***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

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| **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

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| **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

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| --- | --- |
| **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!**