

Syrian Private University

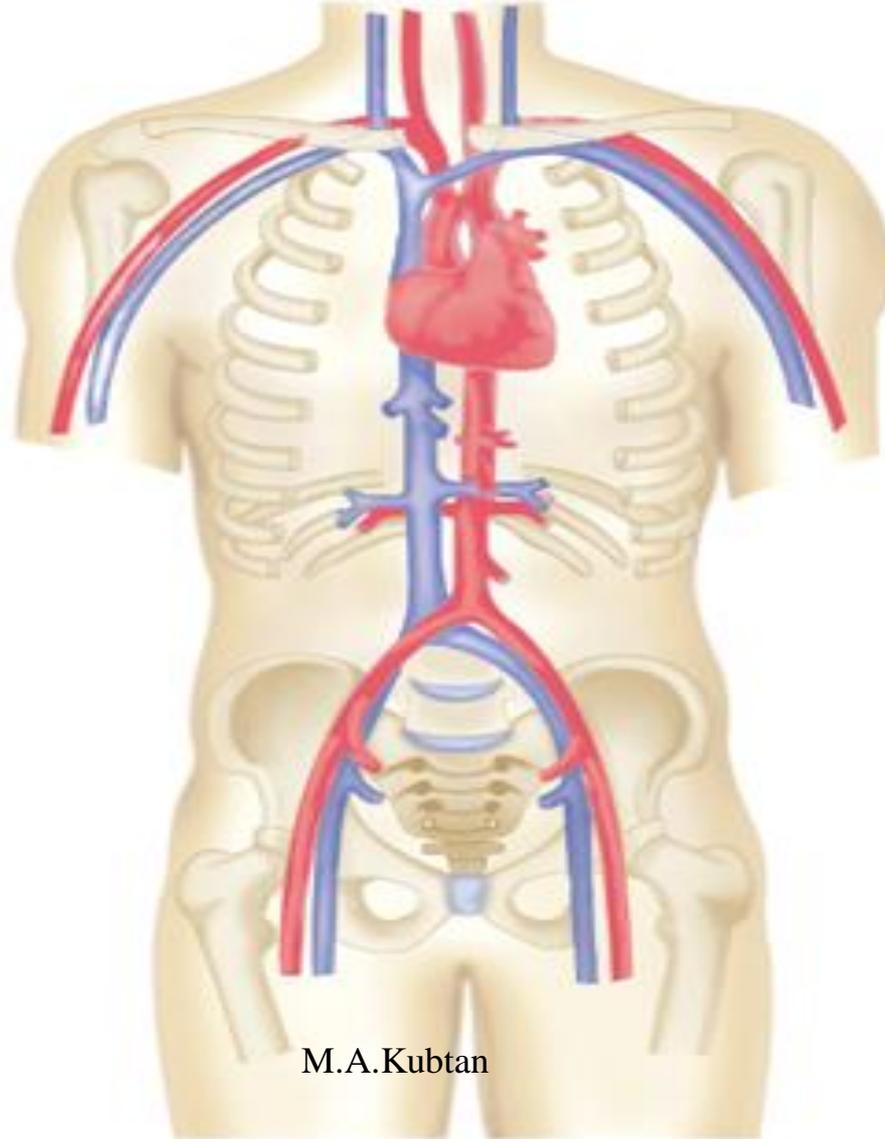
Medical Faculty

Medical Terminology

M.A.Kubtan , MD – FRCS

Lecture 6

The Cardiovascular System



M.A.Kubtan

Objectives

After studying this chapter you will be able to:

- **Name the parts of the cardiovascular system and discuss the function of each part.**
- **Define combining forms used in building words that relate to the cardiovascular system.**
- **Identify the meaning of related abbreviations.**
- **Name the common diagnoses, clinical procedures, and laboratory tests used in treating the cardiovascular system.**

Objectives Cont'd

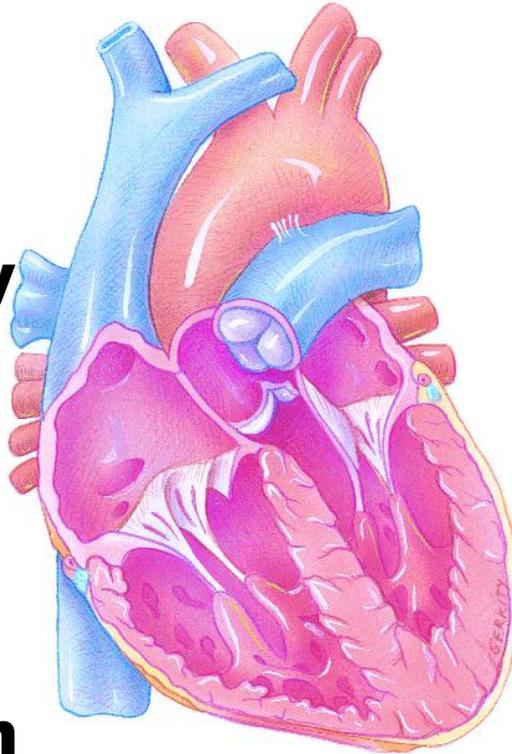
- **List and define the major pathological conditions of the cardiovascular system.**
- **Explain the meaning of surgical terms related to the cardiovascular system.**
- **Recognize common pharmacological agents used in treating the cardiovascular system.**

Structure and Function

The Heart

- Pumps blood through the blood vessels to all body cells.

- Is covered by a protective sac called the *pericardium* which is divided into two layers the *visceral* and *parietal* pericardium.



- Is divided into right and left sides by the *septum*.

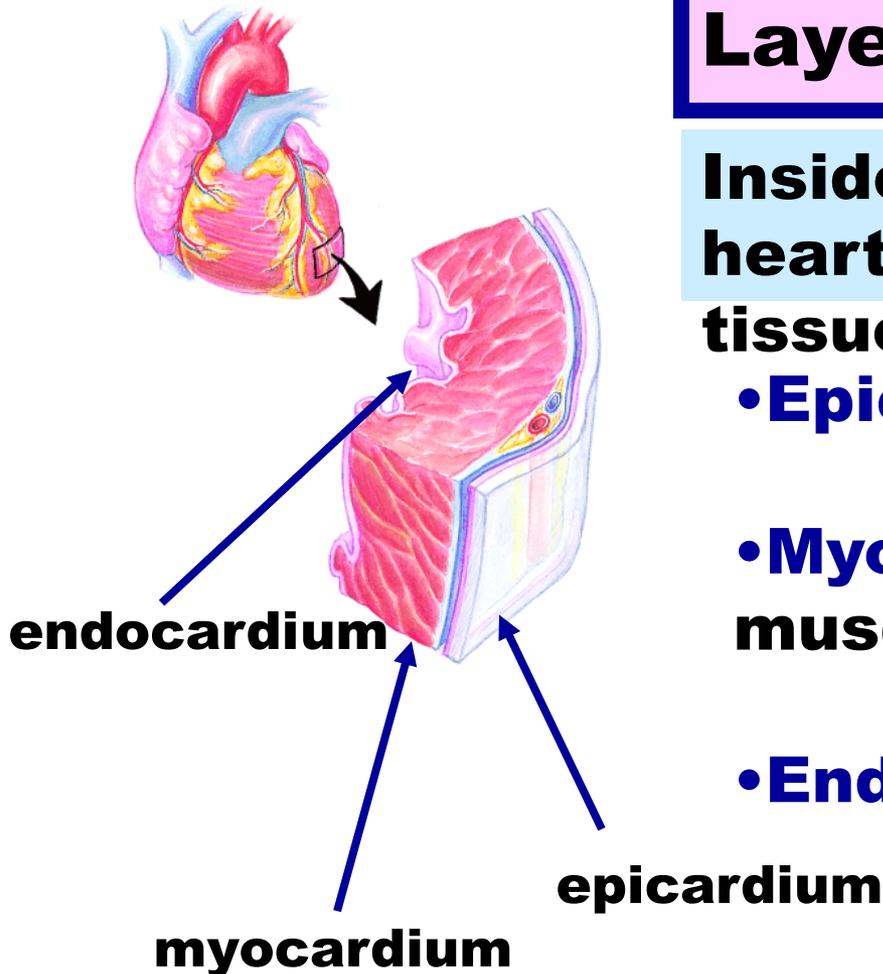
- Each side consists of an *atria* and a *ventricle*.

Structure and Function

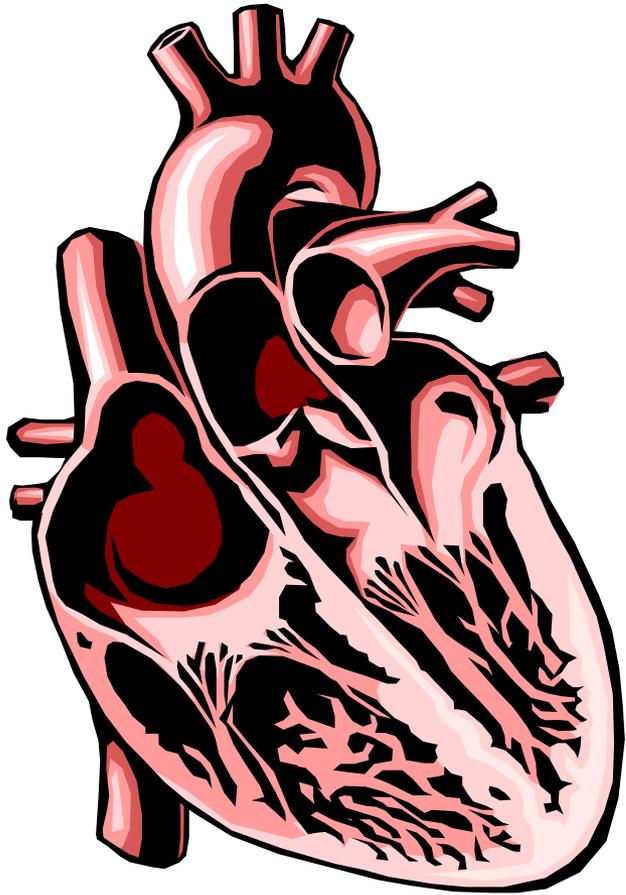
Layers of the Heart

Inside the pericardium, the heart has three layers of tissue.

- **Epicardium** (outermost layer)
- **Myocardium** (middle layer of muscular tissue)
- **Endocardium** (inner layer)



Structure and Function



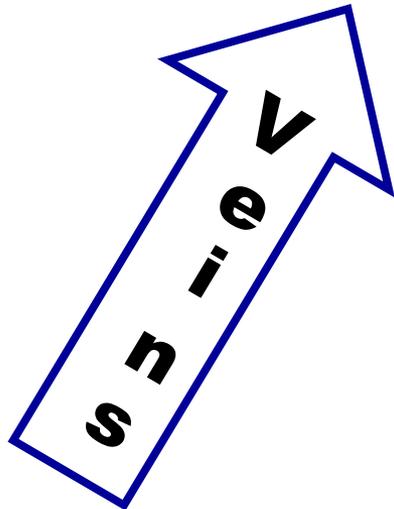
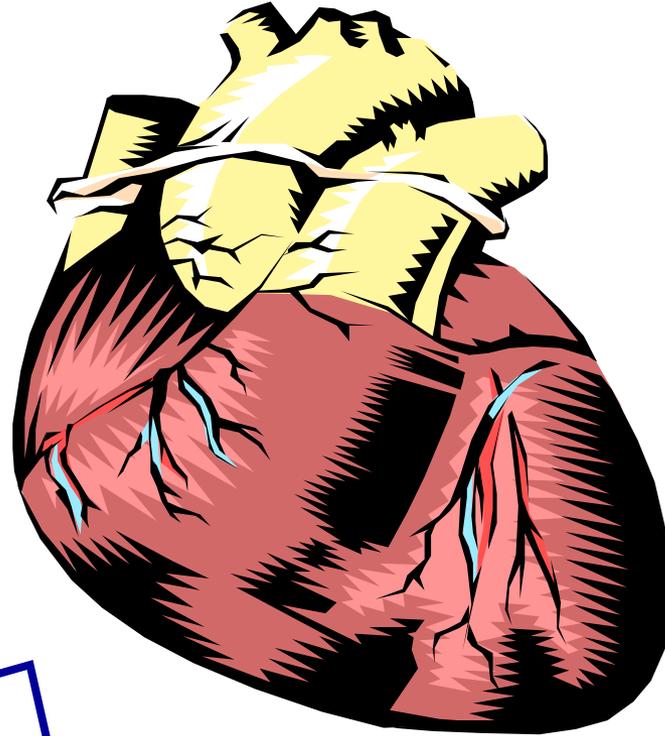
Heart Chambers

- **Right and left atria are the upper chambers of the heart.**
- **Right and left ventricles are the lower chambers of the heart.**
- **Fibers in the ventricles (Purkinje fibers) cause the ventricles to contract.**
- **Blood flows through the heart in only one direction regulated by valves.**

Structure and Function



• Carry blood *away* from the heart.



• Carry blood *toward* the heart.

Structure and Function

Valves of the Heart

Atrioventricular Valves

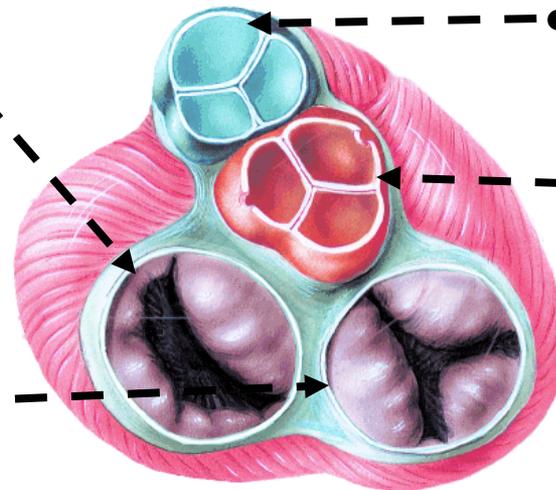
Semilunar Valves

• **Bicuspid valve (mitral)**

• **Pulmonary valve**

• **Aortic valve**

• **Tricuspid valve**



Cross Sectional Top View of Heart

Control blood flow within the heart

Prevent the backflow of blood into the heart

Structure and Function

Coronary Circulation

Circulation of blood within the heart muscle by the *coronary arteries*.

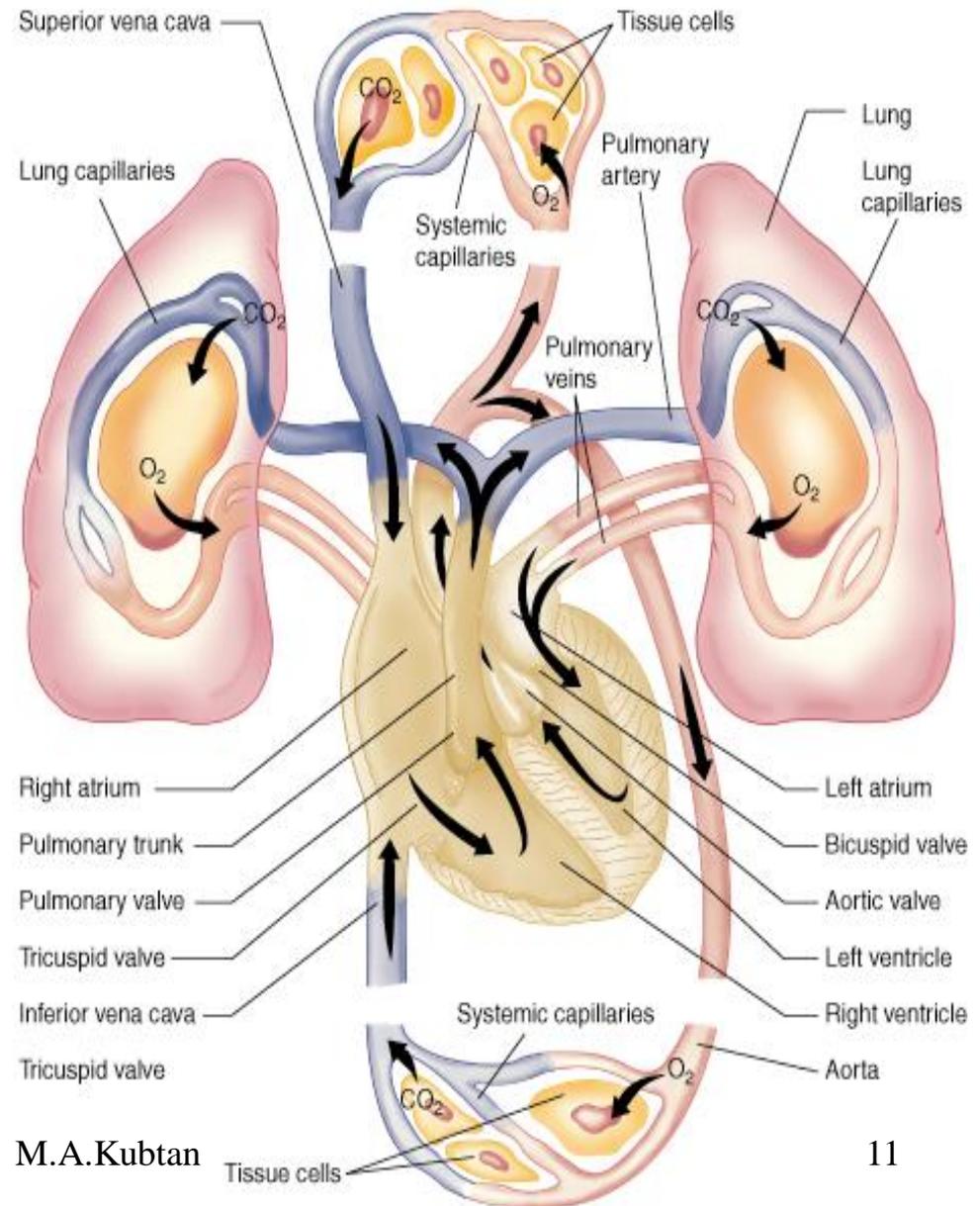
- **Coronary arteries branch off of the aorta, which is the largest artery in the body.**
- **Coronary arteries encircle the heart to supply the heart muscle with about 100 gallons of blood daily.**
- **The heart requires more oxygen than any other organ in the body except the brain.**

Structure and Function

Pulmonary Circulation

Circulation of blood between the heart and lungs.

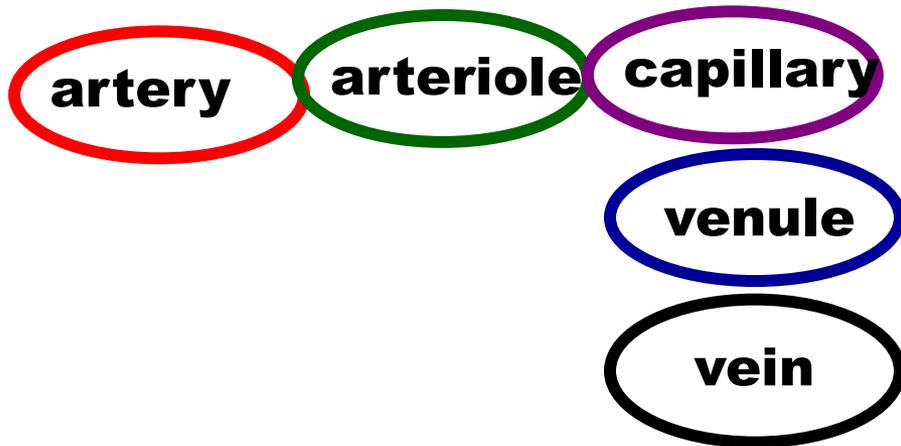
- **Pulmonary arteries** are the only arteries to carry blood low in oxygen.
- **Pulmonary veins** are the only veins to carry oxygen rich blood.



Structure and Function

Systemic Circulation

Flow of blood between the heart and the cells of the entire body.



- **Blood travels through the body in a surge as a result of the heart contractions.**

- **Blood vessels become smaller in diameter as the blood leaves the heart.**

- **Remember arteries leave the heart and veins return to the heart. *Capillaries* are the smallest blood vessels and they serve as a transfer station between the arteries and veins.**

Structure and Function

Blood Pressure

- Measures the force of the blood surging against the walls of the arteries.



Systole

Contraction phase of the heart

Diastole

Relaxation phase of the heart

Structure and Function

Conduction System

Sinoatrial node (Pacemaker)



Atrioventricular node



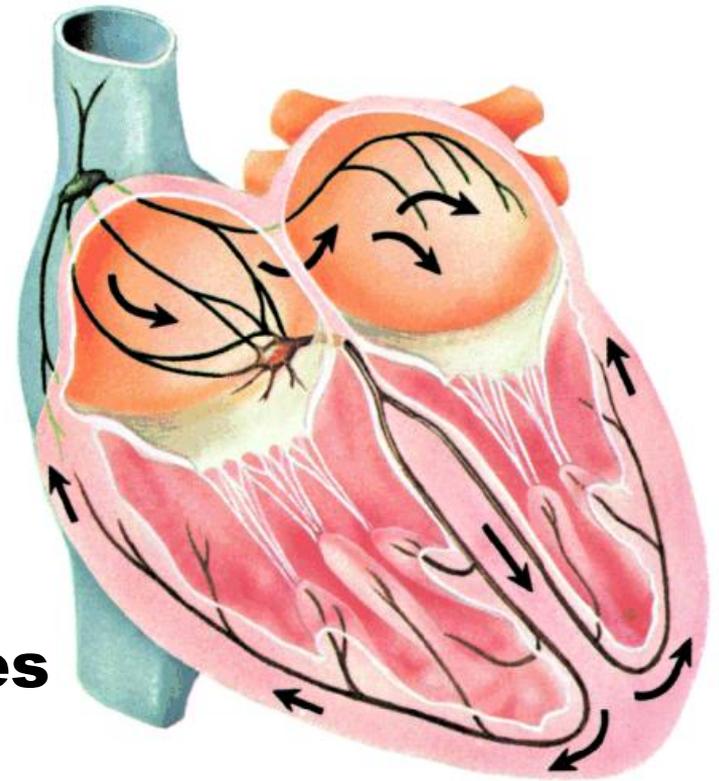
Bundle of His



Right and Left Bundle Branches



Purkinje Fibers



Structure and Function

Conduction System

The heart's pacemaker causes regular contracting of the myocardium resulting in a regular heartbeat or pulse.



Contraction Phases

- **Polarization (resting)**
- **Repolarization (recharging)**
- **Depolarization (contracting)**

Structure and Function

Conduction System

Factors affecting the heart rate:

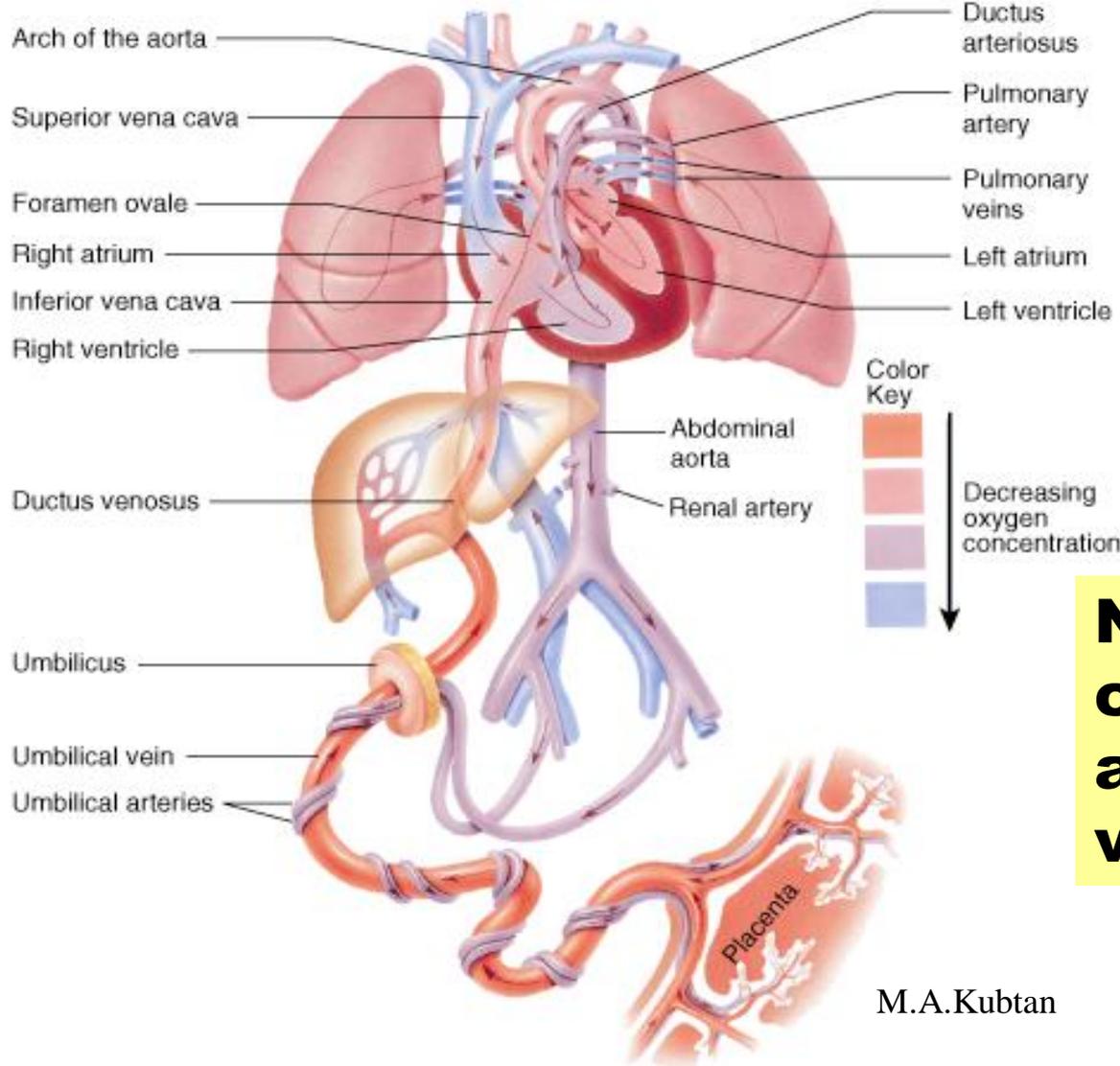
- **Health status**
- **Physical activity**
- **Emotions**

During one cardiac cycle the heart contracts and relaxes.

Cardiac Cycle = 1 contraction + 1 relaxation

Structure and Function

Fetal Circulation



Structures unique to the fetus:

- Foramen ovale
- Ductus arteriosus
- Ductus venosus

Note the umbilical cord contains two arteries and one vein.

Combining Forms and Abbreviations

Combining Form

Meaning

angi (o)



blood vessel

aort (o)



aorta

arteri (o)



artery

ather (o)



fatty matter

atri (o)



atrium

cardi (o)



heart

hemangi (o)



blood vessel

Combining Forms and Abbreviations

Combining Form

Meaning

pericardi (o)



pericardium

phleb (o)



vein

sphygm (o)



pulse

thromb (o)



blood clot

vas (o)



blood vessel

ven (o)



vein

Combining Forms and Abbreviations

Abbreviation

Meaning

AcG **accelerator globulin**

AF **atrial fibrillation**

AS **aortic stenosis**

ASCVD **arteriosclerotic
cardiovascular disease**

ASD **atrial septal defect**

ASHD **arteriosclerotic heart disease**

AV **atrioventricular**

Combining Forms and Abbreviations

Abbreviation

Meaning

BP	blood pressure
CABG	coronary artery bypass graft
CAD	coronary artery disease
cath	catheter
CCU	coronary care unit
CHD	coronary heart disease
CHF	congestive heart failure

Combining Forms and Abbreviations

Abbreviation

Meaning

CO



cardiac output

CPK



creatinine phosphokinase

CPR



cardiopulmonary resuscitation

CVA



cerebrovascular accident

CVD



cardiovascular disease

DSA



digital subtraction angiography

DVT



deep venous thrombosis

Diagnostic, Procedural and Laboratory Tests

Cardiology is the treatment of cardiovascular diseases and the physician who specializes in heart conditions is called a ***cardiologist***.



Auscultation may reveal the following abnormal heart sounds:

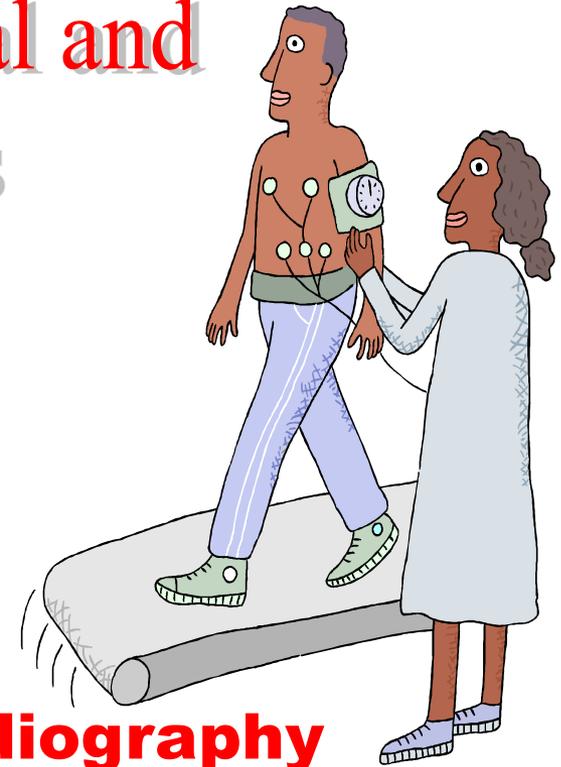
- **Murmur**
- **Bruit**
- **Gallop**

Diagnostic, Procedural and Laboratory Tests

Common Diagnostic Tests

Exercise tolerance test (ETT)

- Patients exercise on a treadmill and the technician monitors the heart rate and respiratory rate.



Electrocardiography

- Produces an electrocardiogram which measures the amount of electricity that flows through the heart.
- Electrodes placed on the skin at specific points detect the heart's electrical impulses.



Diagnostic, Procedural and Laboratory Tests

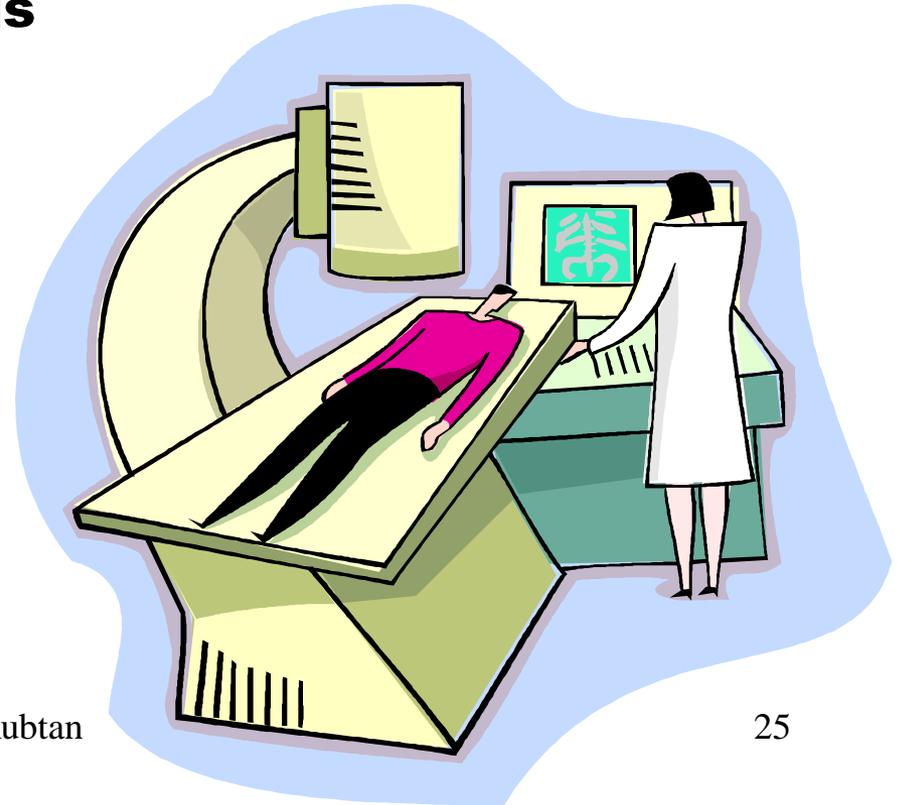
Tests involving x-rays

•Angiocardiogram

-injection of a dye followed by x-rays of the heart and the heart's large blood vessels

Others Tests

- angiogram
- arteriogram
- aortogram
- venogram(phlebogram)
- ventriculogram



Diagnostic, Procedural and Laboratory Tests

Ultrasound tests produce images by using sound waves.

Doppler ultrasound

- **Measures blood flow in certain blood vessels**

Echocardiography

- **Records sound waves to show the structure and movement of the heart**

Diagnostic, Procedural and Laboratory Tests

Other Noninvasive Tests

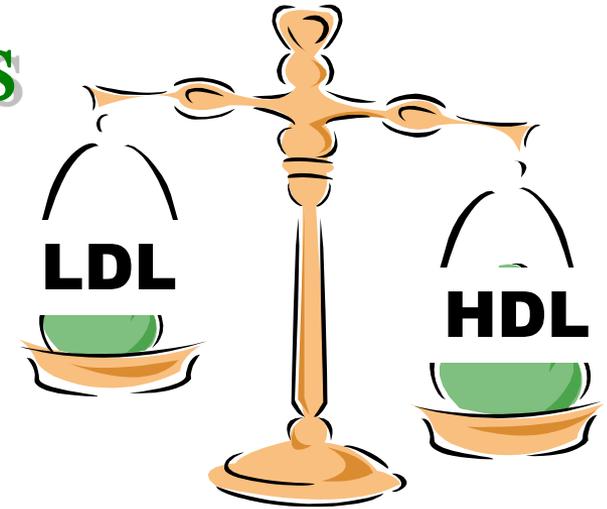
- **Cardiac scan**
- **Positron emission tomography (PET)**
- **Multiple-gated acquisition (MUGA) angiography**
- **Magnetic resonance imaging (MRI)**

Other procedures require insertion of an actual device such as a catheter into a vein or artery, and the device is guided to the heart as with **cardiac catheterizations.**

Diagnostic, Procedural and Laboratory Tests

Laboratory Tests

The flow of blood in the arteries is affected by the amount of **cholesterol** and **triglycerides** contained in the blood.



- **High-density lipoproteins actually remove lipids from the arteries and protect from the formation of blockages.**

- **Low-density lipoproteins and very low-density lipoproteins cause cholesterol to form blockages in the arteries.**

Diagnostic, Procedural and Laboratory Tests

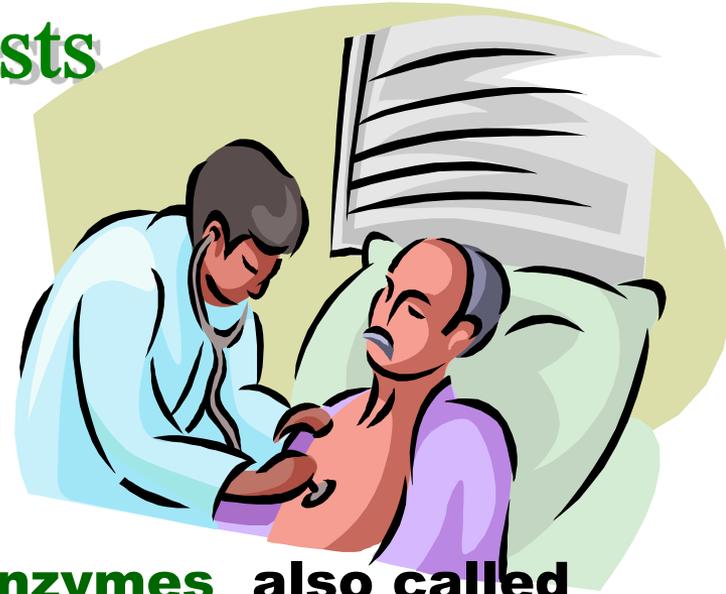
Laboratory Tests

Also help to diagnose myocardial infarction.

• **Troponin T** and **troponin I** are proteins found in the heart and tests for these can diagnose a myocardial infarction faster than most other lab tests.

• **Cardiac enzymes** also called serum enzyme tests measure the amount of enzymes released into the blood by the damaged heart muscle during a myocardial infarction.

- **CPK** (creatine phosphokinase)
- **LDH** (lactate dehydrogenase)
- **GOT** (glutamic oxaloacetic transaminase)



Pathology

Risk Factors to Developing Cardiovascular Disease (CVD)



poor diet



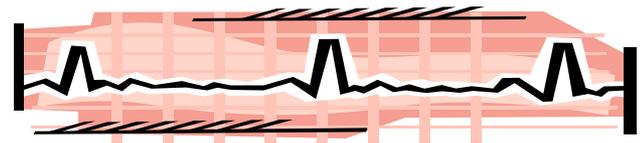
smoking



lack of exercise



Heart Rhythm



Abnormal rhythms are called **arrhythmias.**

• **Bradycardia**

• **Tachycardia**

• **Atrial Fibrillation**

• **Flutter**

• **Murmur**

• **Gallop**

• **Premature atrial contractions (PAC)**

• **Premature ventricular contractions (PVC)**



Pathology

Blood Pressure abnormalities can damage the heart and other body systems.

- **Hypertension (too high)**
- **Hypotension (too low)**

- **Essential hypertension occurs without any specific cause.**
- **Secondary hypertension has a known cause, for example, high-salt intake.**

Pathology

plaque

thrombus

atheroma

Diseases of the Blood Vessels

**varicose
veins**

embolus

phlebitis

Pathology

Coronary Artery Disease

Refers to any condition that reduces the nourishment the heart receives from the blood flowing through the arteries of the heart, such as:

Aortic stenosis

Angina Pectoris

Coarctation of the aorta

Pulmonary artery stenosis

Pathology

General Heart and Lung Diseases

Myocardial infarction

- **Disruption of blood flow to the heart muscle; also called heart attack.**

Cardiac Arrest

- **Also known as asystole, is the sudden stopping of the heart.**

Congestive Heart Failure

- **Occurs when the heart is unable to pump the necessary amount of blood.**

Pathology

Specific Inflammatory Conditions of the Heart

- endocarditis

- myocarditis



- bacterial endocarditis

- pericarditis

Other Conditions

- cardiomyopathy

- intracardiac tumor

Pathology

Congenital Heart Conditions

- **Patent ductus arteriosus**
- **Septal defect**
- **Tetralogy of Fallot**

Valve Conditions

- **Aortic regurgitation**
- **Mitral insufficiency**
- **Mitral valve prolapse**
- **Tricuspid stenosis**
- **Valvulitis**
- **Rheumatic heart disease**

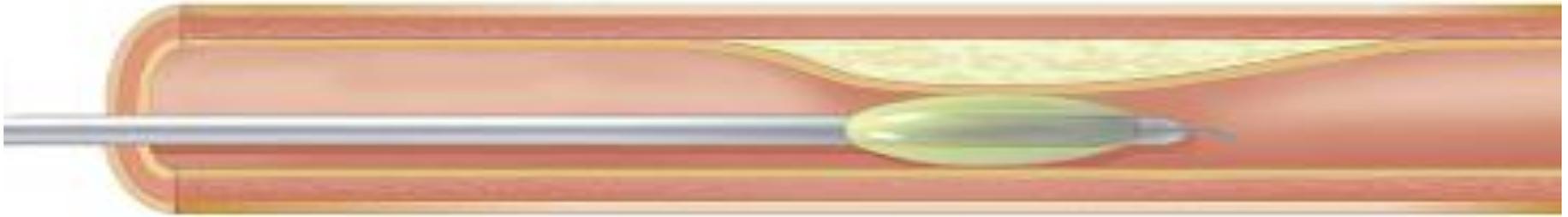
Surgical Terms



The goal of most cardiovascular surgery is to improve blood flow to all body cells.

Surgical Terms

Percutaneous transluminal coronary angioplasty (PTCA) is a surgical procedure in which a balloon catheter is inserted into a blocked blood vessel to increase the blood flow of that vessel.



Narrowed artery with balloon catheter positioned.



Inflated balloon presses against arterial wall.

Surgical Terms

***Cardiac Catheterization* is the most common type of operation performed in the United States.**

Other procedures involving catheters:

Balloon valvuloplasty

- **Used to open narrowed cardiac valve openings.**

Coronary angioplasty

- **Used to open a blood vessel.**

Angioscopy

- **Uses a fiberoptic catheter to view the interior of a blood vessel**

Surgical Terms

Some conditions require the creation of a bypass around blockages.



Coronary bypass surgery

- **A vein from another part of the body is often used as a graft to bypass an arterial blockage.**
- **Saphenous vein and the mammary arteries are commonly used as grafts for this procedure.**

Fontan's operation

- **Creates a bypass from the right atrium to the main pulmonary artery.**

Surgical Terms

Surgical removal and replacement procedures

- **Heart transplant**
- **Thrombectomy**
- **Embolectomy**
- **Atherectomy**

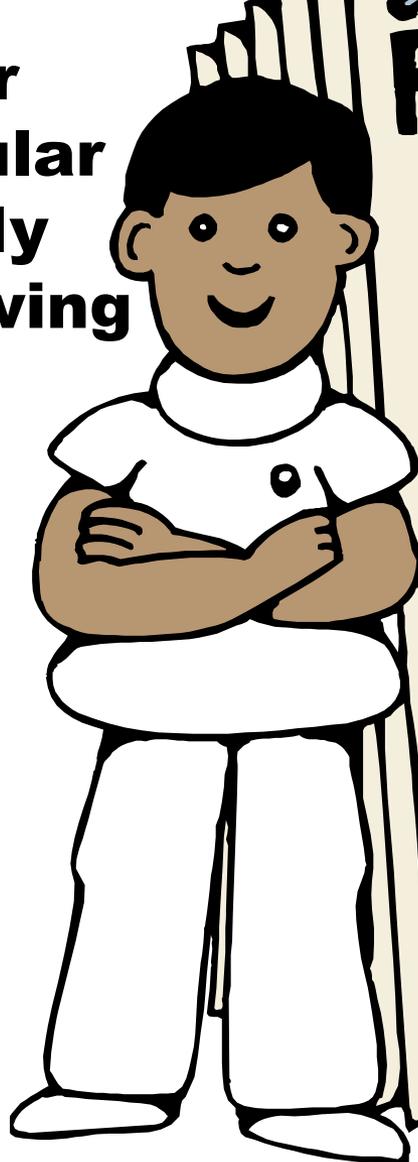
- **Valve replacement**
- **Endarterectomy**
- **Arteriotomy**
- **Valvotomy**
- **Venipuncture**

Surgical reconstruction and repair procedures

- **Valvuloplasty**
- **Anastomosis**

Pharmacology

Drug therapy for the cardiovascular system generally treats the following conditions:



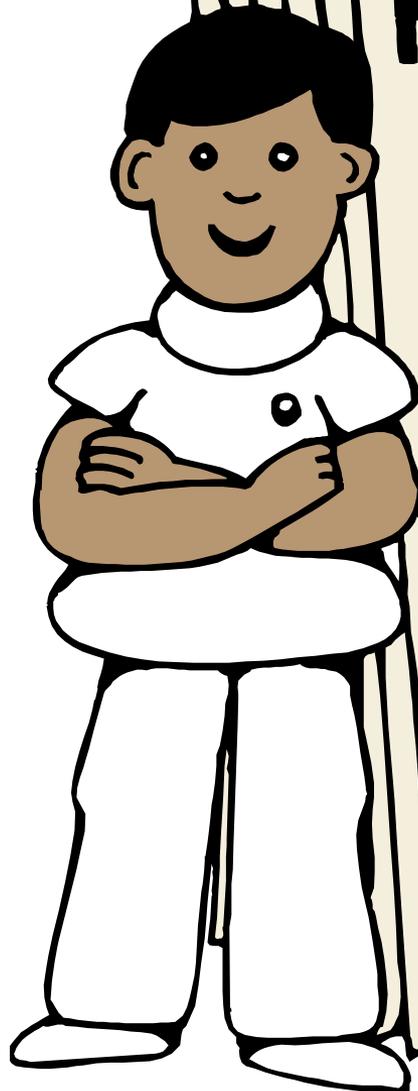
Rx **CARDIOVASCULAR CONDITIONS**

- **angina**
- **heart attack**
- **high blood pressure**
- **high cholesterol**
- **congestive heart failure**
- **rhythm disorders**
- **vascular problems**

Pharmacology

Antianginals

Relieve pain
and prevent
attacks of
angina



Rx

**Three Categories of
Drugs:**

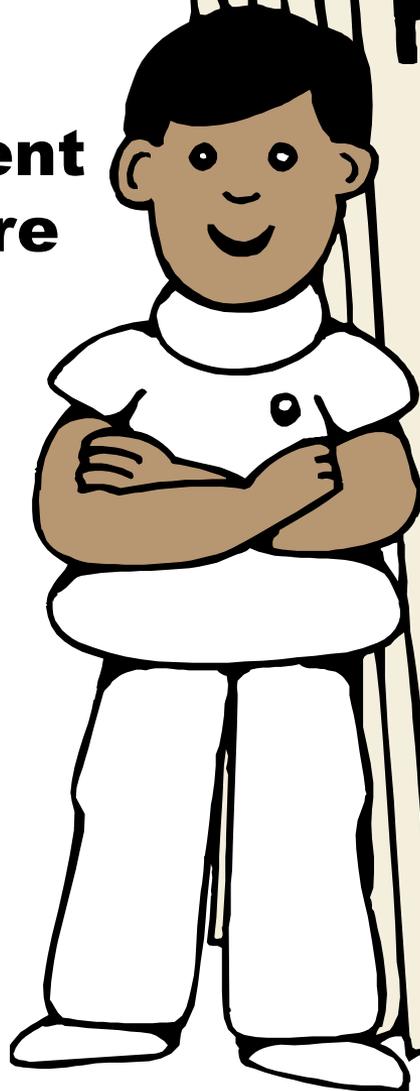
- **nitrates**
(nitroglycerine)

- **beta blockers**
(atenolol)

- **calcium channel
blockers**
(nifedipine)

Pharmacology

High blood pressure may require treatment with one or more drugs.



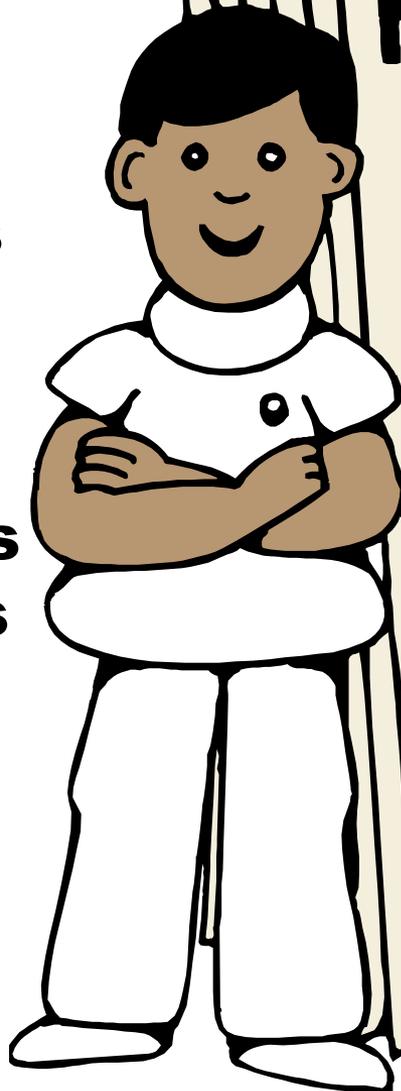
Rx

Medications for:
HYPERTENSION

- **vasodilators**
- **diuretics**
- **angiotensin converting enzyme (ACE) inhibitors**

Pharmacology

Congestive heart failure is treated with medications that increase myocardial contractions. In certain situations the blood vessels may need to be narrowed as well.



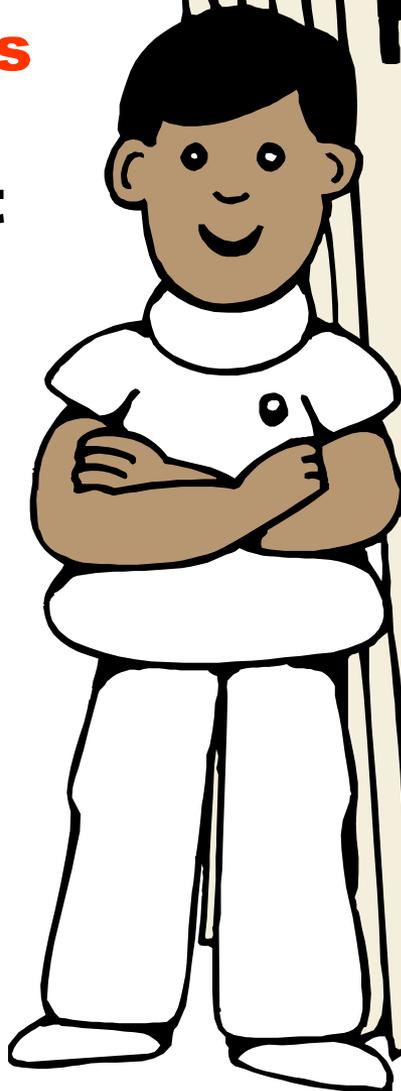
Rx

Medications for:
**CONGESTIVE
HEART
FAILURE**

- **ACE inhibitors**
- **diuretics**
- **cardiotonics**
- **vasoconstrictors**

Pharmacology

Rhythm disorders are treated with medications that normalize the heart rate by affecting the nervous system that controls the heart rate.



Rx

Medications for:
**RHYTHM
DISORDERS**

- beta blockers
- calcium channel blockers



Pharmacology

Other Medications

Lipid-lowering drugs help the body excrete unwanted cholesterol.

Anticoagulants and antiplatelet medications inhibit the ability of the blood to clot.

Medications used for vascular problems may include drugs that decrease the thickness of the blood or drugs that increase the amount of blood the heart is able to pump.

Apply Your Knowledge

All arteries ***except*** one carry oxygenated blood and all veins ***except*** one carry deoxygenated blood.

The (**pulmonary**) artery carries deoxygenated blood.

The (**pulmonary**) vein carries oxygenated blood.

Apply Your Knowledge

In fetal circulation, blood flows from the right atrium through the foramen ovale into the left atrium. What would happen if the foramen ovale remained open permanently after birth?

Answer:

This would result in a mixing of oxygenated and deoxygenated blood, which would cause an impairment in the delivery of oxygenated blood to the body cells.

Apply Your Knowledge

Henry, age 56, arrives at a local emergency room complaining of chest “tightness”. Which of the following tests might the physician order to evaluate his symptoms?

A. Holter monitor

B. electrocardiography

C. doppler ultrasound

Answer: B. electrocardiography

Apply Your Knowledge

In mitral valve prolapse, which of the following would you expect to occur based on your knowledge of the normal flow of blood through the heart?

A. Blood would become congested in the lower legs

B. Blood would become congested in the vena cava

C. Blood would become congested in the lungs.

Answer: C. Blood would become congested in the lungs