
Circulation and Cardiac Emergencies



Emergency Medical Response



You Are the Emergency Medical Responder

You are called to the home of a 50-year-old man whose wife called 9-1-1 because he was complaining of severe pressure in his chest and pain that was radiating to his shoulder. The patient is now perspiring and breathing rapidly and appears very anxious. He states, "I feel like I can't catch my breath. I still feel the pressure, but it has gotten a little bit better."

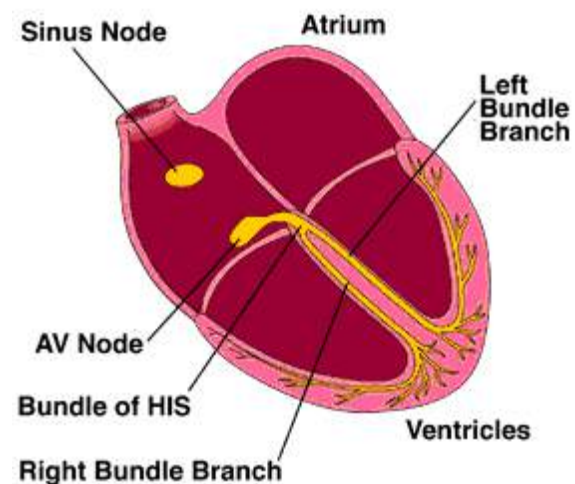
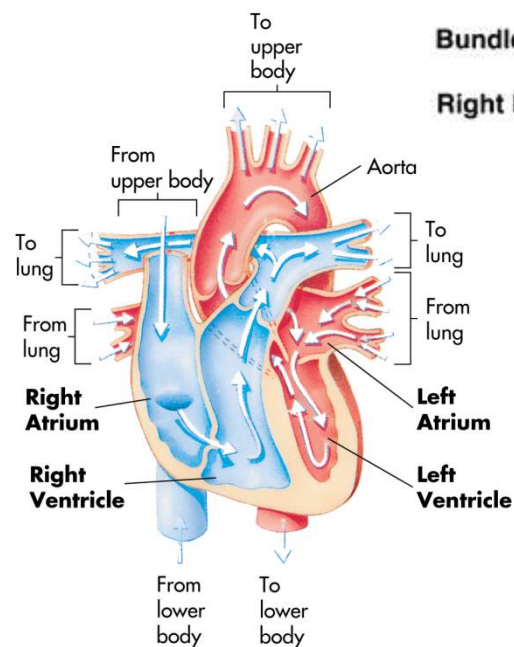
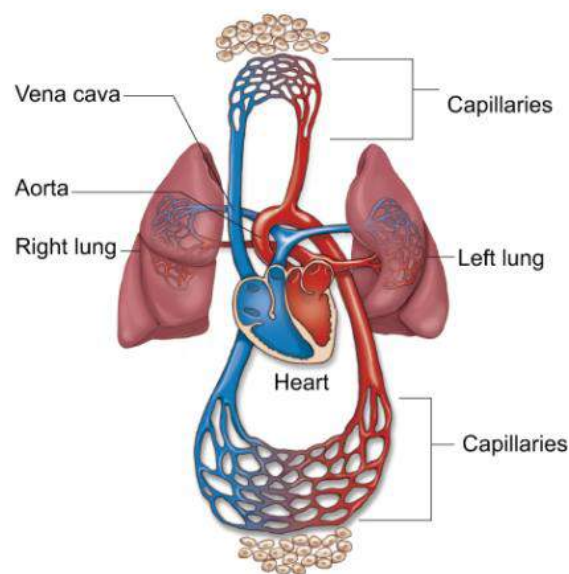
What signs and symptoms would lead you to suspect that the patient is having a heart attack?

What body systems are most likely involved?

What links in the Cardiac Chain of Survival have been met?

Anatomy and Physiology

- Heart structures
- Blood flow through the heart
- Electrical impulse conduction
- Perfusion

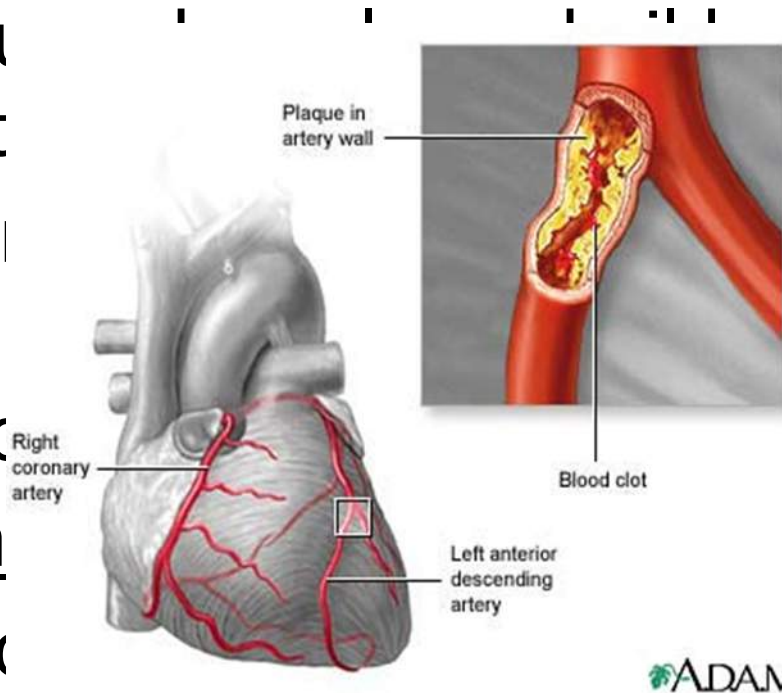


Pathophysiology of the Circulatory System

- Cardiovascular disease as the #1 killer in the United States – 80 million Americans
- The two most common conditions caused by cardiovascular disease are—
 - Coronary Heart Disease (CHD)
 - Stroke (brain attack)

Coronary Heart Disease

- CHD occurs in the arteries that supply the heart muscle
- Possible complications include:
 - Acute Coronary Syndrome
 - Myocardial Infarction
 - Coronary artery disease



occurs in the heart muscle

Acute Coronary

Heart attack

Some blocked

Other Cardiac Problems

- Angina pectoris – chest discomfort
- Arrhythmias (i.e., ventricular fibrillation [V-fib] and ventricular tachycardia [V-tach])
- Atrial fibrillation – usually not life-threatening
- Congestive heart failure
- Hypertension – high blood pressure
- Diabetes – affects nerves, silent heart attack

DVD

The Heart's Electrical System

What is the difference between a Heart Attack and
Cardiac Arrest

DVD

Heart Attack and the Cardiac Chain of Survival

Early recognition of the signs and symptoms of a heart attack and early action increase the chance of survival.

What are the signs and symptoms of a heart attack?

Heart Attack: Signs and Symptoms

- Persistent chest discomfort, pressure or pain
 - Squeezing, tight, or heavy sensation
 - Possible spreading to shoulder, arm, neck, jaw
- Chest discomfort or pain that is severe, lasting more than a few minutes, goes away and comes back or persists with rest
- Pain that comes and goes (such as angina pectoris)
- Difficulty breathing
- Other signs: pale or ashen skin, sweating, dizziness, nausea or unexplained fatigue
- Women are more likely to experience shortness of breath; nausea or vomiting; stomach, back or jaw pain; or unexplained fatigue or malaise

Cardiac Emergencies

- Cardiac arrest occurs when the heart stops beating, or beats to ineffectively to circulate blood
 - Primary cause is cardiovascular disease
 - Cardiac arrest
 - No breathing
 - No pulse
- Brain damage can begin in about 4 to 6 minutes and the damage can become irreversible after about 10 minutes from lack of oxygen.
- Sudden Cardiac Arrest (SCA)
 - Suddenly and without any warning signs

Care for Cardiac Emergencies

- Act immediately and summon more advanced medical personnel
- Have person stop activity and rest
- Loosen tight or uncomfortable clothing
- Comfort the patient
- Give aspirin if medically appropriate and permitted by local protocols
- Assist with prescribed medication
- Prepare for CPR and for using an AED



Activity

Upon arriving at the home of a patient who is sitting on the ground near her vegetable garden, you are approached by the patient's husband, who says that he called 9-1-1 because she started complaining of shortness of breath. "We were working out here in the garden for a couple of hours, trying to get it ready for planting when all of a sudden she got really nauseous and fatigued. Then she said she felt this sudden, sharp pain in her chest and had trouble catching her breath."

What actions would be appropriate for this patient?

Cardiac Chain of Survival***



1. Early recognition and early access to the EMS system
2. Early CPR
3. Early defibrillation
4. Early advanced medical care

For each minute CPR and defibrillation are delayed, the patient's chance of survival is reduce by about 10%

You Are the Emergency Medical Responder

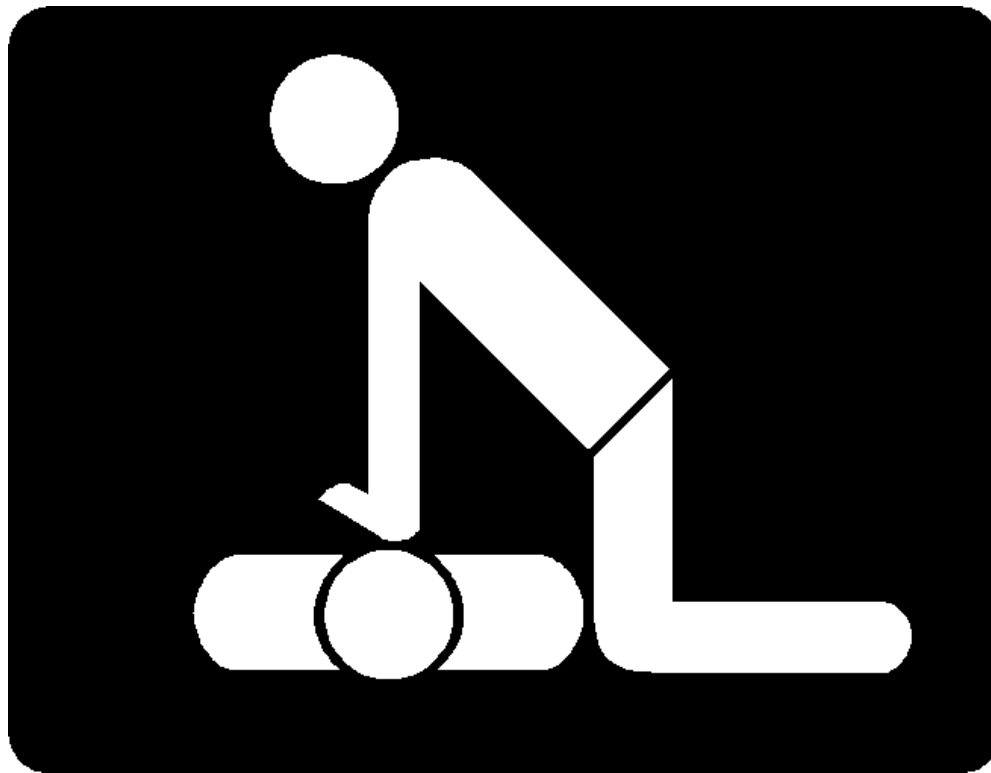
You suspect that the 50-year-old man with severe chest pressure is having a heart attack and you call for more advanced medical personnel.

**What links in the Cardiac Chain of Survival
have occurred up to this point?**

Preventing Coronary Heart Disease

- Risk factors that cannot be changed:
 - Age
 - Gender
 - Ethnicity
 - Family history
- Risk factors that can be changed:
 - Smoking
 - Uncontrolled blood cholesterol
 - Uncontrolled high blood pressure
 - Uncontrolled diabetes
 - Lack of regular exercise

CPR and Automated External Defibrillation (AED)



You Are the Emergency Medical Responder

An elderly man suddenly collapses while working in the office. He is lying on the floor and does not appear to be moving. You, as a member of the medical emergency response team (MERT), recognize the emergency, activate the emergency response plan and perform a primary assessment. The emergency medical services (EMS) system has been activated. You determine that the man is unconscious, not breathing and does not have a pulse. The office building has an automated external defibrillator (AED).

How would you respond?



British Heart
Foundation

Registered charity in England & Wales (225971) and Scotland (SC039426)

Emergency Medical Response





Emergency Medical Response



Cardio Pulmonary Resuscitation CPR

Patient is in Cardiac Arrest

- Unconscious
- Not Breathing
- No Pulse

Cycles of—

- Chest compressions
*(*Hands-only CPR*)
- Ventilations



External Chest Compressions

- Increase the level of pressure in the chest cavity, which squeezes the heart and simulates a contraction
- Requires correct hand positioning for maximum effectiveness
 - Lower half of sternum, center of chest
 - Avoid pressing directly on the xiphoid process
 - Apply pressure in a straight, downward manner
 - Ensure proper depth of compression and full recoil for the best blood flow.

Ventilations

- Air forced into lungs
- Mechanisms:
 - Mouth-to-mask ventilations
 - Bag-valve-mask resuscitator (BVM)
 - Fixed- and variable-flow oxygen used in conjunction with delivery devices

One-Rescuer CPR

- Hand position
 - Two hands, center of chest (adult and child)
 - Two to three fingers, center of chest just below nipple line (infant)
- Chest compression depth (***Push Hard***)
 - At least 2 inches for an adult
 - About 2 inches for a child
 - About 1½ inches for an infant
- Rate—at least 100 compressions per minute (***Push Fast***)
- Ratio of 30 chest compressions to 2 ventilations

Discontinuation of CPR

- Do not interrupt CPR for more than a few seconds (*Hands-only CPR*)
- Do not stop CPR except in one of these situations:
 - You see an obvious sign of life, such as breathing
 - An AED is ready to use
 - Another trained responder takes over
 - More advanced medical personnel take over
 - You are presented with a valid DNR order
 - You are too exhausted to continue
 - The scene becomes unsafe

CPR Reminders

- Ensure patient is on a firm, flat surface.
- Keep your fingers off the chest when giving compressions.
- Use your body weight, not your arms, to compress the chest.
- Position your shoulders over your hands with your elbows as straight as possible.
- Counting out loud helps keep an even pace.

Emergency Medical Response



Two-Rescuer CPR

- Two rescuers arrive on scene at same time and begin CPR
 - Change positions frequently
 - Position changes should take < 5 seconds
- One rescuer is performing CPR and a second rescuer becomes available
 - Second rescuer should ensure advanced medical personnel have been called
 - Get AED or help with CPR

Two-Rescuer CPR

- Compression to ventilation ratio
 - Adult
 - 30 chest compressions to 2 ventilations
 - Child / Infant
 - 15 chest compressions to 2 ventilations
- Position changes about every 2 minutes using the word “change” as the signal

Automated External Defibrillators

- Portable electronic devices that analyze the heart rhythm and provide an electrical shock to help the heart re-establish an effective rhythm
- Rhythm is monitored using two electrodes placed on the chest



Automated External Defibrillators



Early Defibrillation

- Early defibrillation is the single most important factor in determining survival from cardiac arrest.
- Each minute it is delayed decreases the person chance of surviving by 10%



Common Life-Threatening Heart Rhythms

- Ventricular fibrillation (V-fib): ventricular quivering (most common cause of sudden cardiac arrest)
- Ventricular tachycardia (V-tach): too rapid heartbeat
- Non-shockable rhythm's:
 - Asystole – 20-50% of all cardiac arrests
 - Pulseless Electrical Activity (PEA) – 15-20%

Conditions for Using AED

- The cessation of cardiac function where the individual will present with:
 - Unresponsive
 - Not breathing
 - No detectable pulse
- CPR alone will **NOT** reverse ventricular fibrillation
 - Remember, CPR only provides $\approx 30\%$ of the normal blood flow to the brain
- **EARLY** defibrillation again is the single most important factor in survival from sudden cardiac arrest caused by ventricular fibrillation.



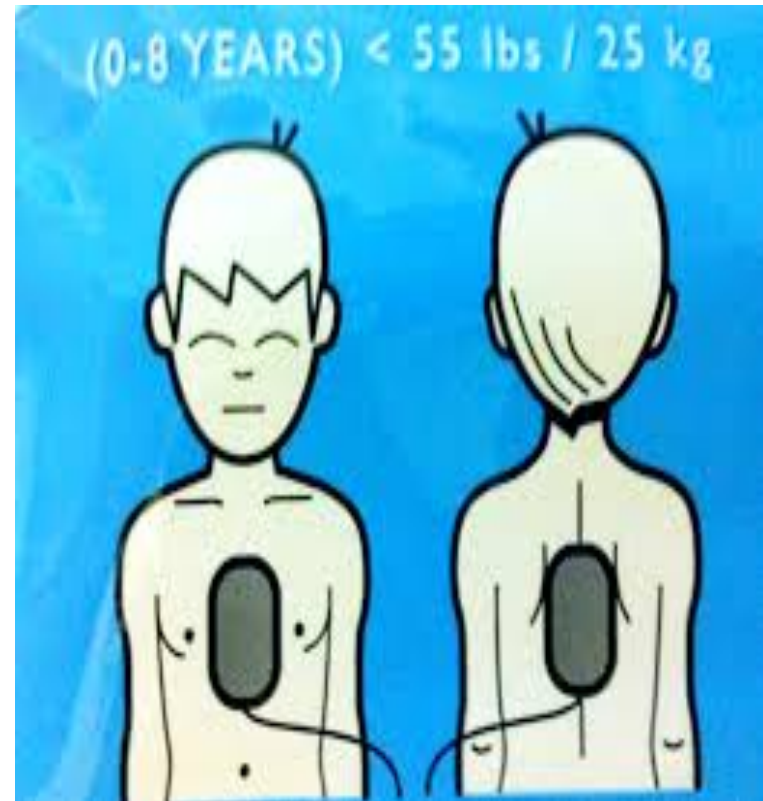
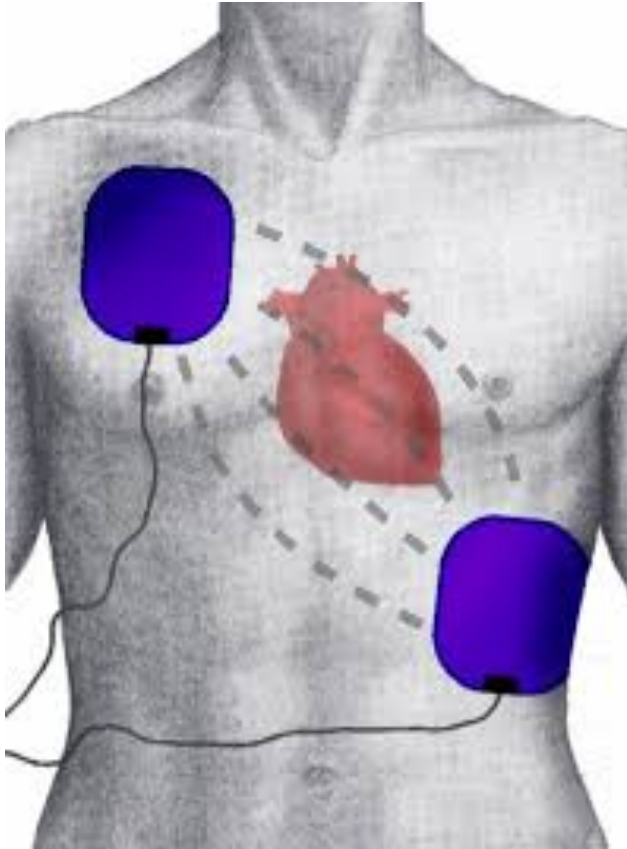
General Steps for Operating an AED

- Turn on AED
- Expose patient's chest and wipe it dry
- Attach AED pads to patient's bare, dry chest
- Allow AED to analyze the heart rhythm
- Deliver a defibrillation shock, if indicated
- **DO NOT TOUCH PATIENT**



DVD
Using an AED

AED pad placement



Special AED Situations

- Pacemakers and ICDs – do not place pad over device
- Water (freestanding, rain, wet clothes)
- Transdermal medication patches
- Hypothermia
- Trauma
- Chest hair – remove if possible
- Jewelry and body piercings – do not remove



AED Precautions

- Do not use alcohol to dry the chest
- Use appropriately sized pads for the patient
- Do not touch the patient while the AED is analyzing or during defibrillation
- Do not defibrillate around flammable or combustible materials
- Do not use in a moving vehicle
- Do *not* use an AED on a patient who is in contact with water
- Do *not* use an AED on a patient wearing a nitroglycerin patch or other patch on the chest
- Do not use mobile or cell phones within 6 feet of an AED

You Are the Emergency Medical Responder

The man who collapsed is unconscious, is not breathing and does not have a pulse. You send another MERT member to summon more advanced medical personnel and to bring the AED from inside the building. You begin CPR. Once the AED arrives, the other MERT prepares the AED for use.