

# Heart Disease

## HEART DISEASE

**Myocardium** - the heart (cardiac) muscle

The left side of the heart is thicker because of the increased pressure it must work against

Responsible for pumping the blood at the proper pressure

- if damaged it will effect the rate or the pressure

The heart acts as a double pump with the Atria pumping together to push the blood into the ventricles.

The Ventricles pump together to push the blood into the body (LV) and the Lungs (RV)

## The vessels

The vessels are under control of the autonomic nervous system which dilates and constricts them as needed

The autonomic nervous system delivers different flows to the parts of the body as needed

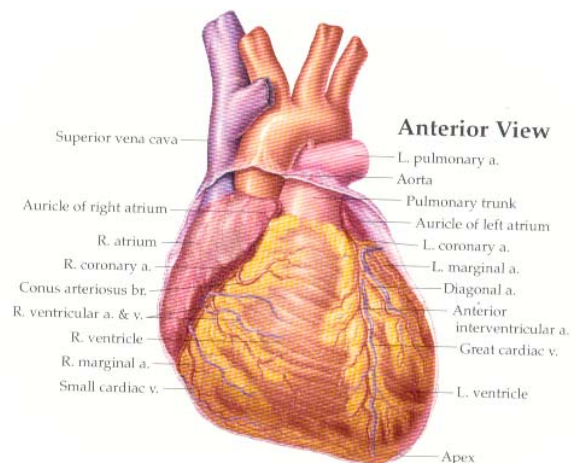
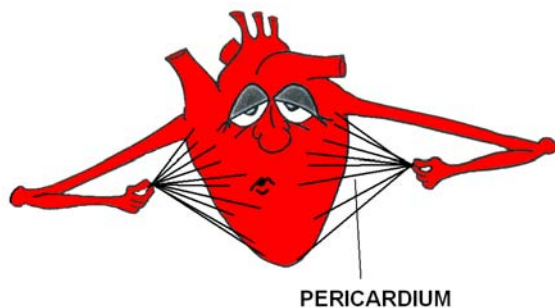
The body will shunt the flow of blood to certain parts of the body in an emergency situation

**Coronary arteries** - The vessels that supply the heart with a constant blood supply. Originate at the aorta just past the aortic valve.

**Aorta** - Blood vessel that leaves the Left Ventricle and delivers freshly oxygenated blood to the body

**Inferior Vena Cava** - Vessel that delivers the blood from the lower extremities, pelvis , and abdomen back to the Right Atrium of the heart

**Superior Vena Cava** Vessel that delivers the blood from the upper extremities, the head, neck, and shoulders back to the Right Atrium of the heart





**Perfusion** The circulation of blood through the bodies organs (arteries, capillaries, cells, capillaries, veins) providing them with nutrients and removing waste.

**Coronary valves** Specialized valves in the heart keep the blood from back flowing.  
Aortic valve - between the left ventricle and the aorta  
Pulmonary valve - between the right ventricle and the pulmonary artery  
Tricuspid valve - Between the Right Atrium and Ventricle  
Mitral valve- Between the Left Atrium and Ventricle

**Blood Pressure** Pressure of the circulating blood against the walls of the arteries

**Systolic pressure** - the pressure present in the arteries at when the heart contracts.

- Maximum pressure

**Diastolic pressure** the pressure present when the heart relaxes

- Minimum pressure

\* Factors that effect **Arterial pressure:**

- Blood volume
- State of the Vessels (dilated or constricted)
- Condition of the heart to contract

\* Factors that effect **Venous pressure:**

- Blood volume
- Capacity of the veins

\* The Body tries to maintain adequate pressure to perfuse all of the organs by regulating the cardiac output and pulse rate.

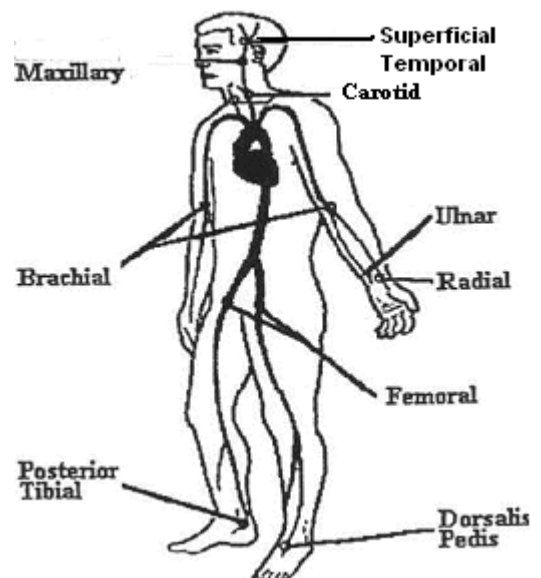
cardiac output = heart rate x stroke volume

blood pressure = cardiac output x vascular res.

**Pulse** the pressure wave that is felt as blood passes through an artery

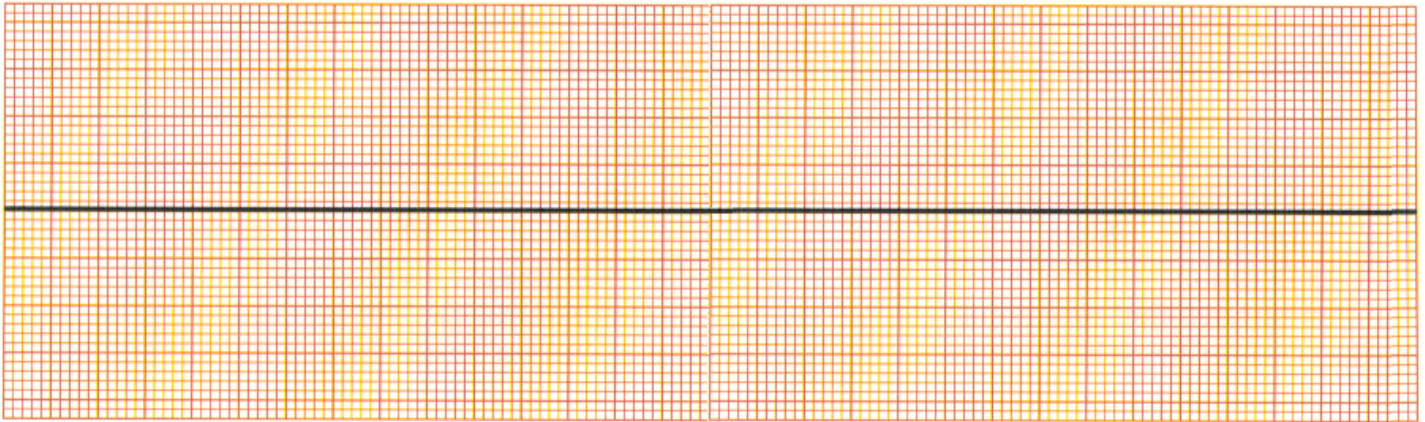
**Pulse points**

- Carotid
- Radial
- Ulnar
- Femoral
- Brachial
- Posterior tibial
- Dorsalis pedis
- Temporal
- Maxillary



## Electrical Conduction System

Heart has its own specialized tissues responsible for conducting impulse through the heart



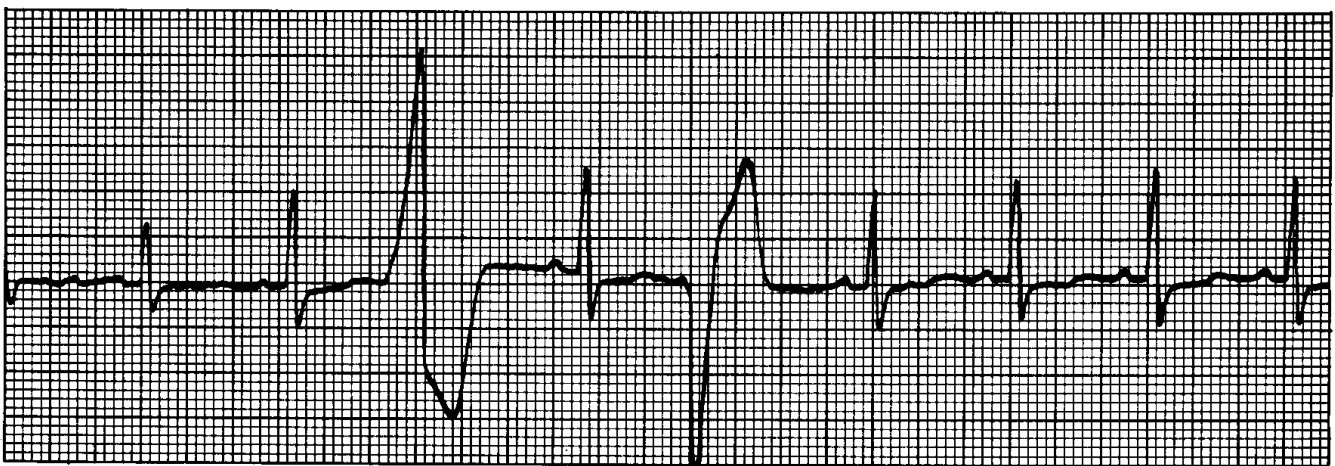
**FIGURE 21-46** Asystole.

### Asystole

**Description:** Absence of cardiac electrical activity

**Etiology:** Usually associated with massive MI, ischemia, and necrosis  
Usually the end result of ventricular fibrillation

**Clinical significance:** prognosis for resuscitation are poor



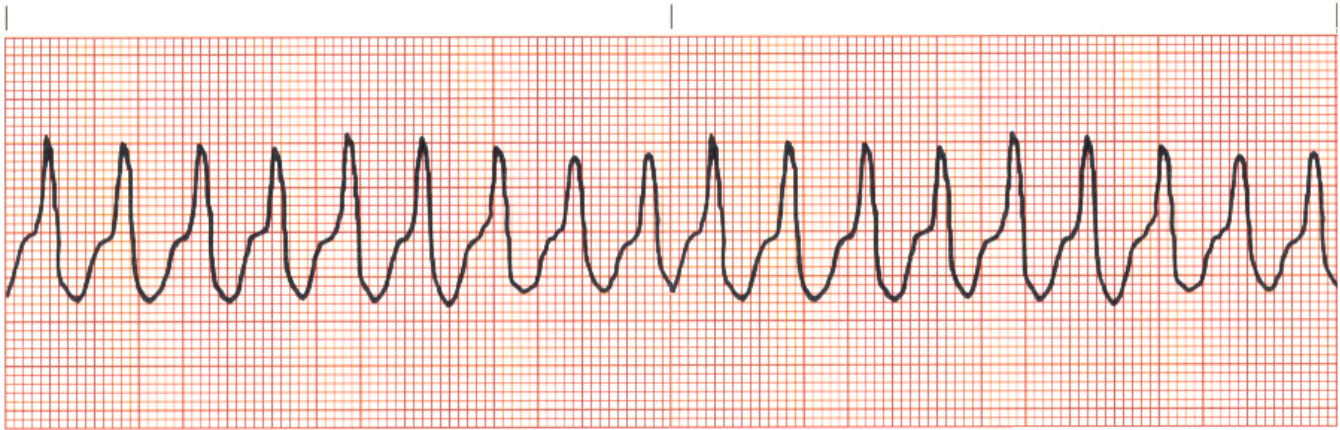
**Multiformed premature ventricular complexes.** Note variation in morphology and in coupling interval of PVC's.

### Premature Ventricle Contractions

**Description:** Results from a single electrical impulse arising from an irritable focus in the ventricle that occurs earlier than the next expected beat.

**Etiology:** May be caused by ischemia or Hypoxia

**Clinical significance:** PVCs can trigger lethal dysrhythmia



**FIGURE 21-43** Ventricular tachycardia.

### **Ventricular Tachycardia**

*Description:* Consists of three or more ventricle complexes in a row at a rate of 100 per min- or greater.

*Etiology:* May be caused by Myocardial ischemia

*Clinical significance:* Rapid ventricular rate may compromise cardiac output



**FIGURE 21-45** Ventricular fibrillation.

### **Ventricular Fibrillation**

*Description:* Results from many reentry circuits within the ventricles with no ventricular depolarization or contraction

*Etiology:* Most cases result from advanced coronary artery disease

*Clinical significance:* Lethal dysrhythmia with no cardiac output

# Symptoms or sensations of a heart attack

You may experience any or all of the following when having a heart attack:

**Prolonged discomfort or a band of pressure**

**Aching, burning, tightness or squeezing**

**Indigestion, fullness or heaviness**

**Choking**

These can occur anywhere in the upper body, chest, neck, or jaw and may spread to one or both arms or begin there. In addition, you may feel the discomfort in the upper back or shoulder blades.

Other symptoms might be:

**Sweating** (cold or hot)

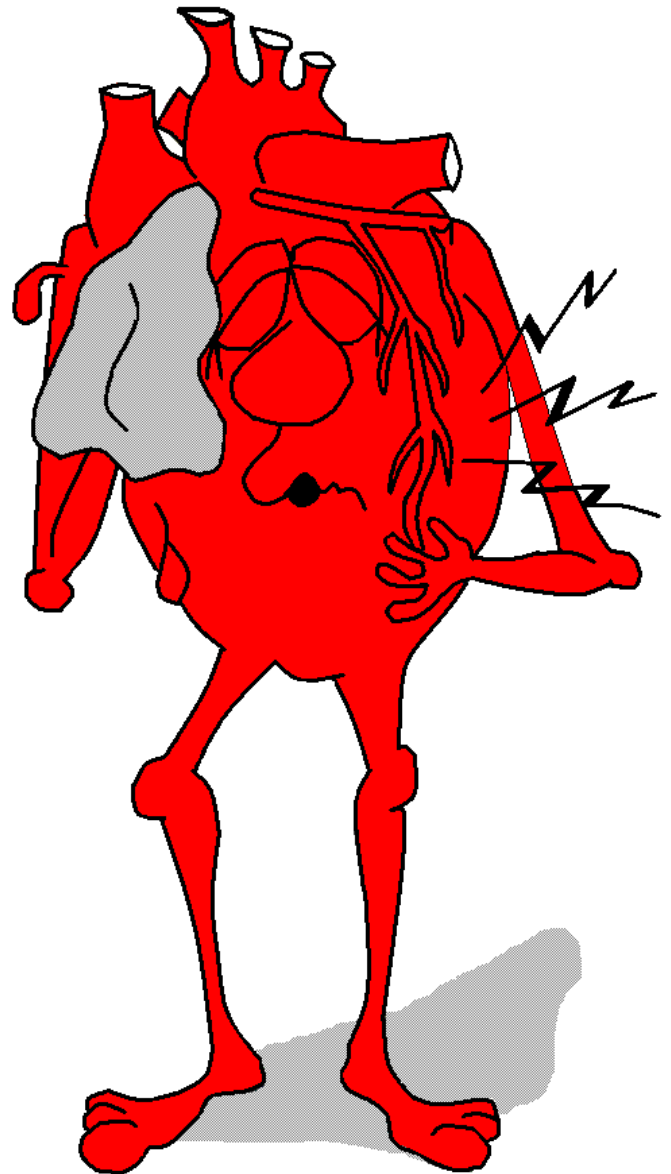
**Nausea and/ or vomiting**

**Dizziness**

**Palpitations**

**Loss of consciousness**  
(occasionally)

**severe weakness**



The symptoms of a heart attack will vary from one person to the next, both in the amount of pain and where they occur.

Therefore, **the way you describe your symptoms is very important** in the physician's diagnosis of a heart attack.

## **Cardiac Compromise**

### **Signs and Symptoms**

Weakness and dizziness (syncope)  
Nausea and vomiting  
Sudden unexplained sweating  
Pain in the chest  
may radiate to arms, jaw, shoulders, etc...  
Crushing, pressure, constricting sensation  
Feeling of impending doom  
Arrhythmias irregular heart beat  
Pulmonary edema  
Elevated pulse - the body trying to maintain cardiac output  
Bradycardia - due to a slowing of the impulses  
Blood pressure may fall as a result of lower cardiac output  
Ashen gray or cyanotic skin  
Distended neck veins - CHF

**Arteriosclerosis** - "Hardening of the arteries" - thickening and loss of elasticity of the arterial Walls

**Atherosclerosis** - Form of arteriosclerosis characterized by thinning of the inner diameter (lumen) of the arterial wall usually caused by "fatty deposits"

**Angina** - Chest pain caused when the heart's demand for oxygen is greater than the available supply

**Myocardial Infarction** - Death of the heart muscle caused by inadequate circulation of the coronary arteries

- Usually occurs in the left Ventricle because of the increased O<sub>2</sub> demand of the muscle

Causes:

Thrombus - Stationary clot

Embolism - Moving clot

Arterial rupture - bursting of the blood vessel

### **Emergency Medical Care:**

ABC's

Reassure the patient - be professional

Oxygen by NRB

Obtain a brief history - Include OPQRST

Vital signs

Position the patient - sitting up

Report to medical control

Consider giving Nitroglycerin

Transport the patient - rapid, but calm manner

If cardiac arrest occurs: Begin Automatic Defibrillation and CPR

# Overview of Defibrillation

**Chain of survival:** Patients have a more successful recovery rate if

EARLY activation of EMS  
CPR is initiated within 4 minutes  
Early defibrillation within 10 minutes  
ACLS

- After 4-6 minutes brain damage may occur
- Cold water drowning are special circumstances

**Defibrillation** The delivery of direct current over the heart

- Trying to convert a rhythm that will not support life to one that will support life
- Most Defibrillators will shock Ventricular Fibrillation (VF) and Ventricular Tachycardia (VT) with a rate of 180 or more

## Types of Defibrillators

### Fully Automated Defibrillators

Analyzes and delivers the shock without intervention by the operator

### Semiautomatic Defibrillators

Once the machine analyzes the rhythm it will advise whether or not to shock the patient  
The provider must push a button to shock the patient •

### Manual Defibrillators

Used only by ALS providers  
The provider must analyze the rhythm and determine if a shock is needed  
Can be used to treat other rhythms other than VF and VT

### Automatic Internal Cardioverter Defibrillators

Implanted defibrillator  
Usually can be seen or felt in the upper left abdomen  
'Will automatically shock the patient if they go into a shockable rhythm  
Avoid placing the pads directly over the device

## Performing Defibrillation

Only attempt defibrillation on Unresponsive, Pulseless, and Apneic patients  
Never touch the patient while the defibrillator is analyzing  
Never analyze the patient while in motion  
Your first priority in a cardiac arrest situation is the analysis of the rhythm  
Most Defibrillators have build-in event recorders and sometimes voice recorders  
Check batteries at the beginning of the shift  
Carry spare batteries  
Before delivering any shocks always "clear the patient"  
Preparing to defibrillate

## **Preparing to defibrillate**

Follow BSI techniques  
Make sure the scene is secure  
If CPR is in progress - Stop  
Perform Initial Assessment (ABC)  
Prepare to use the defibrillator  
If use of the defibrillator will be delayed - Have partner start CPR  
Attach Pads to patient  
Sternum pad - right side of the chest  
Apex pad - left side lower chest  
Turn AED on and begin assessing

## **Analyzing the Rhythm and Delivering Shocks**

Press the button to analyze the Rhythm  
The machine will advise if a shock is indicated

### **Yes**

Clear the patient  
Press to Shock  
Repeat Analysis for a total of three "Stacked Shocks"

After 3 "Stacked Shocks"  
Re-Assess the patient  
Perform CPR or BLS as needed

After 1 minute of CPR  
Re-asses the patient  
Press to Analyze as indicated  
The machine will advise if a shock is indicated

### **Yes**

Clear the patient  
Press to Shock  
Repeat Analysis for a total of three "Stacked Shocks"

### **No**

Re-asses the patient  
Perform CPR or BLS as needed

After 1 minute of CPR  
Press to Analyze the patient

### **No**

Re-asses the patient  
Perform CPR or BLS as needed

After 1 minute of CPR  
Press to Analyze the patient

## **Transport the patient**

After 2 sets of 3 "Stacked Shocks"  
or 3 "No Shock" messages  
or the patient regains a pulse

## **Pediatric Considerations**

The AED should not be used on a patient below the age of 12 or 90 pounds in weight

## **Nitroglycerin**

Common trade names: Nitro-bid, Nitrolingual, and Nitro-stat

Comes in the following forms

Small white pill

Spray

Paste

Skin Patch

## **Indications**

Patient having chest pain

Medications was prescribed for patient

Medical control has given permission

## **Precautions**

Avoid skin contact

Remove nitro patches prior to defibrillation

## **Contraindications**

Systolic BP less than 100 mm Hg

Head injury

Infants and children

Patient has already taken 3 before arrival

## **Actions**

Dilates the coronary blood vessels

Increases the blood flow to the heart

Also dilates the cerebral blood vessels

## **Administration**

After assessment and medical control permission and no contraindication exist

1 Pill is placed under the tongue

After 2-3 minutes re-assess blood pressure

**Doses** may be repeated 2 times for a total of 3 doses

**Congestive Heart Failure** Disease in which the heart loses the ability to adequately pump blood.

- Usually one side of the heart (LEFT) is unable to keep up with the other
- Causes the heart rate to increase and the left ventricle to increase in size - maintain cardiac output
- Fluid from the Pulmonary veins "backup" into the alveoli
- When damage occurs on the right side of the heart the fluid "backup" will show up in the feet - Pedal edema