blood clot forms in the brain. Victims of a stroke often present with a sudden onset of weakness or paralysis in one side of the body, facial droop, slurred or incoherent speech, confusion, and even unconsciousness. It is very important that you call 911 immediately anytime you see a person exhibiting these signs.

While there are no first aid treatments for stroke victims, immediate recognition and calling for help can be lifesaving. Have the victim sit comfortably and rest and stay with him or her until help arrives.

Knowledge Check		
3) A choking victim who is awake should receive...	4) A severe allergic reaction that causes extreme difficulty breathing should be treated with…	5) When helping a victim having a seizure, you should NEVER...
A) Abdominal thrusts B) CPR C) Nitroglycerine D) Call 911 and wait	A) Nitroglycerine B) Aspirin C) Sugary drink D) Epinephrine pen	A) Put something in their mouth B) Roll the victim to the side C) Call 911 for help D) Help lay them on the floor

Answers:
3) A
4) D
5) A

Injuries

Injuries can occur from a variety of causes. The initial concern for any injury is the potential for blood loss and shock.

Bleeding you can see

Injuries that result in bleeding you can see are often easy to find. While most bleeding is not life-threatening, anytime you observe bright red blood spurting out of an injury, you should consider it to be serious.

Before helping a victim who is bleeding, put on protective equipment such as gloves or protective glasses. Then, with a gloved hand apply direct pressure to the injury. As soon as a first aid kit is available, place gauze pads on the wound and continue to apply direct pressure.

If the bleeding soaks through the dressings, add additional dressings on top and continue to apply pressure. DO NOT remove the blood-soaked gauze as doing so could remove the beginning of a clot.

In severe bleeding that is not stopped by gauze and direct pressure, apply a tourniquet. Place the tourniquet several inches above the injury, but not on a joint, and tighten it until the bleeding stops. Be sure to write down what time the tourniquet was applied and give that information to the emergency responders when they arrive.

While commercial tourniquets are widely available and in many first aid kits, you can improvise a tourniquet by using a belt or other wide cloth. DO NOT use string such as a shoe lace or other thin material. Doing so can cause irreversible damage to the extremity.

Bleeding you cannot see

Some injuries can cause internal bleeding. These injuries are much more difficult to find and treat as the injuries are inside the victim's body. If you suspect a victim has an internal injury causing bleeding you cannot see,

call 911 immediately. Have the victim sit or lay quietly until responders arrive. If the victim begins to lose consciousness, lay them on their back and cover them with a blanket to keep them warm.

Broken bones

Broken bones, or fractures, are rarely life-threatening but are often very painful. In most cases, it is best to have the victim sit comfortably and wait for help to arrive. If you must move the victim, such as in cases where help cannot get to you, consider splinting the injury before moving the victim.

To splint a broken bone, use a stiff object longer than the broken bone such as sturdy tree branch, piece of wood, or pipe. Place the object next to, but not on top of, the broken bone. Secure the object to the broken bone using cloth ties, or other soft material.

Make sure you do not place knots on top of the broken bone. In cases where a broken bone breaks the skin, cover the injury with a clean dressing before splinting to help keep the area clean.

Impaled objects

Objects that are lodged in the skin are considered impaled objects. Unless the object is interfering with the victim's ability to breathe, such as an object impaled in the mouth, DO NOT remove the object. Secure the object in place by taping gauze or other bulky dressing around the impaled object. If the object must be removed, use gauze and direct pressure on both sides of the wound to help stop the bleeding once the object is removed.

Burns

Some burns, such as minor sunburns, are uncomfortable but rarely life-threatening. In these cases, cool the area with cool running water. Place a dry, sterile bandage on the injury. Do not use home remedies such as

butter on burns as they cause the area to retain heat making the injury worse.

Significant burns, such as those caused by fire and chemicals, require more care. Remove any smoldering clothes, if possible, and brush any chemicals off the area. Cover the area with dry, sterile dressings and seek immediate medical attention.

Knowledge Check	
6) When trying to stop bleeding you can see, if the gauze becomes blood-soaked, you should:	*7) If you do not have a commercial tourniquet, a possible makeshift tourniquet could be made from:*
A) Remove the gauze and replace it B) Put clean gauze on top of the soaked gauze C) Rinse the injury with water D) Remove the gauze and use your hand	A) A shoelace B) Spare electrical wire C) Twine D) Your wide belt

Answers:
6) B
7) D

Environmental Emergencies

Depending on your environment, environmental emergencies may be a common occurrence or something you are never faced with. Environmental emergencies consist of heat and cold emergencies and animal bites.

Heat Emergencies

Heat emergencies are caused by prolonged exposure to hot environments. These emergencies often begin as cramps in large muscle such as the legs or abdomen and progress to heat exhaustion and eventually heat stroke. If a victim begins feeling weak while working in such an environment, immediately move them to a cool, shady area and call 911. Remove tight or restrictive clothing and place a wet, cool cloth or towel on the victim's head or chest. It can also be helpful to use a spray bottle, spraying a light mist of cool water on the victim's skin.

Cold Emergencies

Hypothermia occurs when the body's temperature drops too far below normal. Victims experiencing hypothermia may shiver controllably, appear confused and disoriented, or can be unconscious. If you suspect a victim is experiencing hypothermia, quickly move them to a warm area and call 911. Be careful when moving a hypothermic victim who is unconscious, as vigorous movement may cause them to go into cardiac arrest. If you have heat packs, place them under the arms and in the groin area to help warm the patient.

Frostbite is a cold emergency that effects only specific areas of the body such as fingers or toes. These areas will appear waxy and cold with no feeling or movement. If you are helping a victim with frostbite, handle the area carefully to avoid further damage. DO NOT actively warm the area if there is any chance the area may refreeze before help arrives. Doing so can cause irreversible damage.

Bites and stings

Animal bites or stings are rarely life threatening but often uncomfortable. When helping a victim who is suffering from an animal bite or sting, make

sure the environment is safe for you to help. It is often helpful if you can help identify the type of animal involved, but DO NOT attempt to capture or trap it for identification.

Bees, unlike other stinging insects, leave their stinger in the victim's skin. To remove the stinger, DO NOT use tweezers as doing so will inject further toxin. Rather, take a credit card or other hard, thin object and scrape the stinger out of the skin. If the victim begins having difficulty breathing after a bee sting, call 911 immediately and help them administer their epinephrine auto injector, if available.

Snake bites can also be concerning. If possible, attempt to identify the snake. Poisonousness snakes generally have a more triangular head and leave two "fang" bite marks while non-poisonousness snakes generally have a more "horseshoe" bite pattern. To treat a victim of a snake bite, have the victim sit calmly. Apply a tight bandage to the area. If you must move the victim to another location, consider applying a splint to the bitten extremity. DO NOT attempt to suck venom out of a bite and avoid washing the wound as the venom on the skin could be used to help identify the bite.

Knowledge Check	
8) A victim experiencing a heat emergency should be immersed in ice cold water immediately	9) You should never attempt to catch a snake to help identify the type of bite.
A) True B) False	A) True B) False

Answers:
8) B
9) A

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