Assessment of Cardiovascular System
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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.

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

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)
**Cardiovascular: Heart Sounds**

- **Characteristics of Heart Sounds**
  - Frequency (pitch): high or low
  - Intensity (loudness): loud or soft
  - Duration: very short heart 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 x 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

- **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: 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: 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
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
  - Palpation
  - Percussion
  - Auscultation

Physical Assessment

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

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

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.

Assessment: Objective

- 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 & 4th Heart Sounds

- **S3** (Gallops): 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.

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 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. 5th ICS medial midclavicular line (mitral)
- Listen with diaphragm and bell in each area.
- Position pt. Supine, L. side lying and sitting, leaning forward.

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

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

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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

• 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

• 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.

• 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.
Assessment: Objective

- **Auscultation:**
  - Pulse Alterans – 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

Summary: Cardiovascular

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