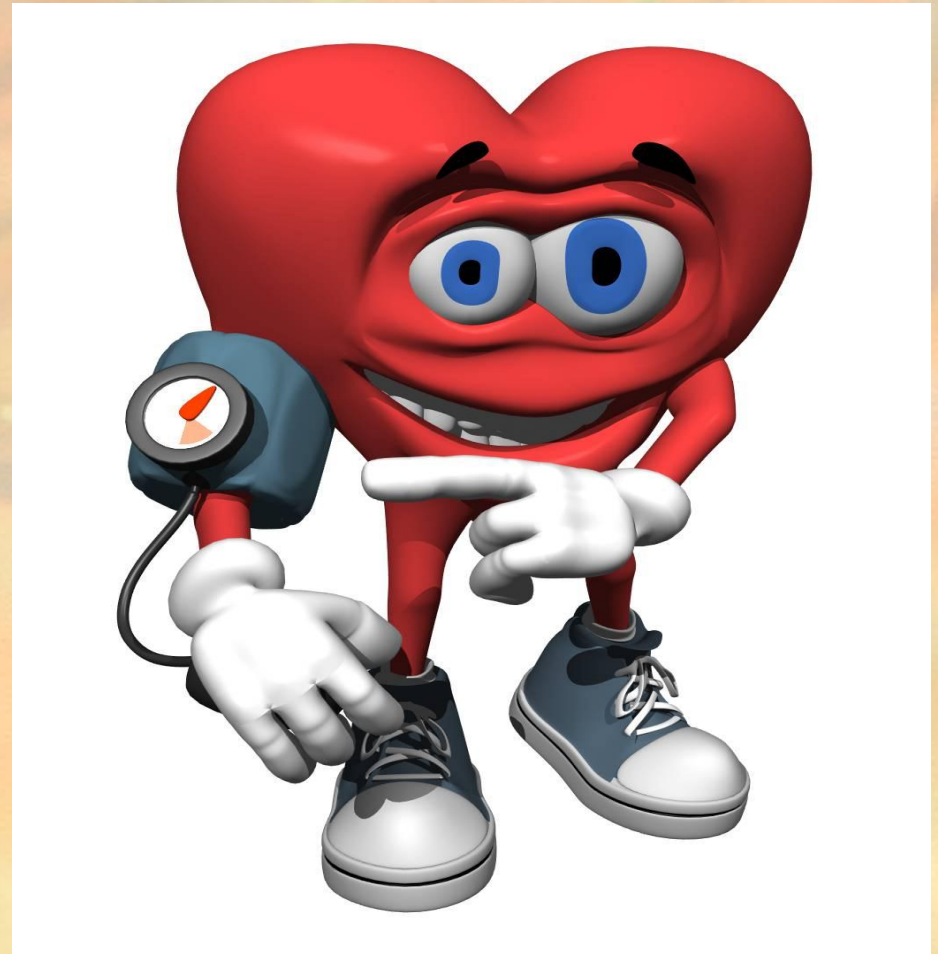
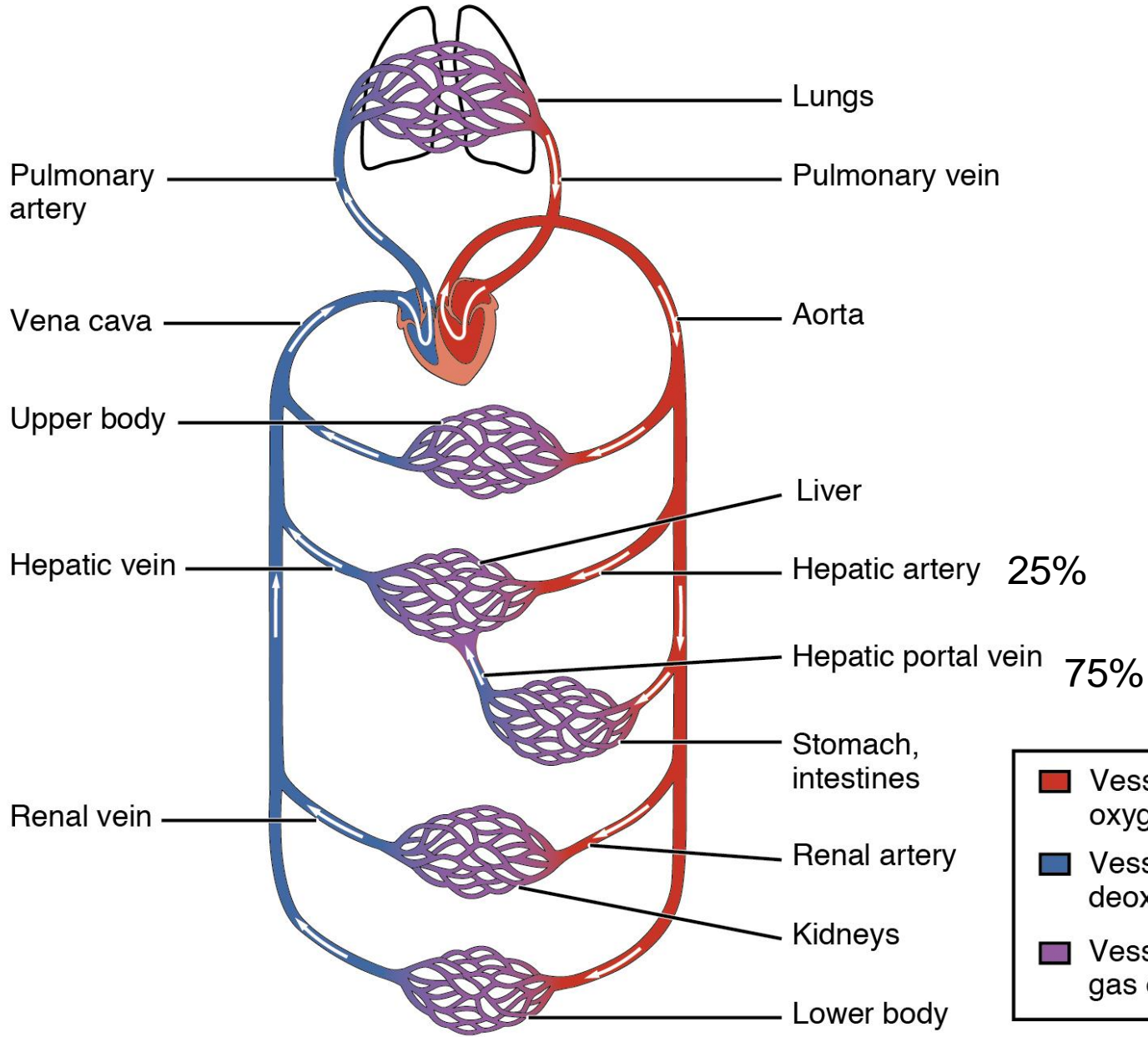





# Blood Pressure Measurement



Pulmonary circulation

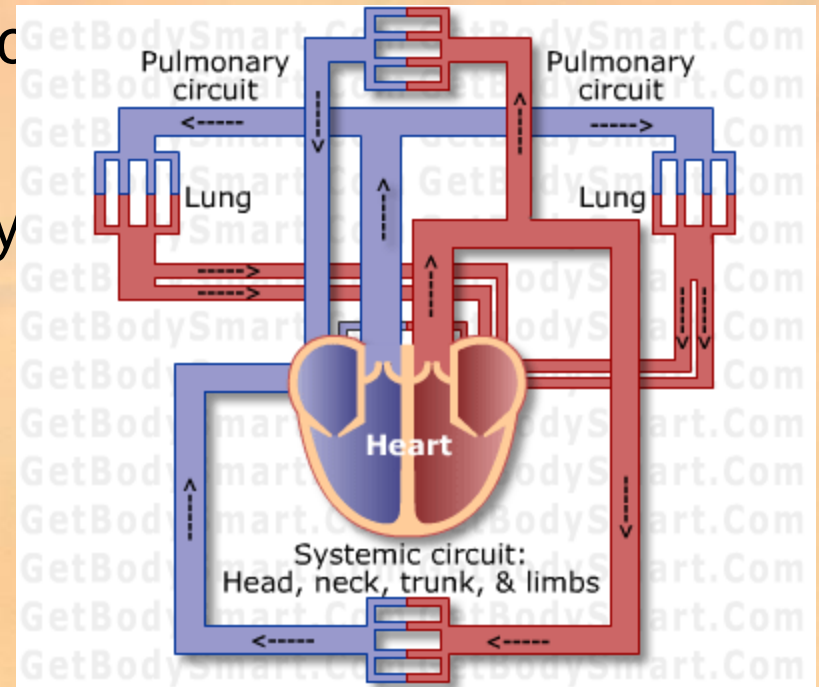
Systemic circulation



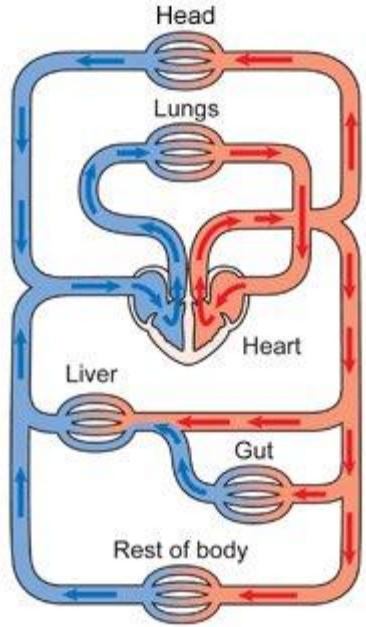
-  Vessels transporting oxygenated blood
-  Vessels transporting deoxygenated blood
-  Vessels involved in gas exchange



# CIRCULATORY ROUTES

- Blood vessels are organized in circulatory routes that carry blood throughout the body
- Two main circuits
  - Systemic
  - Pulmonary



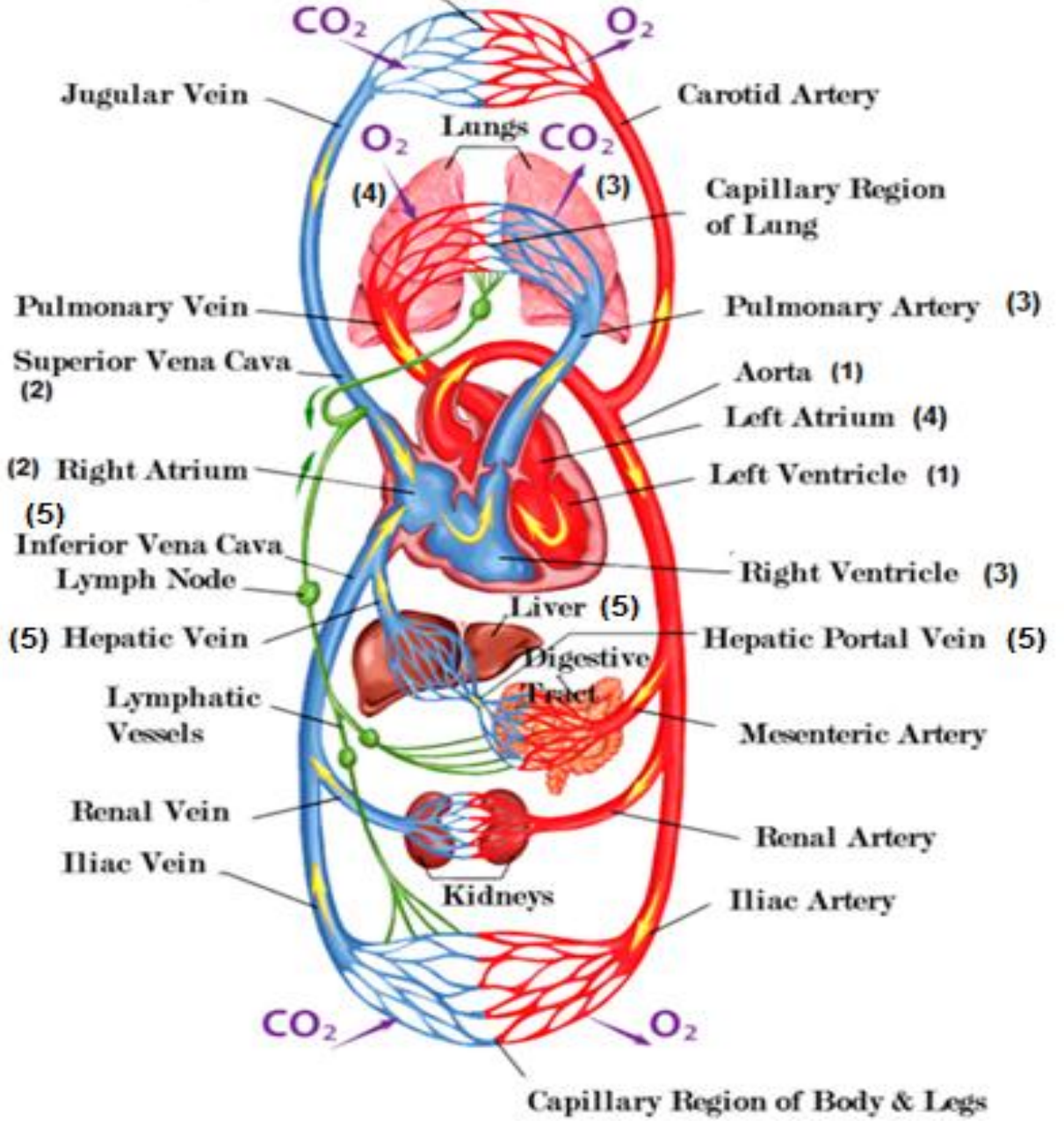




 Blood carrying carbon dioxide in veins  
 Blood carrying oxygen in arteries

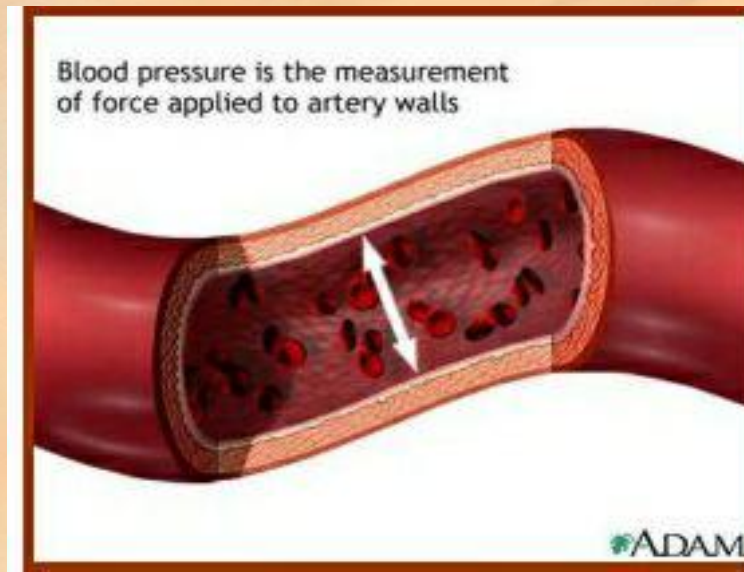


**Capillary Region of Head & Arms**



# Blood Pressure

$$\text{Blood pressure} = \text{C.O.} \times \text{T.P.R.}$$



# Blood Pressure

- **Systolic Blood Pressure**: equals left ventricle pressure during systolic phase
- **Diastolic Blood Pressure**: is more than left ventricle pressure because of elastic property of arteries in saving blood's energy





$$PP = P_{\text{SYS}} - P_{\text{Dias}}$$



**Unit:**  
**mmHg**  
**Cm H<sub>2</sub>O**





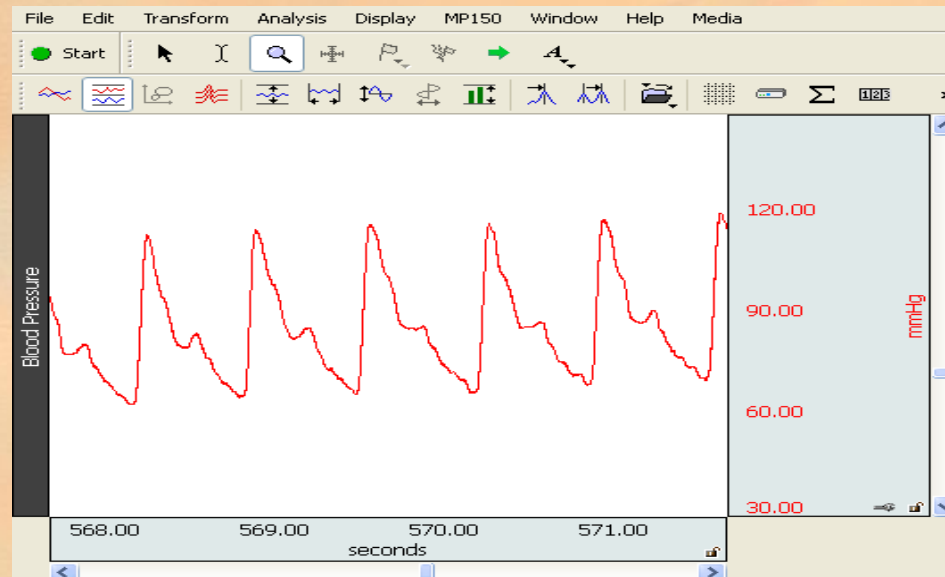
# Mean Arterial Pressure

- $MAP = \frac{Sys P + 2Dias P}{3}$

- $MAP = P_{Dias} + \frac{1}{3} PP$



# Direct BP Measurement



# Mercury Sphygmomanometer





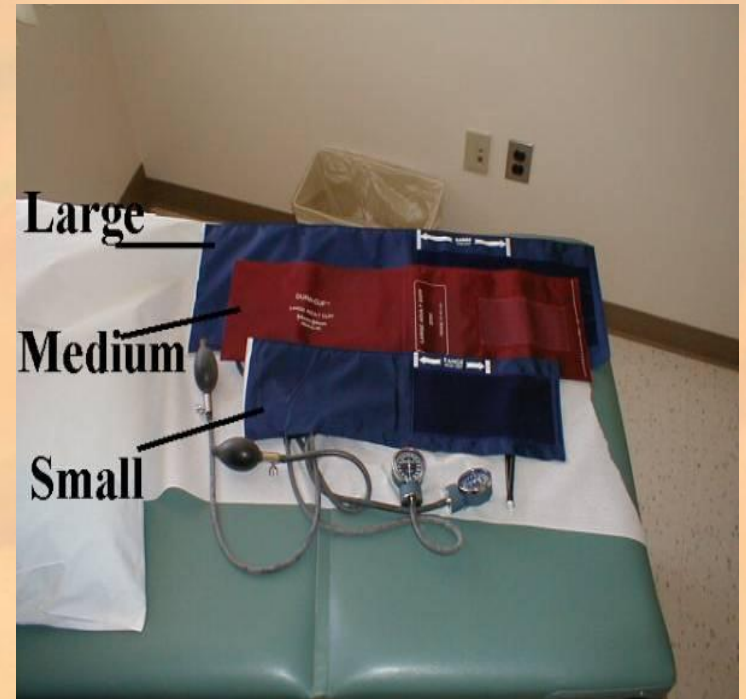
# Recoil Sphygmomanometer



# Digital BP test Equipments

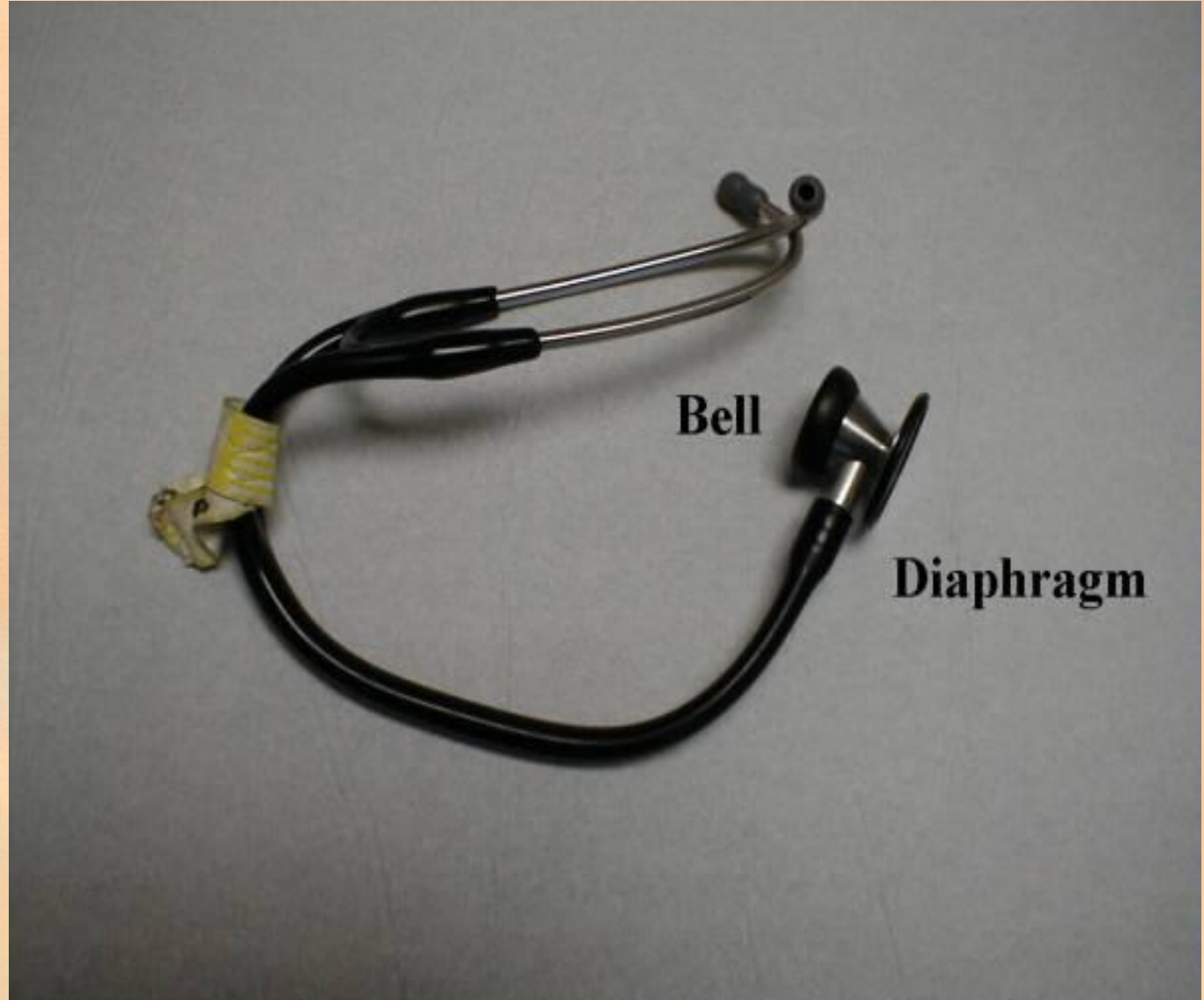


# Cuff





# Stethoscope

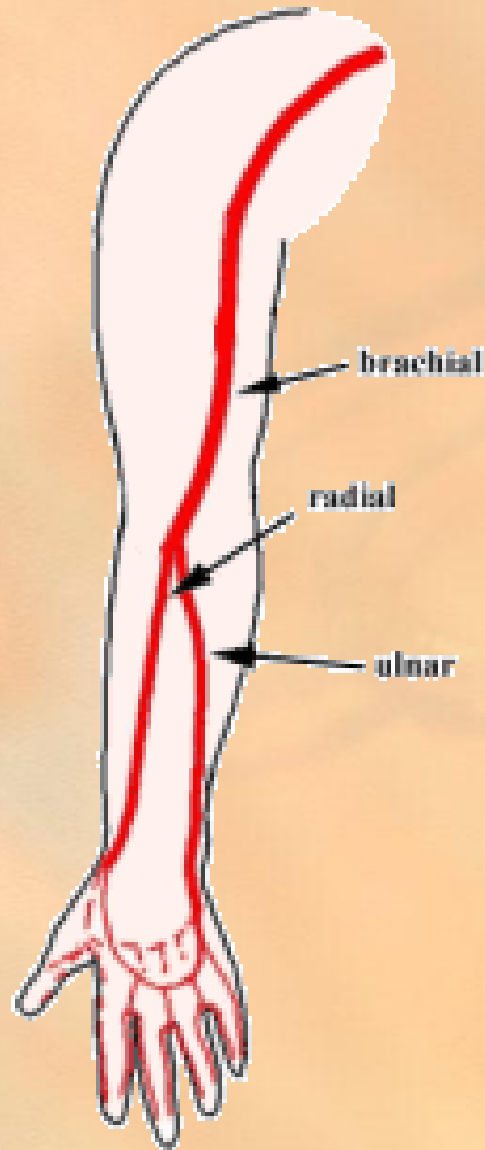


# Indirect methods

- Palpation method
- Auscultation Method

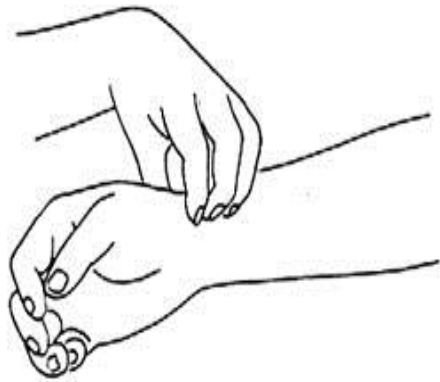
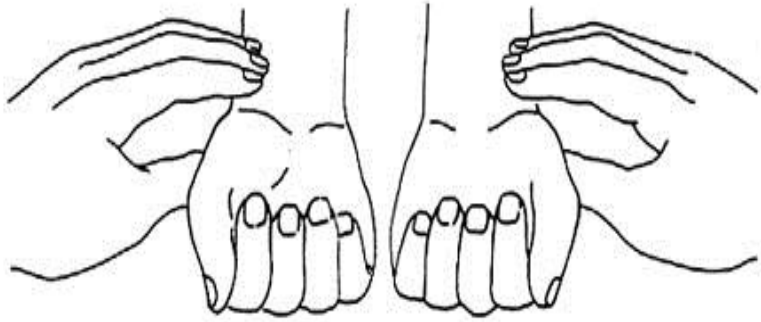


# Palpation Method

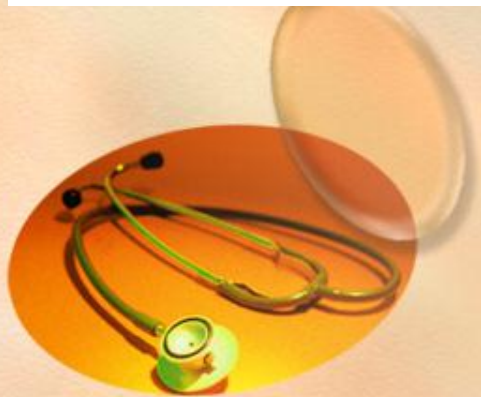
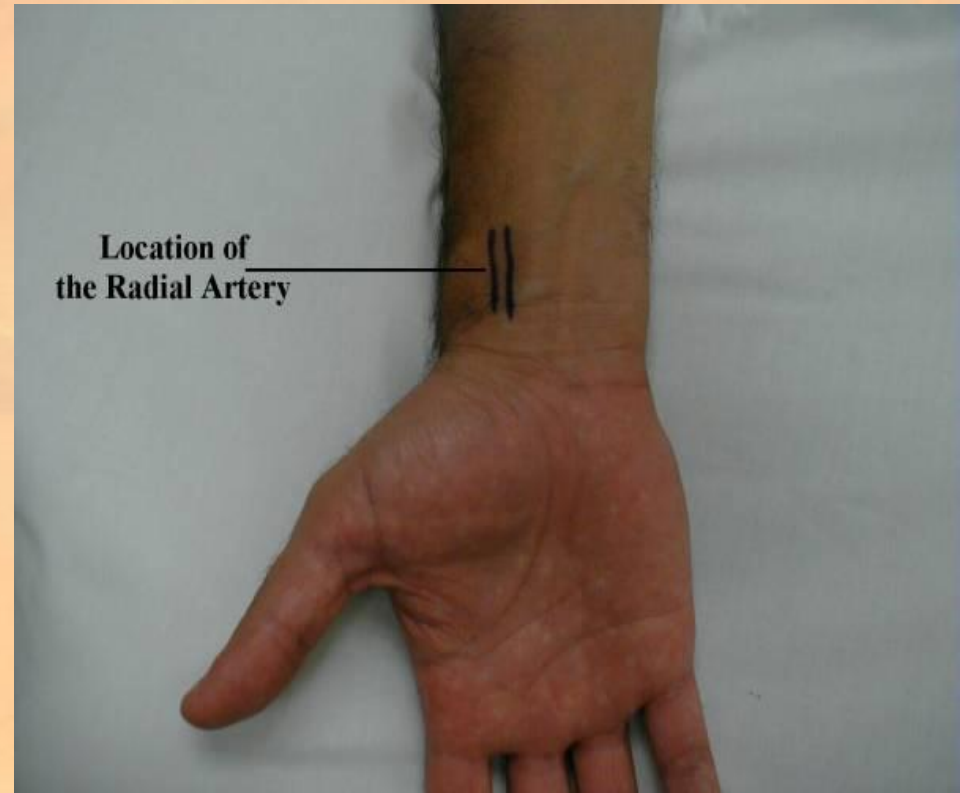




# Radial Artery Palpation



Location of  
the Radial Artery



# روش لمسی (Palpation Method)



Radial pulse in the anatomical snuffbox



Radial pulse in distal forearm



Brachial pulse in the cubital fossa





# A PRESSURE-FLOW RELATIONSHIP

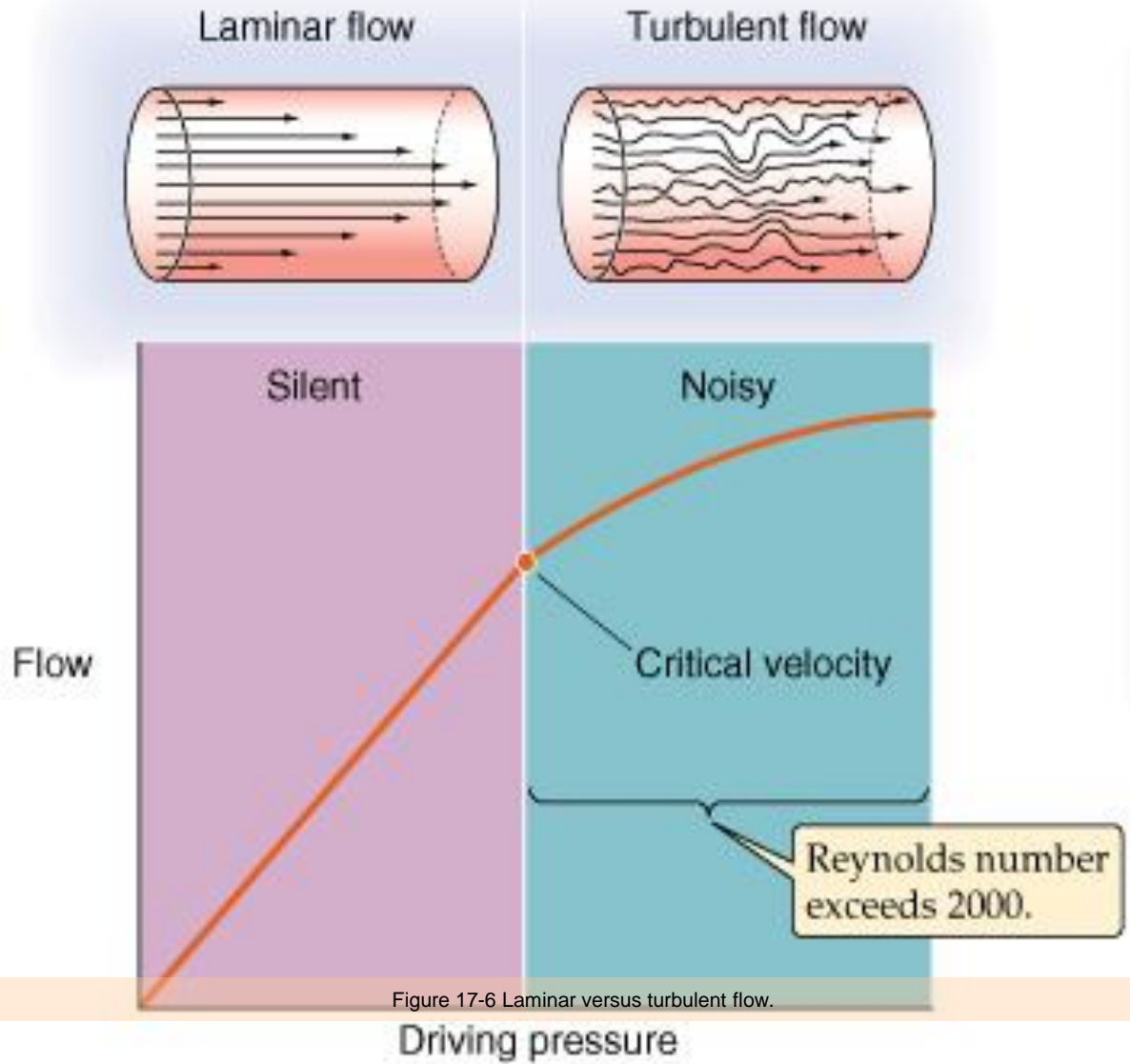
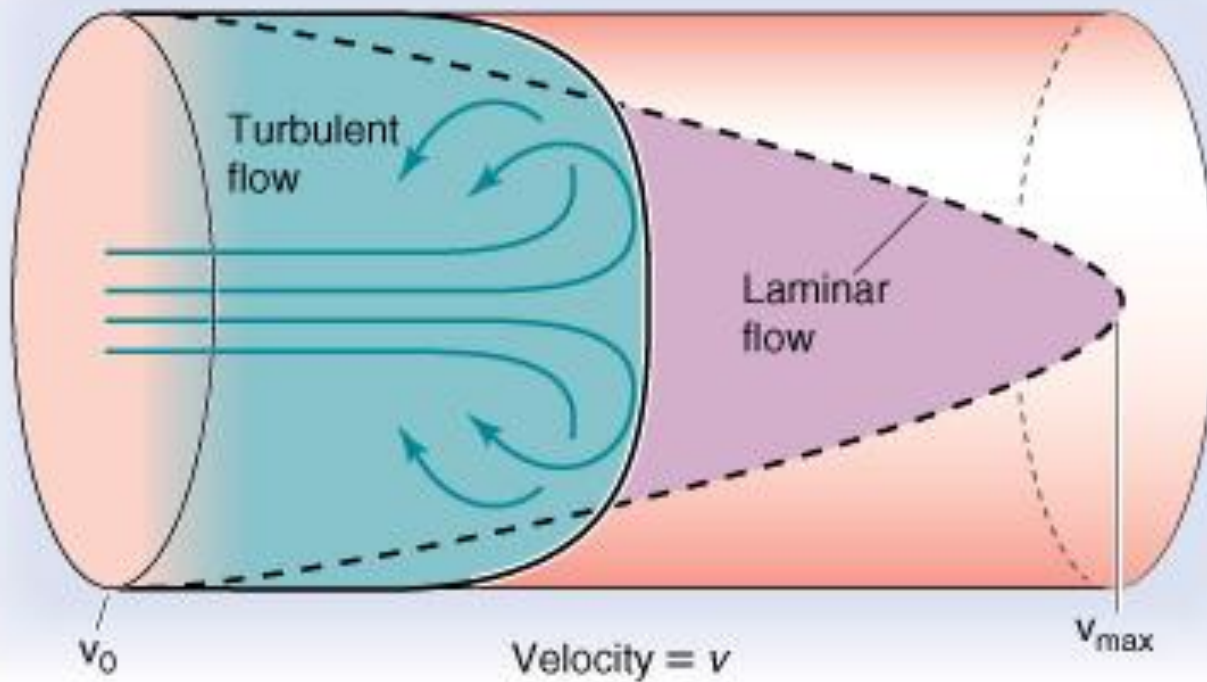


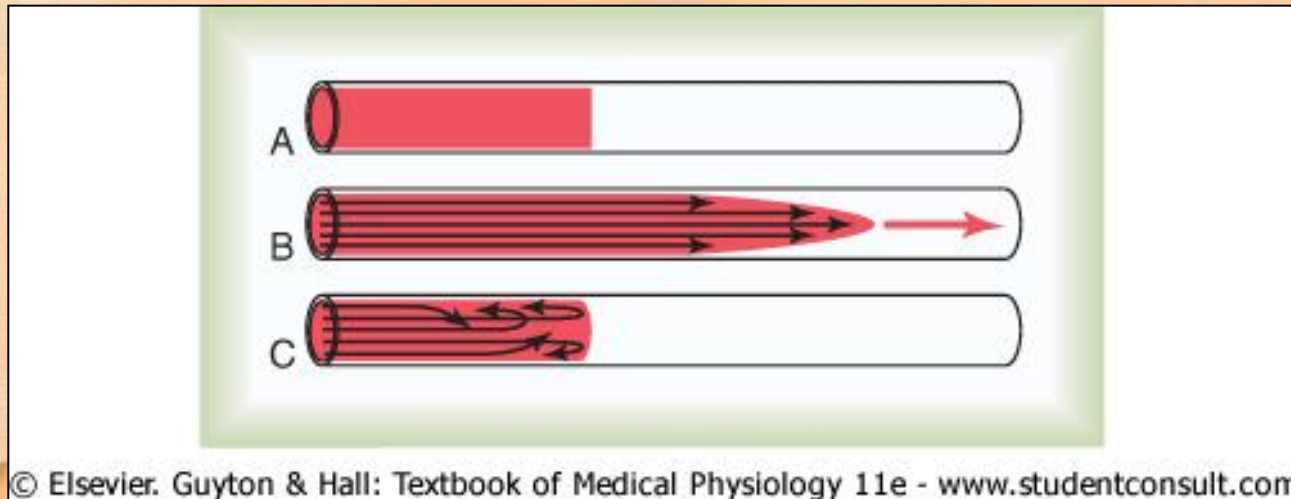
Figure 17-6 Laminar versus turbulent flow.

**B** VELOCITY PROFILES



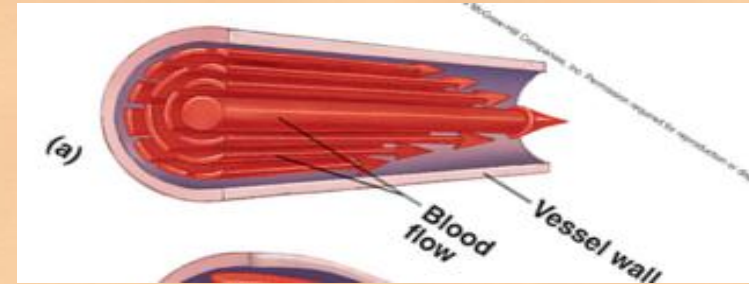
# Modes of flow in vessels

- Blood flow can either be laminar or turbulent





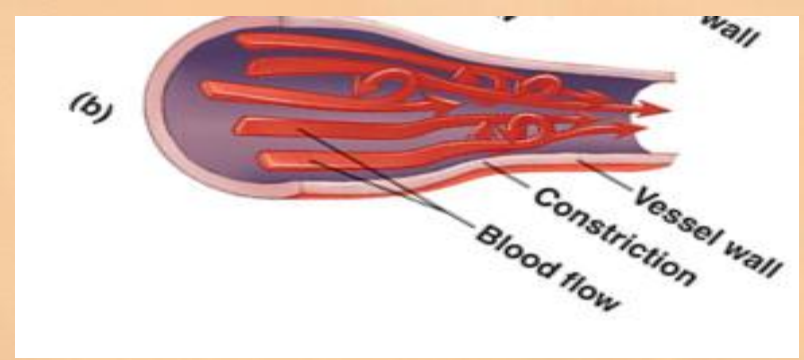
# Laminar Flow



- When blood flows through a long smooth vessel it flows in straight lines, with each layer of blood remaining the same distance from the walls of the vessel throughout its length
- When laminar flow occurs the different layers flow at different rates creating a parabolic profile
- The parabolic profile arises because the fluid molecules touching the walls barely move because of adherence to the vessel wall. The next layer slips over these, the third layer slips over the second and so on.
- Streamlined
- Outermost layer moving slowest and center moving fastest



# Turbulent flow



- When the rate of blood flow becomes too great (exceeds critical velocity), when it passes by an obstruction or constriction in a vessel, when it makes a sharp turn, or when it passes over a rough surface, the flow may then become turbulent.
- Turbulent flow means that the blood flows crosswise in the vessel as well as along the vessel, usually forming whorls in the blood called eddy currents. When eddy currents are present, the blood flows with much greater resistance than when the flow is streamline because eddies add tremendously to the overall friction of flow in the vessel.
- Interrupted



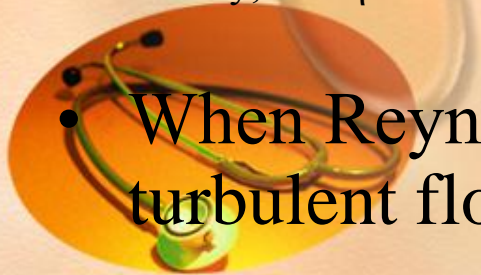
# Turbulent flow

- The tendency for turbulent flow increases in direct proportion to the velocity of blood flow, the diameter of the blood vessel, and the density of the blood, and is inversely proportional to the viscosity of the blood, in accordance with the following equation:

$$Re = (v \cdot d \cdot \rho) / \eta$$

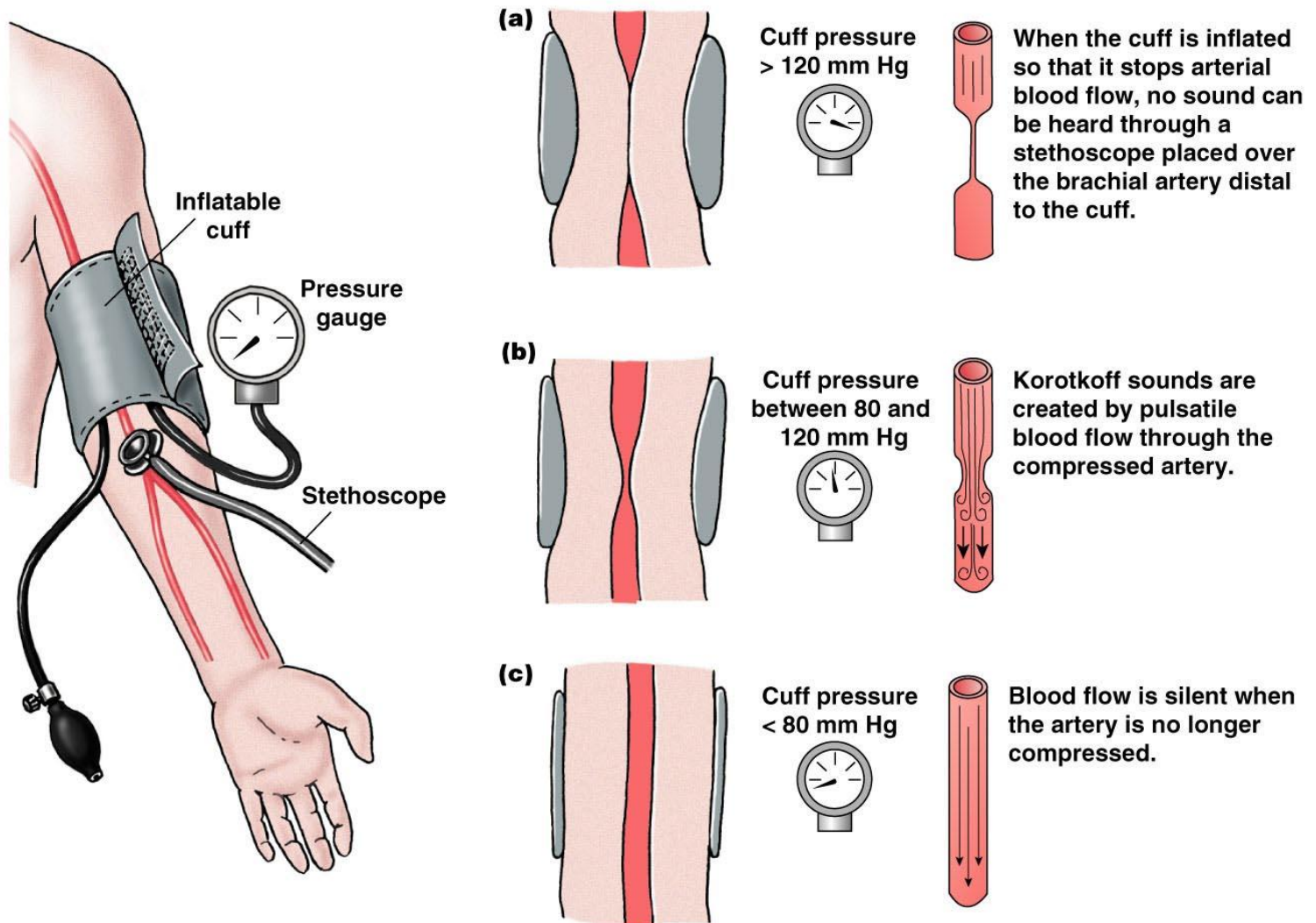
where  $Re$  is *Reynolds' number* and is the measure of the tendency for turbulence to occur,  $v$  is the mean velocity of blood flow (in centimeters/second),  $d$  is the vessel diameter (in centimeters),  $\rho$  is density, and  $\eta$  is the viscosity (in poise)

- When Reynolds' number increases above about 2000 turbulent flow will result

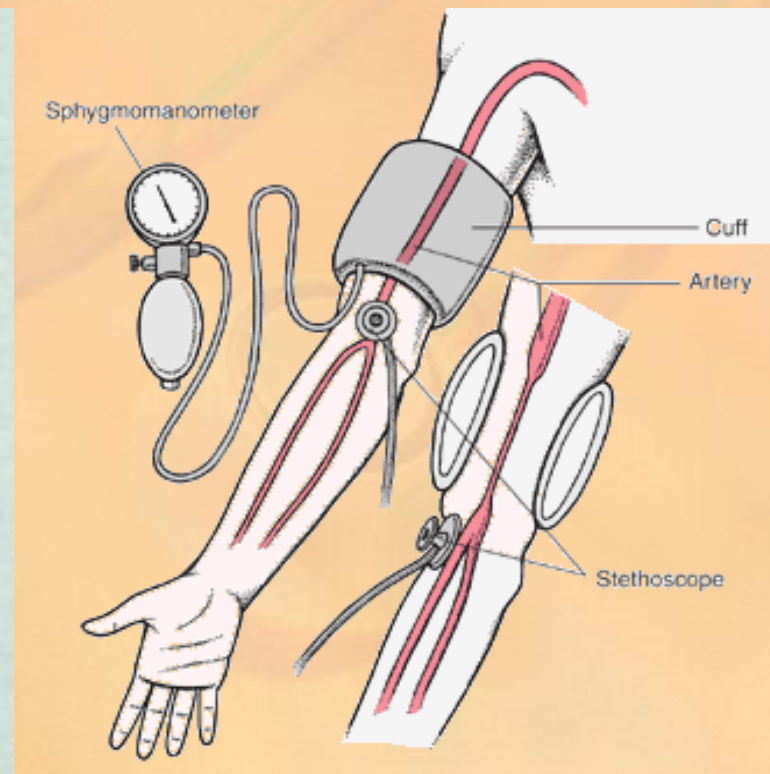
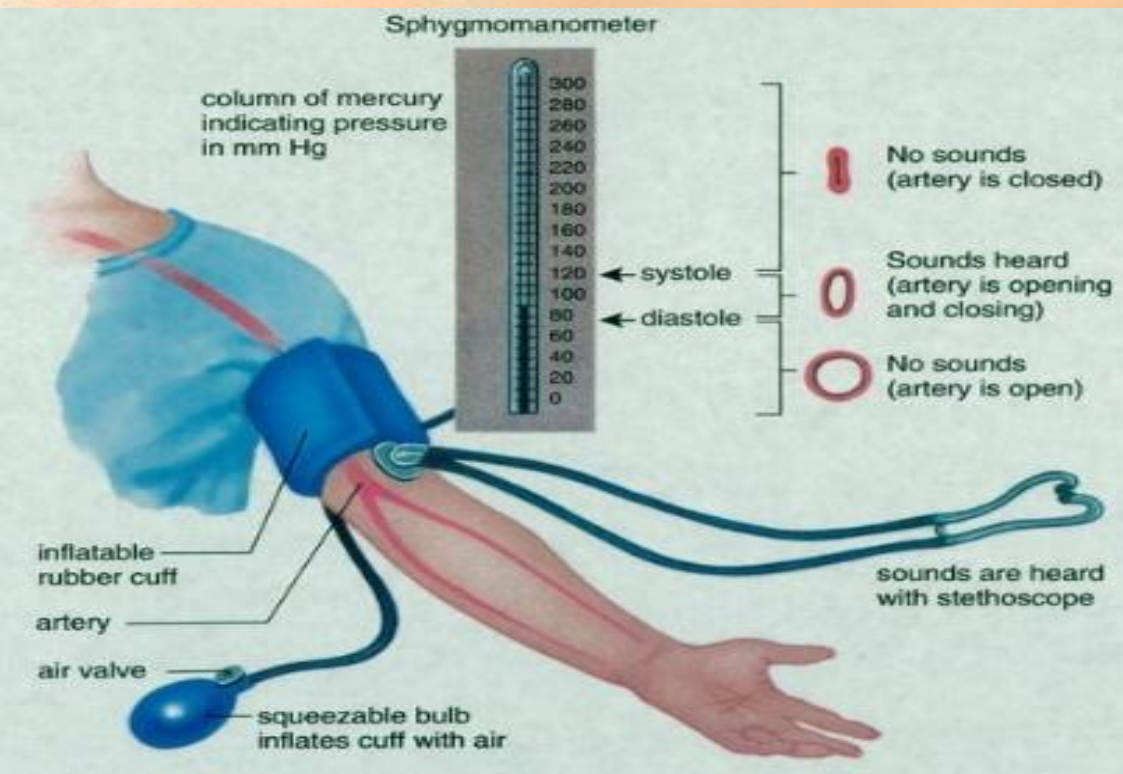




# Principles of Sphygmomanometry



# Auscultation Method





# BP Test Conditions





# What time must be measured BP?

- Resting
- Before smoking
- Before consumption of tea or coffee



# Factors affected on BP

- **Sex** ... M > F ... due to hormones/ equal at menopause.
- **Age** ... Elderly > children ... due to atherosclerosis.
- **Emotions** ... ↑ due to secretion of adrenaline & noradrenaline.
- **Exercise** ... ↑ due to ↑ venous return.
- **Hormones** ... ↑ (e.g. Adrenaline, noradrenaline, thyroid H).
- **Gravity** ... ↑ Lower limbs > upper limbs.
- **Race** ... Orientals > Westerns ... ? dietary factors, or weather.
- **Sleep** ... ↓ due to ↓ venous return.
- **Pregnancy** ... ↑ due to ↑ metabolism.



Have beautiful moments

