Cardiovascular System

Inspection

Ensure that this is always conducted on bare skin!

- General inspection of the vascular system
  - Skin color changes
  - Hair distribution
  - Skin lesions
- Inspection of the chest
  - Symmetry
  - Pectus excavatum
  - Pectus carinatum
  - Pulsations
  - Heaves/Lifts
    - A more vigorous than expected apical impulse
    - Seen usually around the 5th intercostal space, left mid-clavicular line
  - Apical impulse
    - It should be visible between the 4th and 5th intercostal spaces, left mid-clavicular line
    - Might be impacted by the shape and thickness of the chest wall and the amount of tissue, air, or fluid present
- Inspection of the skin
  - Cyanosis
  - Bruising
  - Venous distention
  - Tattoos
- Inspection of the nails
  - Clubbing
    - Enlargement of the nail
    - Convex curvature of the nail
    - Associated with respiratory and cardiovascular diseases, cirrhosis, colitis, and thyroid disease
  - Spooning
    - An upward curving of the nails/concave curvature
    - Seen in iron deficiency anemia and hypothyroidism
  - Splinter hemorrhages
    - Blood clots visible in nailbeds that tend to run vertically
    - Seen in endocarditis and vasculitis
  - Beau lines
    - Deep grooves running from side to side in fingernails
    - Seen in coronary occlusion and other systemic disorders (appear weeks after occurrence)
  - Cyanosis

Palpation

- Landmarks
  - Suprasternal notch
  - Xiphoid process
  - Angle of Louis
  - Ribs and intercostal spaces
  - Manubrium
  - Sternum

- Precordium
  - General tips for palpation
    - Use either the proximal halves of four fingers or your entire hand
    - Touch skin *lightly* and let the cardiac movements touch your hand
  - Sequence
    1. Apex of the heart
    2. Left sternal border
    3. Base of the heart
    4. Right sternal border
    5. Epigastrium and axilla
- Apical impulse (also referred to as Point of Maximal Impulse [PMI])
  - Checking the apical impulse can let us know if there is cardiomegaly or clue us in to other cardiac abnormalities
  - Process
    - Palpate at the 5th intercostal space, left mid-clavicular line
    - Determine the width in which you can palpate the PMI
      - This is usually **no greater than 1 cm**
    - Video Link
      - https://www.youtube.com/watch?v=mMrvn2pmuIM
  - Abnormalities
    - In left ventricular hypertrophy the PMI shifts lateral and downward
    - Heaves/Lifts
    - Thrill
      - A fine, but palpable rushing vibration that can signal a defect in the closure of a semilunar valve, pulmonary hypertension, or an atrial septal defect
    - Faint PMI
      - Can be due to obesity or a thick chest
    - Cardiomegaly
      - Note by a PMI > 10 cm lateral to the mid-clavicular line
  - Pulses
    - Carotid (**ensure that only one is palpated at a time**)
    - Brachial
    - Radial
    - Femoral
    - Popliteal
    - Dorsalis pedis
    - Posterior tibial
      - Grading of pulses

Grade	Description
4	*Bounding, aneurysmal*
3	*Full, increased*
2	*Expected*
1	*Diminished, barely palpable*
0	*Absent, not palpable*

  - Skin temperature and turgor
  - Somatic dysfunction
    - T1-T5 are levels for sympathetic innervation for the heart
    - OA and AA are levels for parasympathetic innervation for the heart (vagus relationship)

Percussion

- Beneficial if you suspect cardiomegaly and you have no access for a chest X-ray or echocardiogram
  - Expected distance from mid-clavicular line is 7-10 cm

Auscultation

- 5 specific locations to auscultate the heart
  - **Aortic** – 2nd intercostal space at the right sternal border
  - **Pulmonic** – 2nd intercostal space at the left sternal border
  - **Erb's Point** – 3rd intercostal space at the left sternal border
  - **Tricuspid** – 4th intercostal space at the left sternal border
  - **Mitral** – 5th intercostal space at the left mid-clavicular line
    - A helpful mnemonic for this is "A PET Mary"
  - Video Link
    - https://www.youtube.com/watch?v=h8B3JBW_mX8
- Positions to listen in
  1. Sitting
  2. Leaning forward
  3. Supine
  4. Left lateral decubitus
- Bruit auscultation
  - What: "Whooshing" noises caused by turbulence (generally signals the presence of atherosclerosis)
  - How: Use light pressure and the bell
  - Locations
    - Carotid arteries
    - Abdominal aorta – lateral to the umbilicus on the left
    - Renal arteries – 2" above and 2" lateral to the umbilicus (can also use 2 fingerbreadths for each direction)
    - Iliac arteries – 2" below and 2" lateral to the umbilicus (can also use 2 fingerbreadths for each direction)
    - Femoral arteries
    - Video Link
      - https://www.youtube.com/watch?v=A8_p0oIM_VA
- Murmurs
  - What: A prolonged extra sound during either systole and/or diastole and is associated with a disruption to blood flow into, through, or out
    - Grading of murmurs

Grade	Description
I	*Barely audible in a quiet room (requires "tuning in")*
II	*Quiet, but clearing audible*
III	*Moderate loud, but no thrill present*
IV	*Loud with a thrill present*
V	*Very loud with an easily palpated thrill*
VI	*Very loud, hear even without stethoscope (palpable **and** visible thrill)*

- Enhancement of murmurs
  - ******Note: This is not an exhaustive list!******
  - Systolic Murmurs
    - Aortic Stenosis
      - No specific maneuver distinguishes this murmur, but the diagnosis can be made by exclusion, clinical presentation, and physical exam
    - Mitral Regurgitation
      - Hand grip enhances murmur
  - Diastolic Murmurs
    - Aortic Regurgitation
      - Accentuated by having the patient sit and lean forward
        - Video Link
          - https://www.youtube.com/watch?v=aMRYU5hY03Y

- Mitral Stenosis
    - Accentuated by having the patient lie in the left lateral decubitus position
        - Video Link
            - https://www.youtube.com/watch?v=g60XNtXx-G0

Special Tests

- Orthostatic Blood Pressure
    - Why: Orthostatic blood pressure alerts us to an issue in the cardiovascular system. A positive test might be caused by hypovolemia, certain medications, Addison's disease, etc. It can also be seen in the elderly, postpartum women, and those on prolonged bed rest.
    - How:
        - Have your patient lie supine for 10 minutes. Take his/her blood pressure while supine.
        - Have your patient stand. Take his/her blood pressure within 3 minutes of standing.
    - Positive Test:
        - A systolic blood pressure that decreases ≥ 20 mmHg **or** a diastolic blood pressure that decreases ≥ 10 mmHg within 3 minutes of standing
            - Your patient may also complain of symptoms such as dizziness, euphoria, nausea, or headache
                - ***Be aware: You patient may pass out!***
- Capillary Refill
    - Why: The capillary bed joins the arterial and venous systems. If it takes longer than expected, one can suspect there is some sort of problem with peripheral perfusion.
    - How:
        - Blanch the nail bed by squeezing the nail bed for several seconds.
        - Quickly release the pressure.
        - Observe how long it takes the normal pink color to return. This should be 2 seconds or less.
    - Positive Test:
        - Capillary refill time of longer than 2 seconds.
- Pitting Edema
    - Why: Right heart failure patients may experience edema. Increases in venous hydrostatic pressure results in edema in dependent areas.
    - How:
        - Press your index finger over a bony prominence such as the tibia or the medial malleolus for several seconds.
        - Quickly release pressure.
    - Positive Test:
        - A depression that does not rapidly refill and resume its original contour could indicate pitting edema
            - Grading of pitting edema

Grade	Description
+1	*Slight pitting, no visible distortion, disappears rapidly*
+2	*Somewhat deeper pit, but again no readily detectable distortion (disappears in 10-15 seconds)*
+3	*Noticeable deep pit that may last more than 1 minute and dependent extremity looks fuller and swollen*
+4	*Very deep pit that lasts as long as 2-5 minutes and dependent extremity is grossly distorted*

- Homan's Sign
    - Why: A positive test suggests DVT.
    - How:
        - Flex the supine patient's leg/knee with one hand.
        - Quickly dorsiflex the foot.
            - Video Link
                - https://www.youtube.com/watch?v=5-LCDB_PPYM
    - Positive Sign: Pain in the calf.

- Bancroft/Moses' Sign
  - Why: A positive test suggests DVT in the posterior tibial veins.
  - How:
    - With your patient supine or seated, wrap your hand around the gastrocnemius muscle.
    - Compress the gastrocnemius muscle against the tibia.
      - Video Link
        - https://www.youtube.com/watch?v=b1oaLDj1u4Y
  - Positive Sign: Pain in the calf upon anteroposterior compression of the gastrocnemius muscle against the tibia.
- Allen Test
  - Why: Assesses the patency of the ulnar artery before performing a radial artery puncture for arterial blood gas or radial artery catheter.
  - How:
    - With the patient's palm facing upwards, compress the radial and the ulnar artery with your thumbs.
    - Have the patient open and close the fist 5 times before leaving the blanched palm open.
    - Release pressure on the ulnar artery alone and watch for palmar reperfusion within 4-5 seconds.
      - Video Link
        - https://www.youtube.com/watch?v=hLov_jwTBkg
  - Positive Test: Lack of palmar reperfusion.
    - **Do NOT perform ABG or catheter insertion!**