

**In The Name of God**



**(A PROJECT OF NEW LIFE COLLEGE OF NURSING KARACHI)**

**UNIT 08:  
ASSESSMENT OF  
CARDIOVASCULAR SYSTEM**

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**Acknowledge:**

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# Objectives

- **By the end of the unit, learners will be able to:**
- Describe the components of health history that should be elicited during the assessment of cardiovascular system.
- Identify the landmarks of the chest.
- Describe the following:
  - Pulse rate, rhythm and pulsation characteristics
  - PMI
  - Heart sounds
- Discuss systolic and diastolic murmurs.
- Assess the cardiovascular system systematically.
- Document findings.
- List the changes in cardiovascular system that is characteristics of aging process.

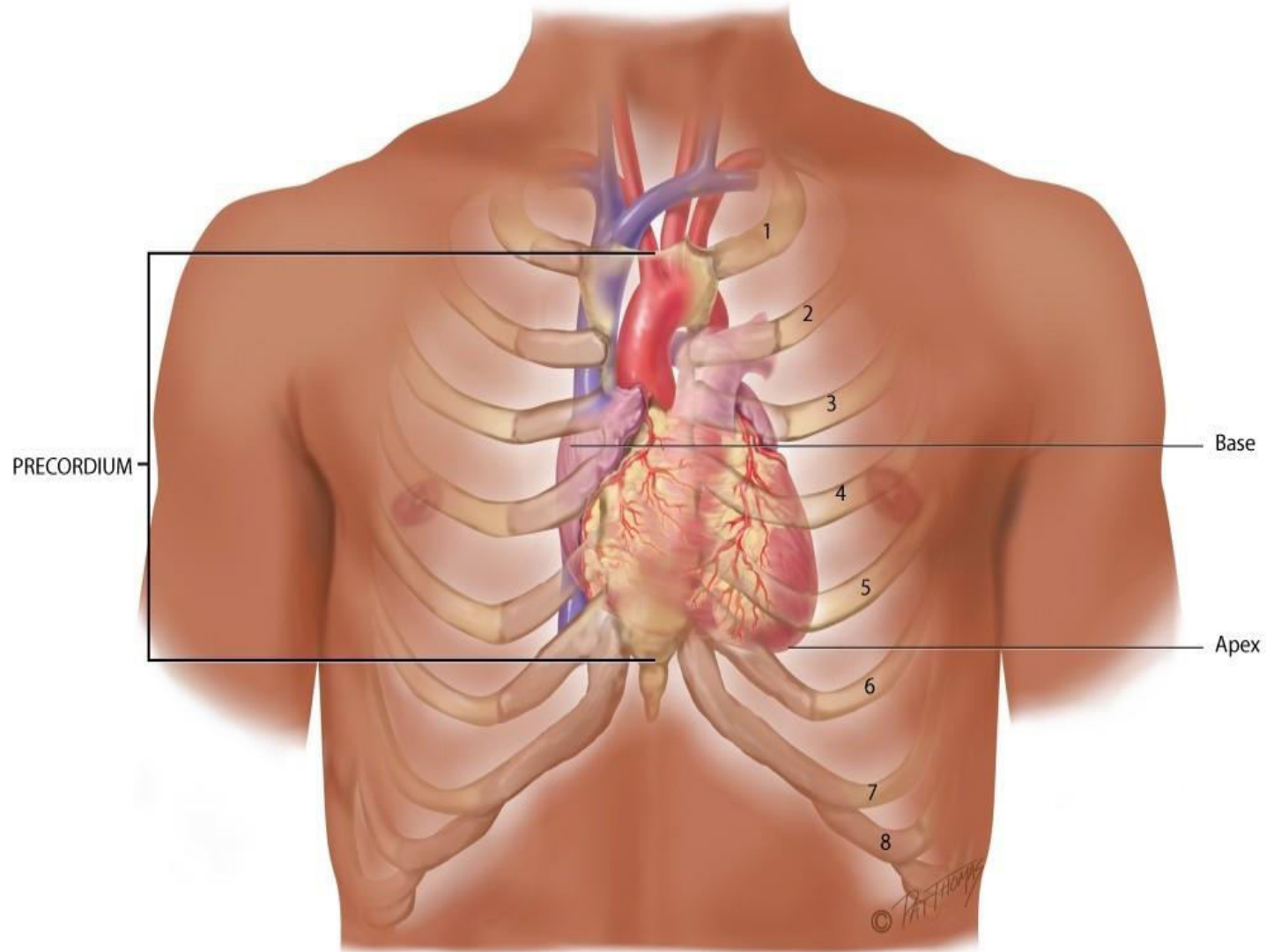
# Cardiovascular System

- Cardiovascular system consists of heart (a muscular pump) and blood vessels
- Blood vessels are arranged in two continuous loops
  - Pulmonary circulation
  - Systemic circulation
- When the heart contracts, it pumps blood simultaneously into both loops

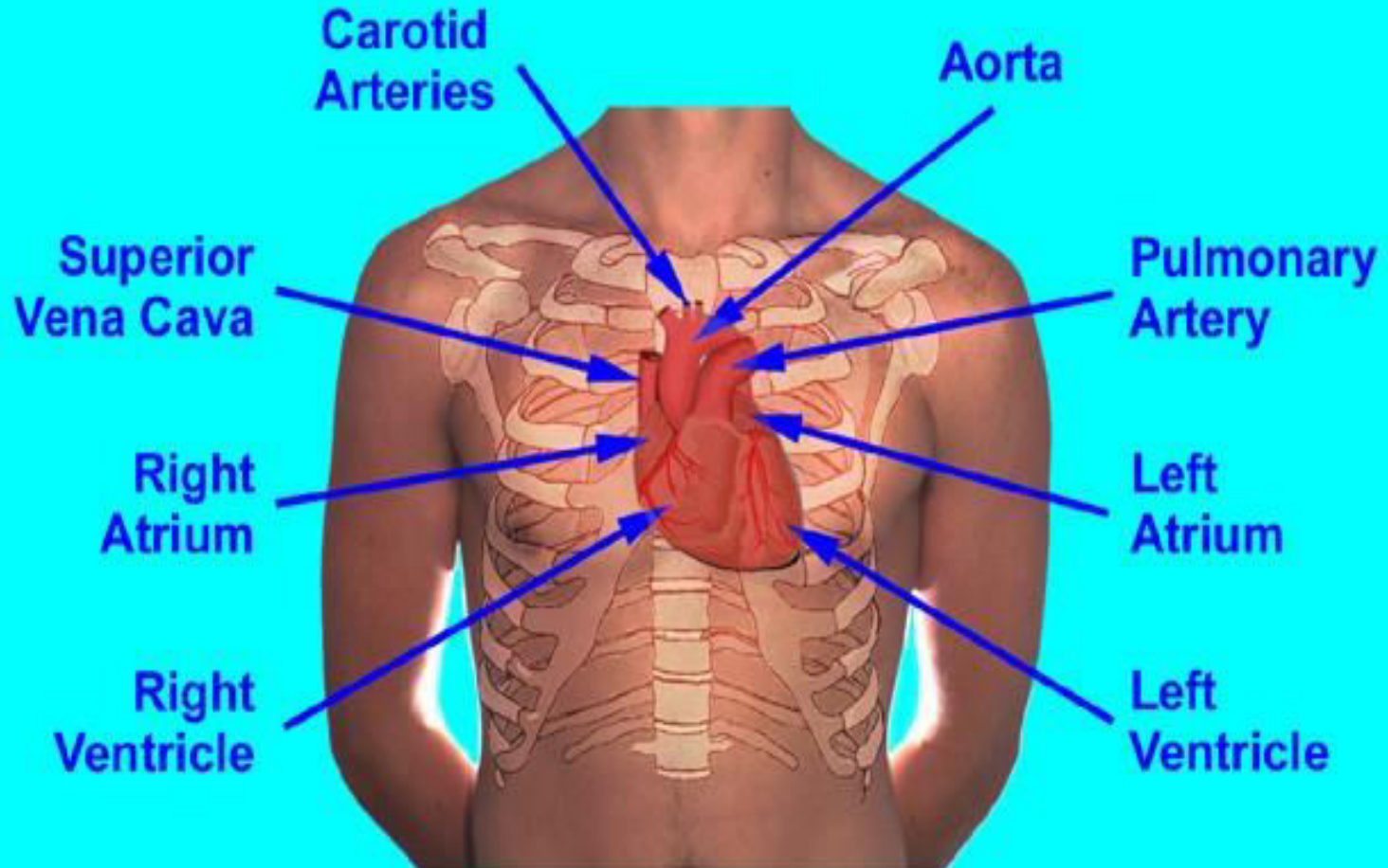
# Cardiovascular Anatomy & Physiology

- Heart is shaped like “Cone”
- “top” of the heart is the base
- “bottom” is the apex
- Heart size = clenched fist
- Precordium - area on anterior chest that covers heart and great vessels
- Atria are tilted slightly toward the back and ventricles extend to left and toward anterior chest wall.

# Precordium, Apex, and Base



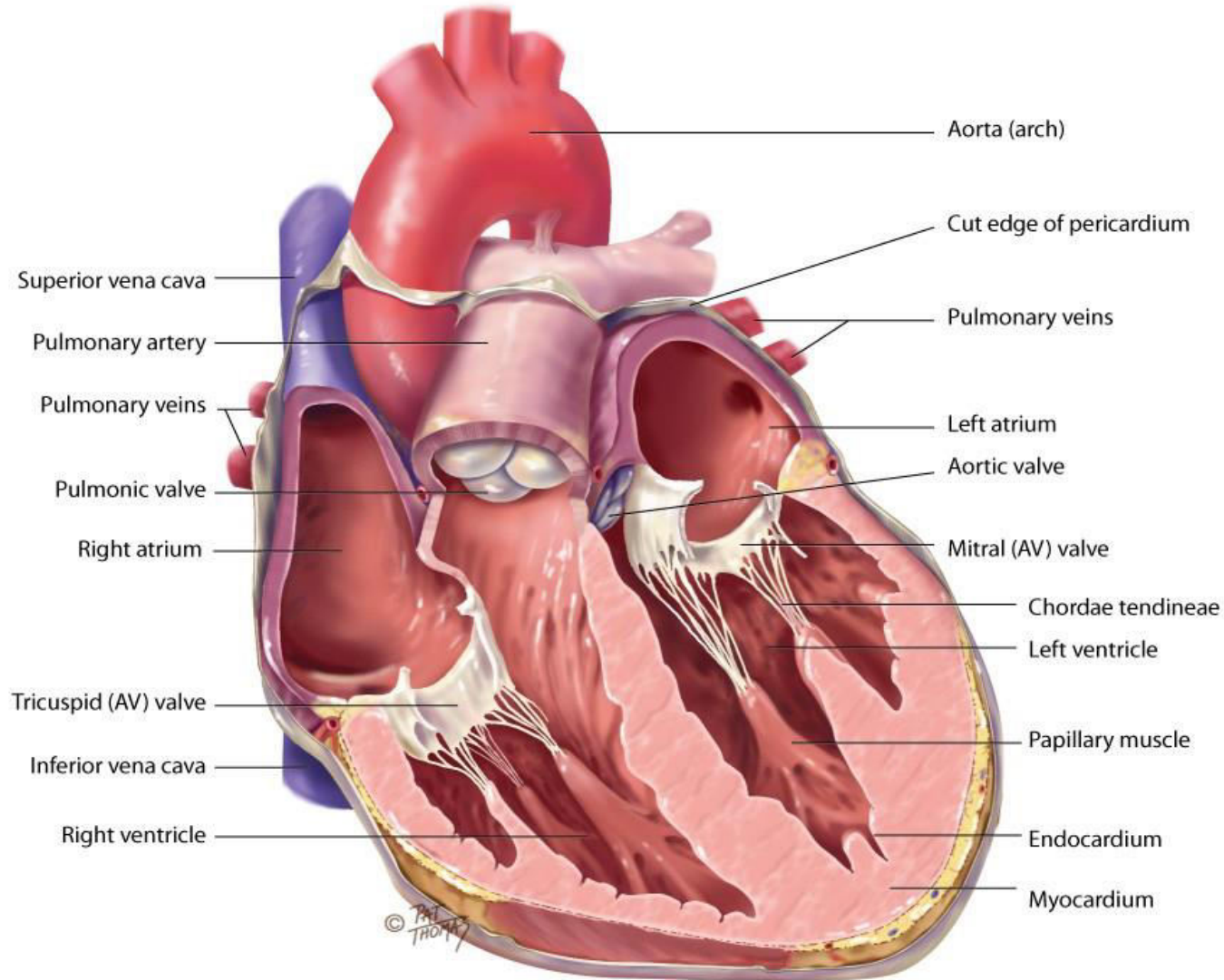
# Heart Position



# Cardiovascular: Blood Flow

- **Unoxygenated Blood:**
  - Superior Vena Cava
  - R Atrium
  - Tricuspid valve
  - R Ventricle
  - Pulmonic Valve
  - Pulmonary Artery  
to lungs (gets  
oxygenated)
- **Oxygenated Blood:**
  - Pulmonary veins
  - L Atrium
  - Mitral Valve
  - L Ventricle
  - Aortic Valve
  - Aorta
  - Body

# Chambers and valves





# Cardiovascular: Blood Flow

- There are two main coronary arteries, the left (LCA) and the right (RCA)
- Coronary artery blood flow to the myocardium occurs primarily during diastole, when coronary vascular resistance is minimized.
- To maintain adequate blood flow through the coronary arteries, the diastolic pressure must be at least 60 mmHg.

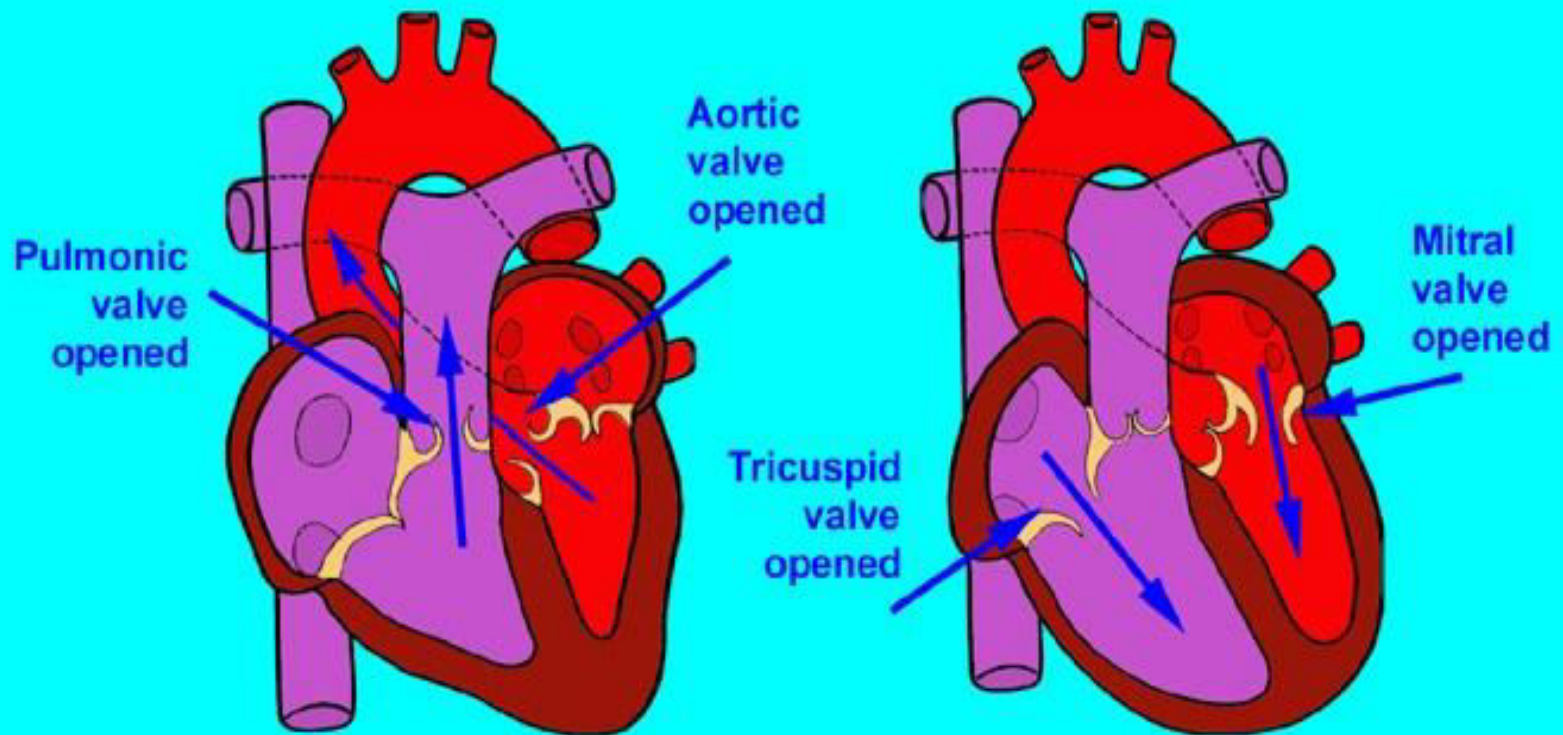
# Cardiovascular: Cardiac Cycle

- 2 phases:
  - DIASTOLE**: ventricles relax and fill with blood
  - SYSTOLE** : ventricles contract pump blood into pulmonary and systemic arteries

# Cardiovascular: Heart Sounds

- Heart sounds: lub dub
- **SYSTOLE**: lub= S1 (closing of AV valves)
- **DIASTOLE**: dub = S2 (closing of semilunar valves)
- During the cardiac cycle, valves are opening and closing, causing different heart sounds (S1 and S2).
- Sometimes abnormal heart sounds are heard due to improper opening or closing of the valves.(murmurs)

# Cardiac Cycle and Heart Sounds



# Cardiovascular: Heart Sounds

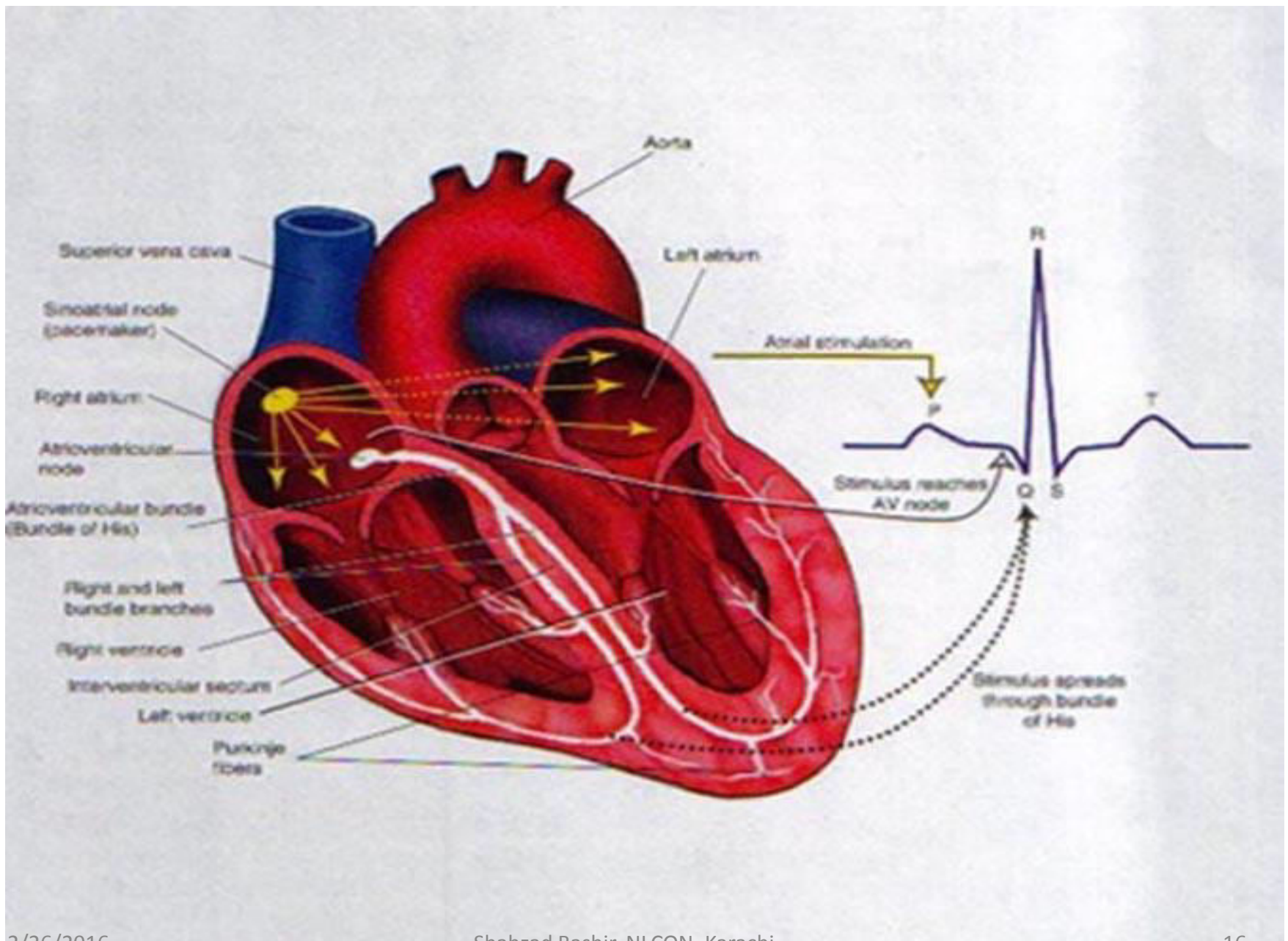
- **Characteristics of Heart Sounds**
- Frequency (pitch): high or low
- Intensity (loudness): loud or soft
- Duration: very short hear sounds or longer periods of silence
- Timing: systole or diastole

# Cardiovascular: Conduction

- Heart contracts by itself through its own conduction system:
- Sinoatrial (SA)node – (pacemaker) initiates electrical impulse
- AV node
- Bundle of HIS (L & R Bundle Branches)
- Purkinje fibers

# Cardiovascular: Conduction

- Electrical impulses shown on ECG (EKG)
- PQRST wave correlates to impulses traveling through the heart.
- SA to AV = P wave, (atrial stimulation)
- Stimulus spreads through bundle of His = QRS complex
- Repolarization of ventricles = T wave on





# Cardiovascular: Pumping Ability

- Cardiac Output (C.O.) = volume of blood in liters ejected by the heart each minute.
- Adult = 4-7 liters/minute
- $C.O. = HR \times SV$
- **Heart Rate (HR)** = number of times ventricles contract each minute.
- **Stroke Volume (SV)** = The amount of blood ejected by the left ventricle during each systole.

# Cardiovascular

- **Preload** = degree of stretch of myocardial fibers at end of DIASTOLE. The more the heart is filled (within limits, i.e., not over-filled), the more forcefully it contracts.
- **Afterload** = pressure or resistance the ventricles must overcome to pump out blood. The amount of resistance is directly related to arterial blood pressure and the diameter of the vessels.

# Assessment: Subjective

- Personal and family history
- Diet history: 24 hr. sample diet  
Opportunity for teaching food selection and preparation
- Socioeconomic status – ability to purchase proper foods, medicines. Employment and its effects on health?
- Cigarette smoking : # packs /day and also # years smoked

# Assessment: Subjective

- Physical Activity/Inactivity – 30 minutes daily of light to moderate exercise recommended by American Heart Assoc.
- Obesity – associated with HTN, hyperlipidemia, and diabetes and all contribute to CV disease.
- Type A personality – not conclusive proof
- Current Health Problems – describe health concerns.

# Assessment: Subjective

- **Chest pain:** or discomfort, a symptom of cardiac disease, can result from ischemic heart disease, pericarditis and aortic dissection.
- **Chest pain:** can also be due to non-cardiac causes; pleurisy, pulmonary embolus, hiatal hernia and anxiety.

# Assessment- Chest Pain

- Onset
- Duration
- Frequency
- Precipitating factors
- Location
- Radiation
- Quality
- Intensity

# Assessment: Subjective

- **Paroxysmal Nocturnal Dyspnea** – client has been recumbent for several hours, increase in venous return leads to pulmonary congestion.
- **Fatigue**- resulting from decreased cardiac output is usually worse in evening. Ask pt. if can they perform same activities as a year ago

# Assessment: Subjective

- **Palpitations-** fluttering or unpleasant awareness of heartbeat. Non- cardiac- causes- fatigue, caffeine, nicotine, alcohol
- **Weight gain-** a sudden increase in wt. of
- 2.2 pounds (1 kg) can be result of accumulation of fluid (1L) in interstitial
- spaces, known as edema.
- **Syncope-** transient loss of consciousness, decrease in perfusion to brain.



# Assessment: Objective

- **General appearance:** Build, skin color, LOC, presence of SOB, DOE
- **Skin-** color and temperature – look for symmetry in color, temp, any cyanosis?
- **Extremities** – assess skin changes, vascular changes, clubbing, capillary filling and edema.
- **Orthostatic BP** – postural hypotension

# Cyanosis with arterial insufficiency



# Arterial insufficiency



# Capillary Refills



# Pitting Edema



# Assessment: Objective

- BP: supine – change position 1-2 minutes, check again.
- Normally, systolic drops slightly or remains unchanged and diastolic increases slightly.
- Peripheral pulses are assessed for:
  - Presence
  - Amplitude
  - Rhythm
  - Rate
  - Equality

# Assessment: Objective

- Specific assessments for particular populations:
- Assessment for Infants
- Assessment for Children
- Assessment for Pregnant Females
- Assessment for Elderly,

# Assessment: Objective

- Precordium Assessment- area over heart, done by:
  - Inspection (I)
  - Palpation (P)
  - Percussion (P)
  - Auscultation (A)



# Physical Assessment

- Inspection- side to side, at right angle and downward over precordium where vibrations are visible.
- Point of Maximal Intensity (PMI) – located at 5<sup>th</sup> intercostal (IC) space at midclavicular line (MCL) – mitral area
- Right Ventricular (RV area)
- Epigastric area
- Pulmonic area

# Physical Assessment

- **Palpation:** fingers and most sensitive part of palm of hand to detect any precordial motion or thrills.
- Palpate apical impulse
- **Percussion:** estimate heart size, most accurately done by chest x-ray
- **Auscultation:**– evaluates heart rate, rhythm, cardiac cycle and valvular function.

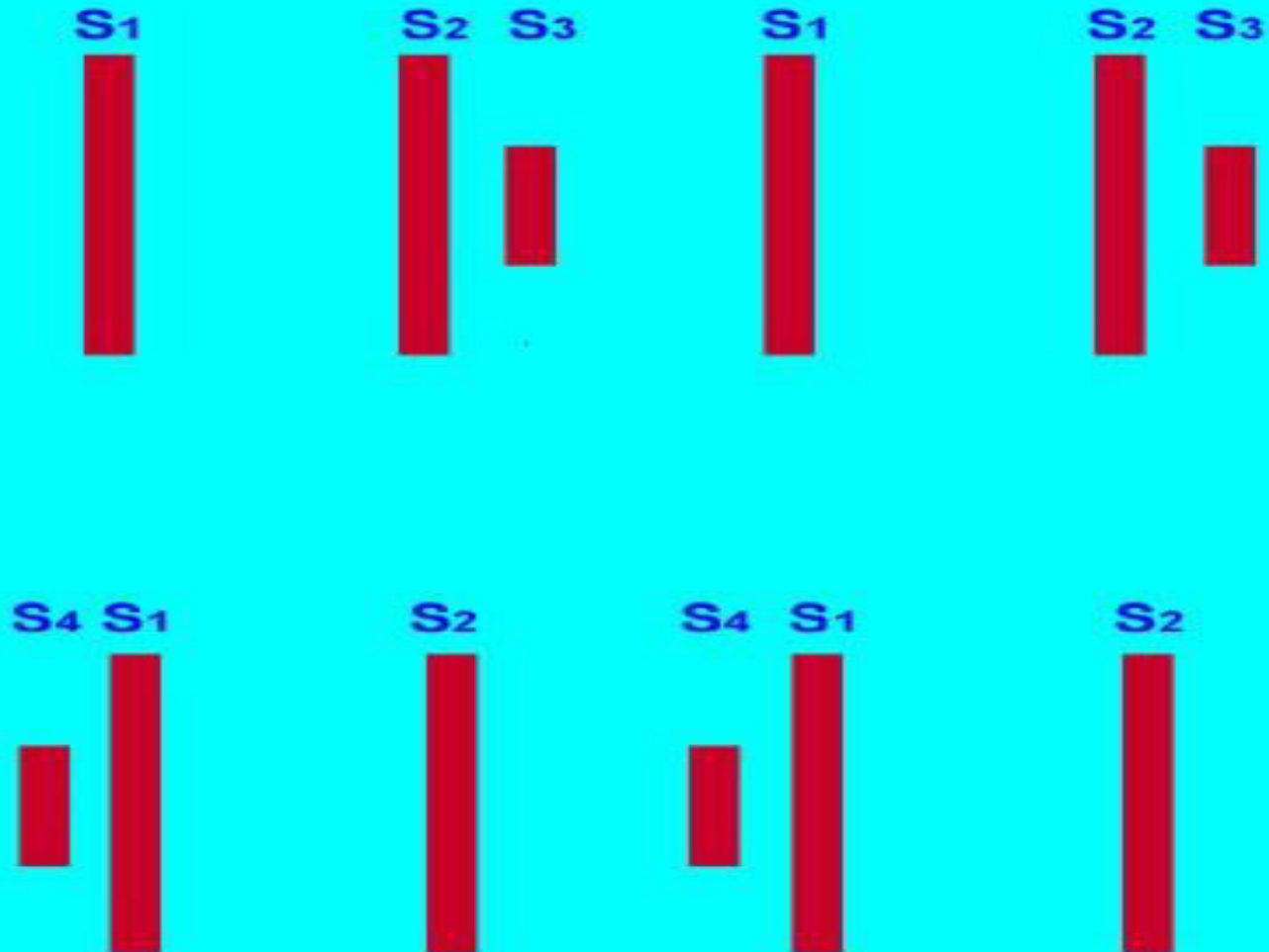
# Physical Assessment: Auscultation

- Diaphragm of stethoscope – 1st and 2nd heart sounds and high frequency murmurs. lub-dub
- Use bell of stethoscope – low frequency
- gallops and murmurs.
- Paradoxical splitting of S2 – severe myocardial depression, may be seen with an MI, aortic stenosis or other causes.

# Auscultation:

- 3rd & 4<sup>th</sup> Heart Sounds
- **S3 (Gallop):** rapid, passive filling phase during diastole into noncompliant ventricle.
- **S4:** pathologic, may be heard with advancing age because of stiffened ventricle.
- **Both S3 and S4 = Summation Gallop:** indication of severe heart failure.
- **Murmurs** – Turbulent blood flow through normal or abnormal valves.

# 3rd and 4th Heart Sounds



# Auscultation

- **Murmurs** – are classified according to their timing and cardiac cycle
- Systolic or diastolic
- Innocent systolic between S1 and S2 commonly heard in children and adults under 30.
- **Configuration of murmurs:** Crescendo-Decrescendo

# Auscultation

- Intensity of murmur:
- Grade:
  - 1: faint
  - 2: soft
  - 3: moderately loud
  - 4: loud with thrill
  - 5: very loud
    - (stethoscope partially off chest)
  - 6: stethoscope off chest, thrill

# Auscultation

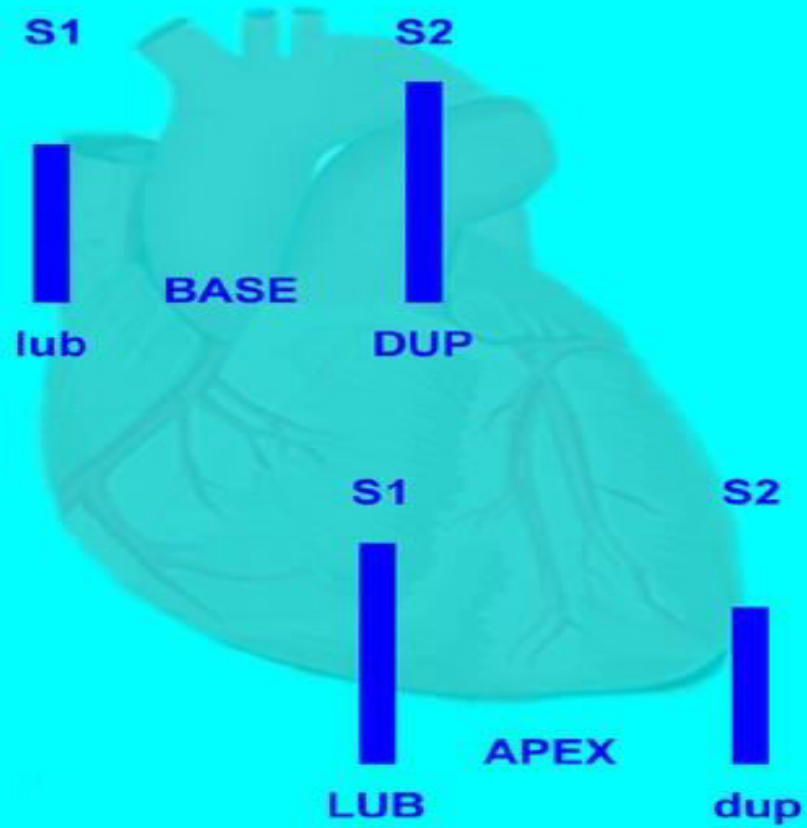
- **Pericardial Friction Rubs-** results from inflammation of pericardial membrane.
- **Ejection Click-** Early systole, stiff deformed valve, high pitch, apex, diaphragm.
- **Opening snap** – Immediately after S2 stenotic mitral or tricuspid valve leaflets recoil abruptly during diastole.



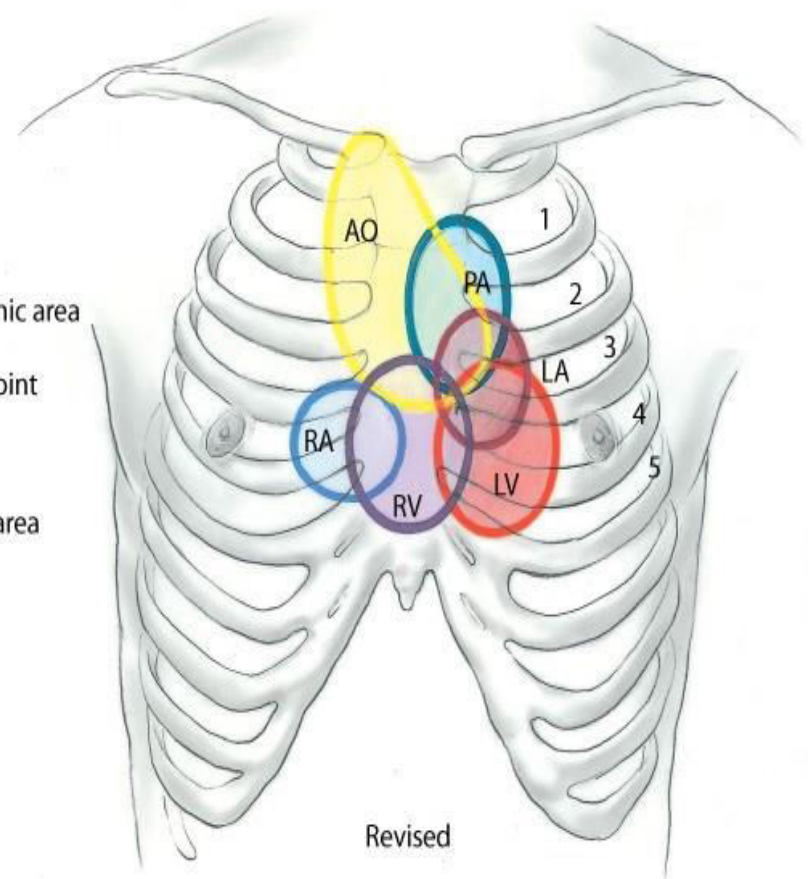
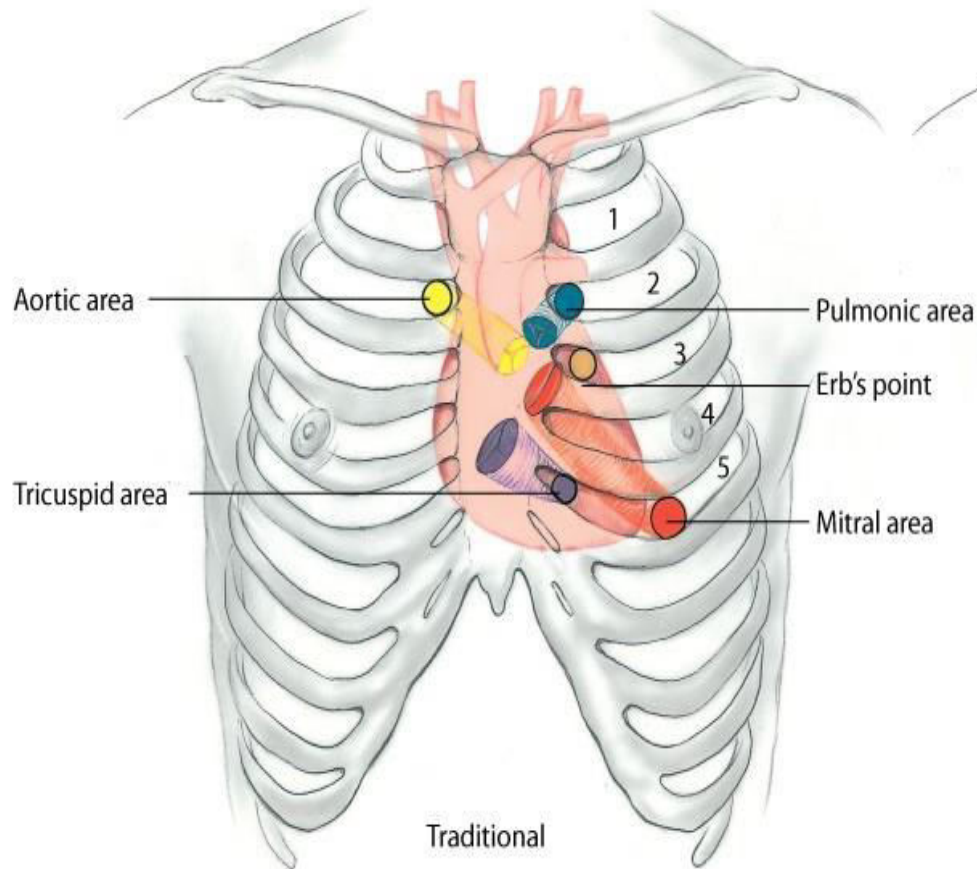
# Auscultation Techniques

- Listen for: S1, S2, extra sounds in S1 and S2, murmurs.
- Listen R. 2nd ICS close to sternum (aortic area)
- Listen L. 2nd ICS (pulmonic)
- Listen L. 3rd ICS (Erb's point)
- Listen L. 5th ICS (tricuspid area)
- Listen L. 5<sup>th</sup> ICS medial midclavicular line (mitral)
- Listen with diaphragm and bell in each area.
- Position pt. Supine, L. side lying and sitting, leaning forward.

## First and Second Heart Sounds



# Auscultatory Areas



AUSCULTATORY AREAS

# Conti...

- Upon completion of auscultation of the precordium:
- Assessment of Cardiovascular system continues with the assessment of the peripheral vascular system.....

# PERIPHERAL CIRCULATION

# Assessment : Subjective

- Leg Pain:
- Hx: DVT,
- Arm/leg skin changes, varicose veins
- Edema
- Medications

# Assessment : Objective

- **Inspection:**
- skin including color & hair distribution
- jugular vein distention
- **Palpation:**
- pulses, tenderness, temperature, edema

# Varicose veins





# Venous Stasis Ulcer



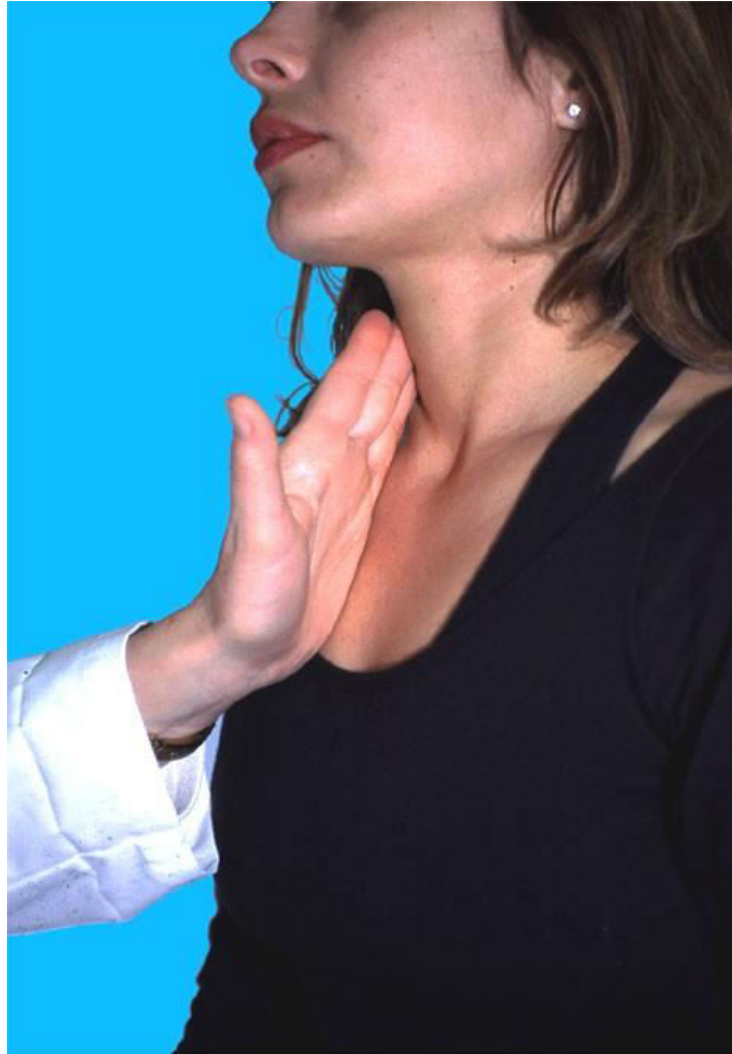
# Jugular distention



# Assessment: Objective

- Pulses- carotid, brachial, radial, femoral, popliteal, posterior tibialis and dorsalis pedis.
- 0= nonpalpable
- 1+ = easily obliterated
- 2+ = weak, but cannot be obliterated
- 3+ = easy to palpate; full; cannot be obliterated.
- 4+ = strong, bounding; may be abnormal

# Carotid



# Brachial



# Trochlear Lymph Node



# Radial



# Popliteal





# Dorsalis Pedis



# Posterior tibial



# Assessment : Objective

- Edema- Check for pretibial edema. How high up does it go?
- 1+- Mild pitting, slight indentation.
- 2+- Moderate pitting- indentation subsides rapidly.
- 3+- Deep pitting, indentation remains short time, leg looks swollen.
- 4+- Very deep pitting, very swollen.

# PVD: Arteriosclerosis-Ischemic ulcer



# PVD: Lymph edema

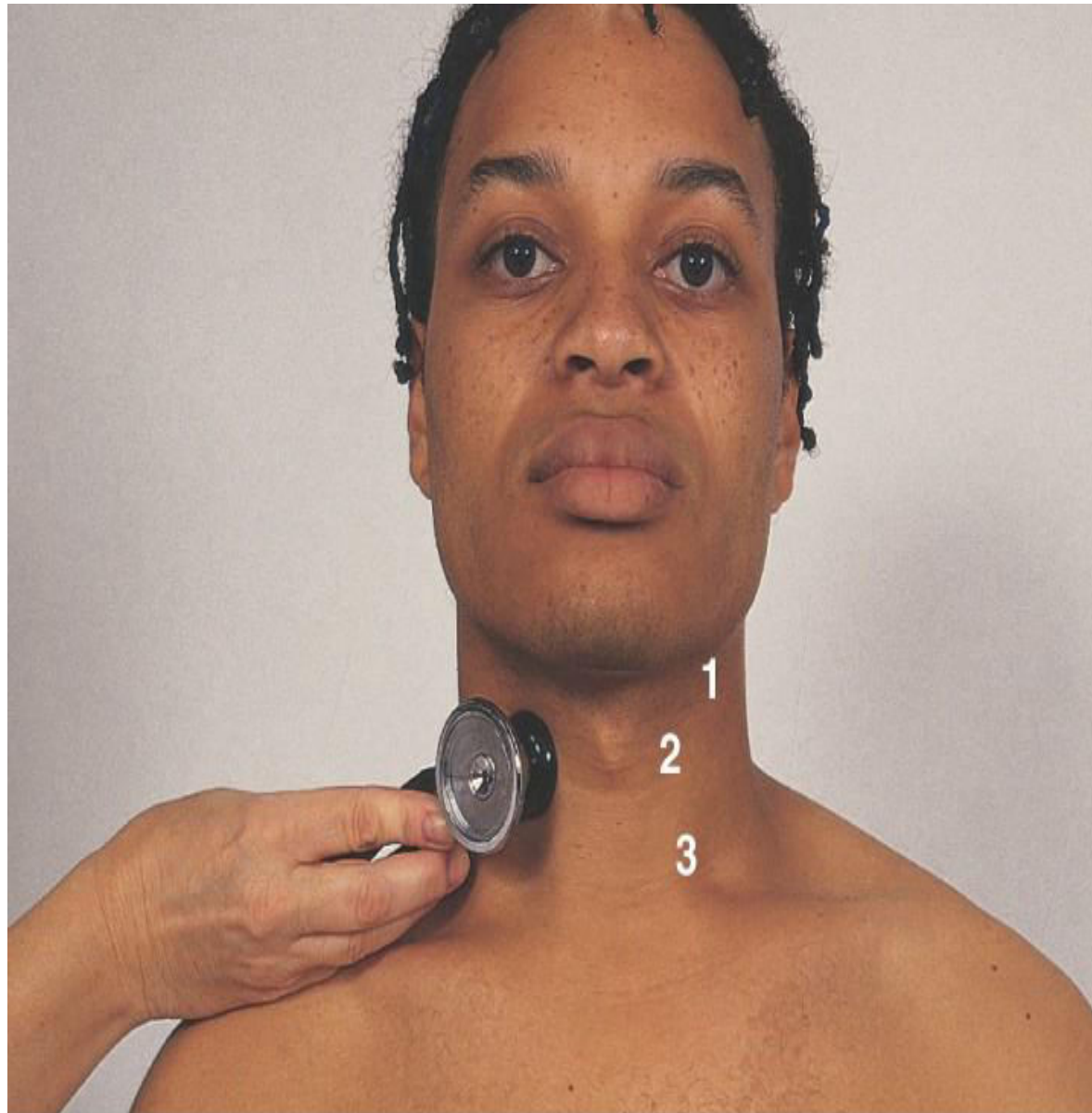


# PVD: Deep Vein Thrombophlebitis



# Assessment : Objective

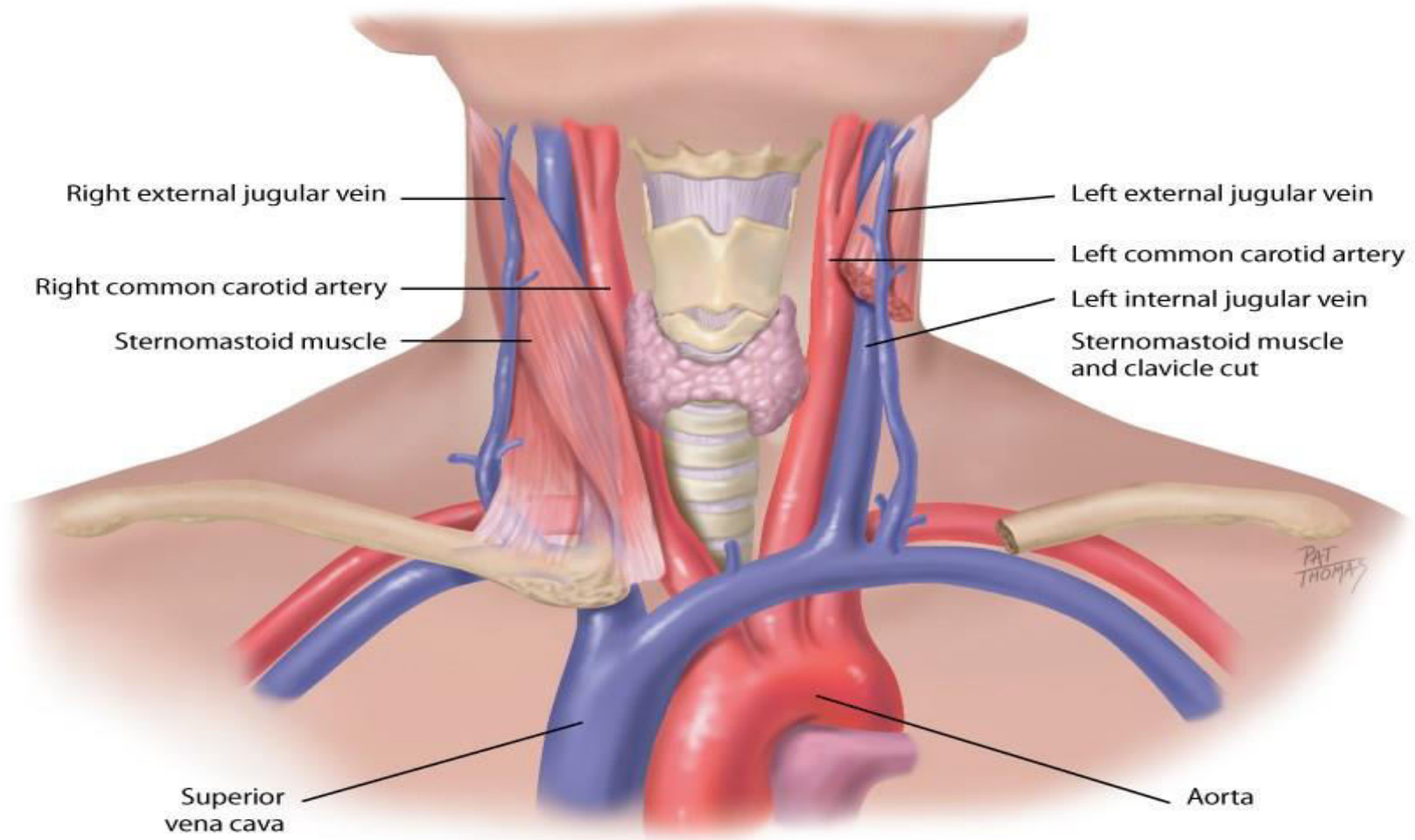
- **Allen test-** occlude radial & ulnar arteries, pt. opens and closed fist, let go quick while you are occluding radial artery and if hand turns pink, ulnar is intact.
- **Auscultation:**
- **Pulse Alternans** – weak pulse alternates with strong pulse, despite regular heart rhythm. It is seen with severely depressed cardiac function.
- Auscultation of carotid arteries to assess for bruits



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# Neck Vessels



NECK VESSELS

# Summary: Cardiovascular

- Physical assessment Includes:
- Neck vessels
- Precordium
- Inspection and palpation of peripheral system with auscultation of the carotids

# Sample charting

- *SUBJECTIVE*

- *No chest pain, dyspnea, orthopnea, cough, fatigue, or edema. No past history of hypertension, abnormal blood tests, heart murmur, or rheumatic fever in self. Last ECG 2 yrs. PTA, result normal. No stress ECG or other heart tests.*

- *Family history: father with obesity, smoking, and hypertension, treated c diuretic medication. No other family history significant for cardiovascular disease.*

- *Personal habits: diet balanced in 4 food groups, 2 to 3 c. regular coffee/day; no smoking; alcohol, 1 to 2 beers occasionally on weekend; exercise, runs 2 miles, 3 to 4 x/week; no prescription or OTC medications or street drugs*

# Sample charting (cont.)

- OBJECTIVE

- Neck. Carotids 2+ and = bilaterally. Internal jugular vein pulsations present when supine, and disappear when elevated to a 45° position.
- Precordium. Inspection. No visible pulsations, no heave or lift.
- Palpation. Apical impulse in 5th ICS at left midclavicular line, no thrill.
- Auscultation. Rate 68 beats per minute, rhythm regular, S1-S2 are normal, not diminished or accentuated, no S3, no S4 or other extra sounds, no murmur

- ASSESSEMENT

- Neck vessels and heart sounds appear healthy

## References

1. Bickley, L. S., Szilagyi, P. G., & Bates, B. (2007). *Bates' guide to physical examination and history taking (11<sup>th</sup> Edi)*. Philadelphia: Lippincott Williams & Wilkins. Chapter No.06 & 07 p.n 171-250
2. Weber, Kelley's. (2007). *Health Assessment in Nursing, 3rd Ed: North American Edition*. Lippincott Williams & Wilkins. Chapter No.14 &15 p.n 239-294