Assessment of Cardiovascular System

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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

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)

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 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

• **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
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
  - 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**

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 & 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.

3rd and 4th Heart Sounds

- S3
- S4
- S3
- S4
- S3
- S4
- S3
- S4
- S3
- S4
- S3
- S4
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. 5th ICS medial midclavicular line (mitral)
- Listen with diaphragm and bell in each area.
- Position pt. Supine, L. side lying and sitting, leaning forward.

Auscultatory Areas
• 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

Venous Stasis Ulcer
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
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: 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.

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

**Slide 19-65**

Summary: Cardiovascular
- Physical assessment Includes:
  - Neck vessels
  - Precordium
  - Inspection and palpation of peripheral system with auscultation of the carotids
**Sample charting**

- Objective
  - No chest pain, dyspnea, orthopnea, cough, fatigue, or odema. No past history of hypertension, abdominal or pelvic surgery, heart murmur, or rheumatic fever in self. Last ECG 2 yrs. PTA, usual normal. No stress ECG or other heart tests.
  - Family history: father with obesity, smoking, and hypertension, treated with diuretic medication. No other family history significant for cardiovascular disease.
  - Personal history: diet balanced on 5 food groups, 2 to 3 a. regular breakfast, no smoking, alcohol, 1 or 2 hours occasionally on weekends, exercised, runs 2 miles, 1 to 4 c/s/week; no prescription or OTC medications or street drugs.

**Sample charting (cont.)**

- Objective
  - Yes: Carotids 2+ and + bilaterally. Internal jugular venous pulsations present when supine, and disappear when seated to a 45° position.
  - Precordium: Inspection. No visible pulsations, no hame or lift.
  - Palpation: Apical impulse on 5th ICS at left midclavicular line, no thrill.
  - Auscultation. Rate 66 before, rhythm regular; S1 S2 normal, not diminished or accentuated, no S3, no S4 or other extrasounds, no murmur.
  - Assessment: Vitals within normal range per chart above.