

Cardiovascular Exam Benchmarks

Preparation and Positioning

For a complete cardiac exam, the patient should be positioned at a 30° to 45° angle, with the examiner on the right. The stethoscope is placed in the ears with the tips of the earpieces facing forward. Use the bell of the stethoscope to listen for low frequency sounds, including S3, S4, and the murmur of mitral stenosis. For other sounds, use the diaphragm.

1. Inspection	Inspect jugular venous pulsations and measure jugular venous pressure
	Inspect the precordium for abnormal pulsations
	Inspect the anterior chest and neck for skin lesions as you perform the exam
2. Palpation	Palpate the apical impulse and note its location. If you cannot feel the apical impulse, palpate again in the partial left lateral decubitus position.
	Palpate the left lower sternal border for a right ventricular lift
	Palpate the carotid arteries, one at a time, observing strength & symmetry of pulses
3. Auscultation	Listen at each location with the diaphragm of the stethoscope <ul style="list-style-type: none">○ Right upper sternal border (R 2nd intercostal space)○ Left upper sternal border (L 2nd intercostal space)○ Left lower sternal border (along the sternum at the 5th intercostal space)○ Cardiac apex (midclavicular line in the 5th intercostal space)
	Listen with the bell at the cardiac apex, for S3, S4, and the murmur of mitral stenosis. If you suspect any of these, listen again in the partial left lateral decubitus position.
	Listen for bruits over each carotid artery
4. Peripheral Circulation	Palpate each of the following pulses on each side: <ul style="list-style-type: none">○ radial○ femoral○ dorsalis pedis○ posterior tibialis
5. Edema	Note the presence and severity of leg edema

Let's explore each of these steps further...

1. Inspection	Inspect jugular venous pulsations and measure jugular venous pressure
	Inspect the precordium for abnormal pulsations
	Inspect the anterior chest and neck for skin lesions as you perform the exam.

Tips on technique:

- Measuring JVP:
 - Position the patient's bed so that you can see the top of the internal and/or external jugular vein. Begin with the head of the bed at 30°, and adjust it up and down as necessary. An oblique light source (a penlight shone across the neck) may help you identify the veins.
 - Measure the vertical distance from the top of the venous pulsations in the internal jugular vein, or the blood column in the external jugular vein, to the sternal angle. Add this distance to 5 cm. This is the jugular venous pressure.
 - The normal JVP is up to 8 cm of H₂O

Abnormal findings:

- Elevated JVP: Finding that the JVP is elevated argues strongly that the directly measured central venous pressure (right atrial pressure) is over 8 cm H₂O. The elevated central venous pressure could be caused by left heart disease, primary or secondary pulmonary hypertension, or pulmonic stenosis.
- Flat neck veins: Finding that the neck veins cannot be seen with the patient supine strongly correlates with a measured CVP less than 5 cm of H₂O.

2. Palpation	Palpate the apical impulse and note its location. If you cannot feel the apical impulse, palpate again in the partial left lateral decubitus position.
	Palpate the left lower sternal border for a right ventricular lift
	Palpate the carotid arteries, one at a time, observing strength & symmetry of pulses

Tips on technique:

- The apical impulse is palpable in less than half of normal adults when supine. Rolling to the partial left lateral decubitus position brings the cardiac apex closer to the chest wall, making the PMI easier to feel.

Abnormal findings:

- **Laterally displaced apical impulse:** A classic finding of congestive heart failure. It is specific but not sensitive. If present, it supports a diagnosis of CHF but its absence does not exclude the diagnosis.
- **Enlarged apical impulse:** Defined as > 4 cm with your patient in the partial left lateral decubitus position. Also a specific but insensitive finding of CHF, arguing for the diagnosis if present.
- **Sustained apical movement**, also called a **lift** or **heave**. Apical movement that lasts longer than normal indicates pressure or volume overload of the left ventricle, or severe cardiomyopathy.

- **A thrill** is a palpable vibration of the precordium. The presence of a thrill distinguishes a grade IV-VI cardiac murmur from a grade I-III murmur.

Auscultation	Listen at each location with the diaphragm of the stethoscope <ul style="list-style-type: none"> ○ Right upper sternal border (R 2nd intercostal space) ○ Left upper sternal border (L 2nd intercostal space) ○ Left lower sternal border (along the sternum at the 5th intercostal space) ○ Cardiac apex (midclavicular line in the 5th intercostal space)
	Listen with the bell at the cardiac apex, for S3, S4, and the murmur of mitral stenosis. If you suspect any of these, listen again in the partial left lateral decubitus position.
	Listen for bruits over each carotid artery

Tips on technique:

- **Normal S1 and S2:** The order of closure of the heart valves is mitral & tricuspid (creating S1) followed by aortic & pulmonic (creating S2). The normal **S1-S2** sounds like “lub-dup.” The “dup” sound of S2 is sharper and higher pitched than the “lub” sound of S1 and is heard best at the pulmonic area.
- **Physiologic splitting of S2:** S2 normally **splits** with inspiration, and when it does, the “dup” sound of S2 now sounds like “drup.” It is best heard in the pulmonic area with the diaphragm of the stethoscope, but the splitting can be appreciated in only about 50% of healthy adults.
- **Telling systole from diastole.** At heart rate < 100, systole is substantially shorter than diastole. The carotid pulse can also be used to time systole, which is concurrent with the carotid upstroke.

Abnormal findings:

- **S3 and S4** are low frequency extra sounds best heard with the bell of the stethoscope at the cardiac apex with the patient in a left lateral decubitus position. An S1 S2 followed by an S3 sounds like: “I be-lieve.” An S4 S1 then S2 sounds like “Be-lieve me.”
- **S3** occurs during early diastole, when blood flowing into an overfilled, non-compliant left ventricle suddenly decelerates. In patients over 40, it indicates systolic heart failure or valvular regurgitation. An S3 may be a normal finding in children and young adults.
- **S4** is heard in late diastole, when atrial contraction pushes blood into the ventricle, and indicates the ventricle is abnormally stiff, due to hypertrophy or fibrosis.
- **Pericardial rub** is a high-pitched, scratchy sound caused by pericardial inflammation. A rub is best heard along the lower left sternal border using the diaphragm of the stethoscope with the patient sitting up, leaning forward, and briefly holding the breath.
- **Murmurs:** If a murmur is heard, describe five basic murmur characteristics:
 - **Grade** (I - VI scale)
 - I—faint
 - II—easily heard
 - III—loud
 - IV—a thrill is present

- V—thrill, plus auscultated with edge of the stethoscope touching the chest wall
- VI—thrill, plus auscultated with the stethoscope held off the skin

- **Timing:** Systolic or diastolic
- **Quality:** Harsh, blowing, musical
- **Location:** Identify where the murmur is heard and where it is loudest.
- **Radiation:** Listen across the precordium and in the carotids
- **Describe three common systolic murmurs**
 - Aortic stenosis
 - Mitral regurgitation
 - Innocent murmur
- **Describe two diastolic murmurs**
 - Aortic regurgitation
 - Mitral stenosis

Peripheral Circulation	Palpate each of the following pulses on each side: <ul style="list-style-type: none"> ○ radial ○ femoral ○ dorsalis pedis ○ posterior tibialis
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Tips on technique:

- Femoral pulses may be checked after the abdominal exam for ease of draping.

Abnormal findings:

- **Absent foot pulses:** The absence of **both** pedal pulses supports a diagnosis of peripheral vascular disease. Many healthy people lack one or the other pedal pulse, but if one is anatomically absent the other is enlarges to make up the difference.

Edema	Note the presence and severity of leg edema
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Tips on Technique:

- If edema is present, note:
 - The severity of edema. Edema is often graded on a 1-4 scale, which is subjective. The proximal extension of edema and the presence of weeping or skin ulceration can also be used to describe the severity.
 - The proximal extension of edema.
 - The presence or absence of pitting. Pitting edema indicates that edema fluid is low protein, as in congestive heart failure, hypoalbuminemia, or pulmonary hypertension.
- The most common causes of edema are venous stasis disease, congestive heart failure, pulmonary hypertension and drug induced edema.

