# Assessing Heart and Neck Vessels

By

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# Structure and Function

- The cardiovascular system is highly complex, consisting of the heart and a closed system of blood vessels.
- To collect accurate data and correctly interpret it, the examiner must have an understanding of the structure and function of the heart, the great vessels, the electrical conduction system of the heart, the cardiac cycle, the production of heart sounds, cardiac output, and the neck vessels.
- This information helps the examiner to differentiate between normal and abnormal findings as they relate to the cardiovascular system.

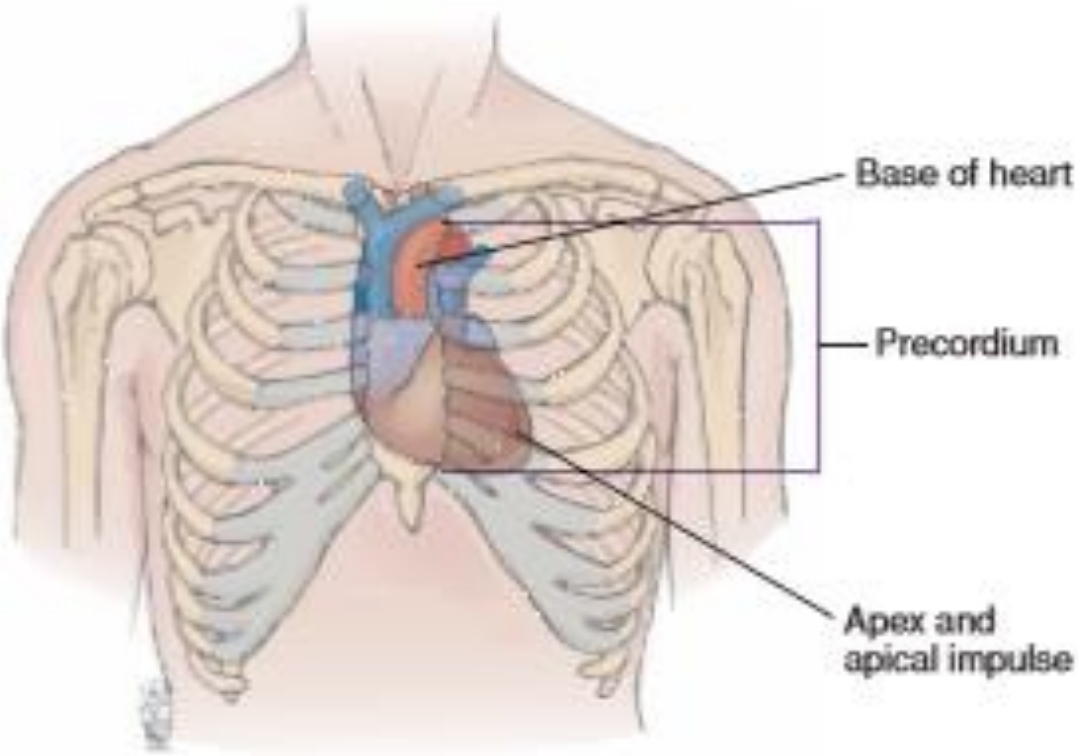



**FIGURE 21-1** The heart and major blood vessels lie centrally in the chest behind the protective sternum.

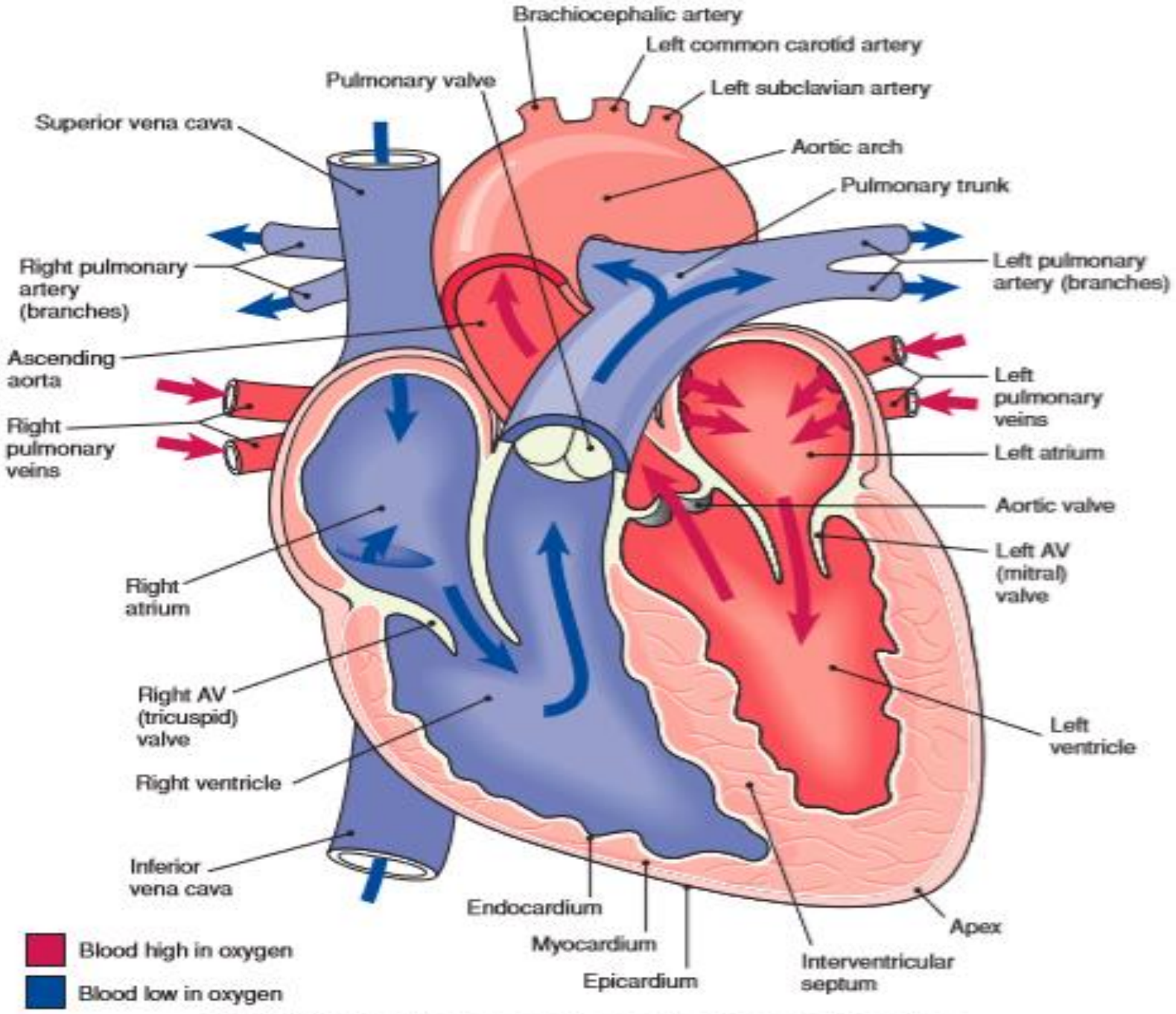



**FIGURE 21-2** Heart chambers, valves, and direction of circulatory flow.

# THE CARDIAC CYCLE

**Diastole**

- During ventricular diastole, the AV valves are open and the ventricles are relaxed. This causes higher pressure in the atria than in the ventricles. Therefore, blood rushes through the atria into the ventricles.

- Near the end of ventricular diastole, the atria contract and complete the emptying of blood out of the upper chambers by propelling it into the ventricles.

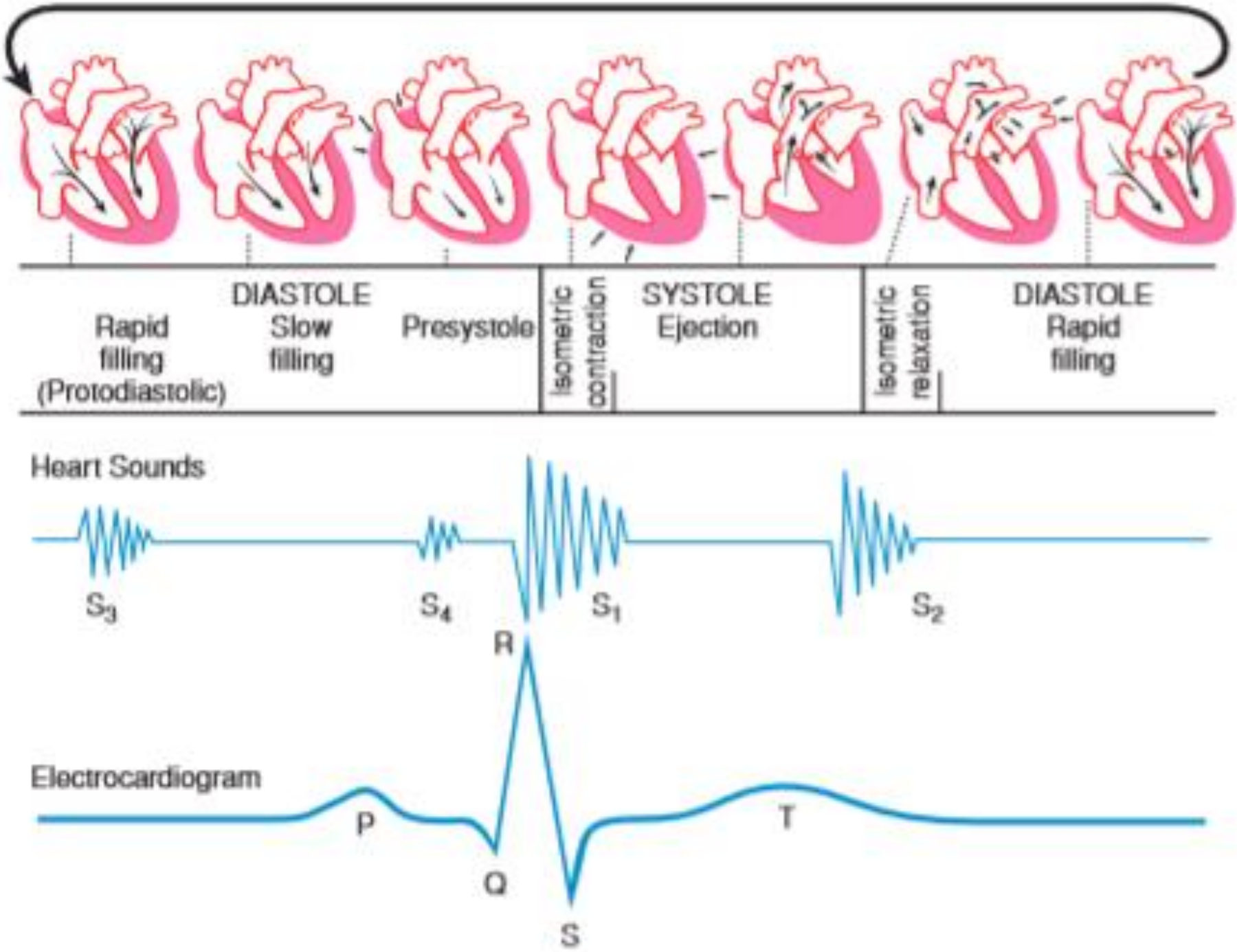
- This final active filling phase is called presystole, atrial systole, or sometimes the “atrial kick.” This action raises left ventricular pressure.

**Systole**

- The filling phases during diastole result in a large amount of blood in the ventricles, causing the pressure in the ventricles to be higher than in the atria.

- This causes the AV valves (mitral and tricuspid) to shut. Closure of the AV valves produces the first heart sound (S1), which is the beginning of systole.

- This valve closure also prevents blood from flowing backward (a process known as regurgitation) into the atria during ventricular contraction


DIASTOLE
Rapid filling (Protodiastolic)
Slow filling
Presystole
Isometric contraction
SYSTOLE
Ejection
Isometric relaxation
DIASTOLE
Rapid filling
Heart Sounds
S3
S4
S1
S2
R
Electrocardiogram
P
Q
S
T

# HEART SOUNDS

- Heart sounds are produced by valve closure, as just described. The opening of valves is silent.

- Normal heart sounds, characterized as “lub dubb” (S1 and S2), and occasionally extra heart sounds and murmurs can be auscultated with a stethoscope over the precordium, the area of the anterior chest overlying the heart and great vessels

- **The first heart sound (S1)** is the result of closure of the AV valves: the mitral and tricuspid valves. S1 (“lub”) is usually heard as one sound but may be heard as two sounds.
- S1 may be heard over the entire precordium but is heard best at the apex (left MCL, fifth ICS).

- **The second heart sound (S2)** results from closure of the semilunar valves (aortic and pulmonic) and S2 (“dubb”) is also usually heard as one sound but may be heard as two sounds correlates with the beginning of diastole.

- If S2 is heard as two distinct sounds, it is called a split S2. A splitting of S2 may be exaggerated during inspiration and disappear during expiration. S2 is heard best at the base of the heart.

# Extra Heart Sounds

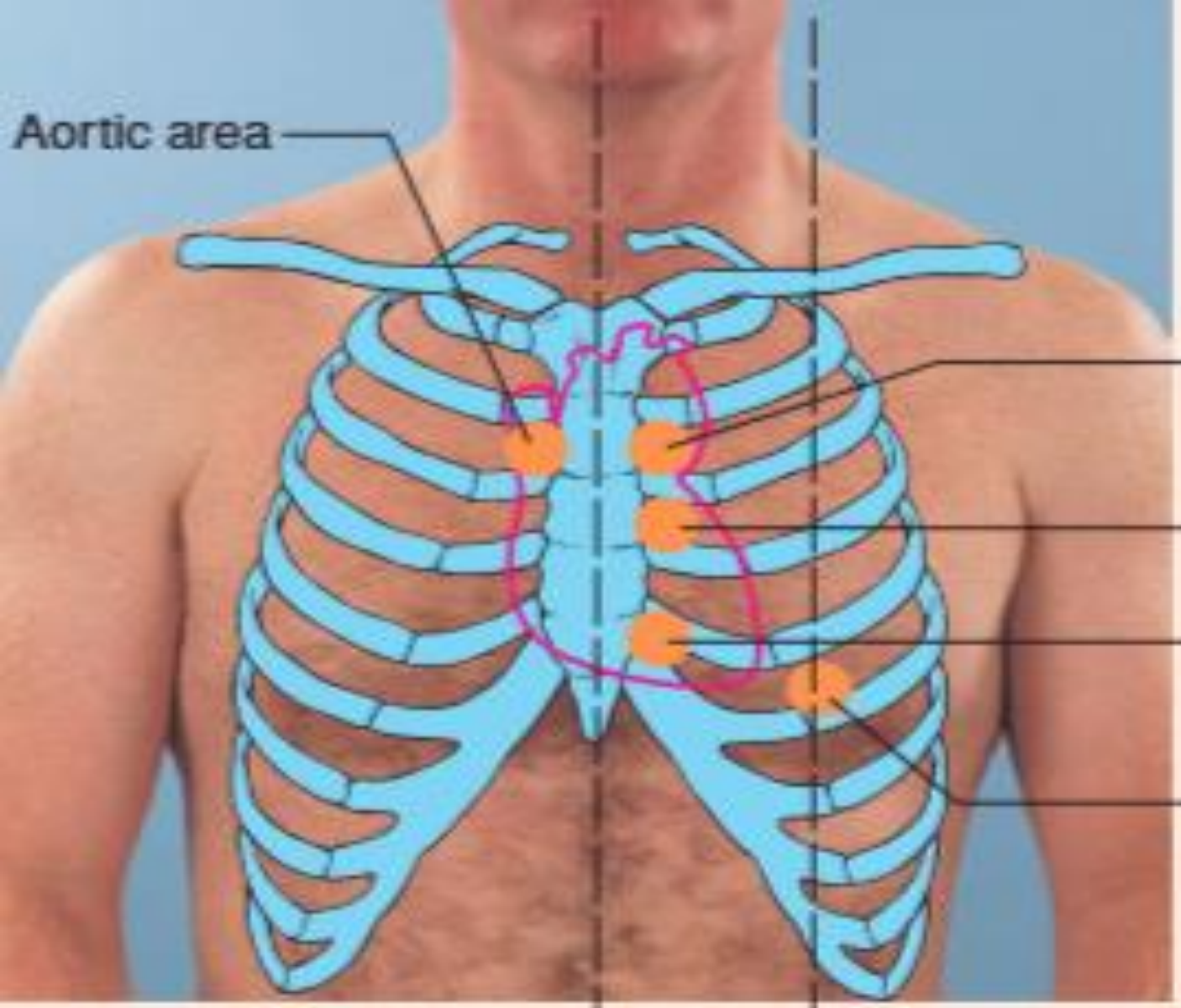
- S3 and S4 are referred to as diastolic filling sounds, or extra heart sounds, which result from ventricular vibration secondary to rapid ventricular filling.
- If present, S3 can be heard early in diastole, after S2.
- S4 also results from ventricular vibration but, contrary to S3, the vibration is secondary to ventricular resistance (noncompliance) during atrial contraction.
- If present, S4 can be heard late in diastole, just before S1.
- S3 is often termed ventricular gallop, and S4 is called atrial gallop.

# Murmurs

- Blood normally flows silently through the heart. There are conditions, however, that can create turbulent blood flow in which a swooshing or blowing sound may be auscultated over the precordium.
- Conditions that contribute to turbulent blood flow include:
  - (1) increased blood velocity
  - (2) structural valve defects
  - (3) valve malfunction,
  - (4) abnormal chamber openings (e.g., septal defect).

# Traditional Areas of Auscultations

- **Aortic area**: Second intercostal space at the right sternal border the base of the heart.
- **Pulmonic area**: Second or third intercostal space at the left sternal border the base of the heart.
- **Erb's point**: Third to fifth intercostal space at the left sternal border. This is the site where heart murmurs are frequently auscultated.
- **Mitral (apical)**: Fifth intercostal space near the left mid-clavicular line the apex of the heart.
- **Tricuspid area**: Fourth or fifth intercostal space at the left lower sternal border.


Aortic area
Pulmonic area
Erb's point
Tricuspid area
Mitral (apical) area
Midsternum
Midclavicular line


AO
PA
LA
RA
RV
LV
1
2
3
4
5

# NECK VESSELS

**Carotid Artery Pulse**

- The right and left common carotid arteries extend from the brachiocephalic trunk and the aortic arch, and are located in the groove between the trachea and the right and left sternocleidomastoid muscles.

- The carotid artery pulse is a centrally located arterial pulse. Because it is close to the heart, the pressure wave pulsation coincides closely with ventricular systole.

- The carotid arterial pulse is good for assessing amplitude and contour of the pulse wave.

- The pulse should normally have a smooth, rapid upstroke that occurs in early systole and a more gradual downstroke.

**Jugular Venous Pulse and Pressure**

- There are two sets of jugular veins: internal and external.
  - The internal jugular veins lie deep and medial to the sternocleidomastoid muscle.
  - The external jugular veins are more superficial; they lie lateral to the sternocleidomastoid muscle and above the clavicle.
- Assessment of the jugular venous pulse is important for determining the hemodynamics of the right side of the heart.
- The level of the jugular venous pressure reflects right atrial (central venous) pressure and, usually, right ventricular diastolic falling pressure.
- Right-sided heart failure raises pressure and volume, thus raising jugular venous pressure.

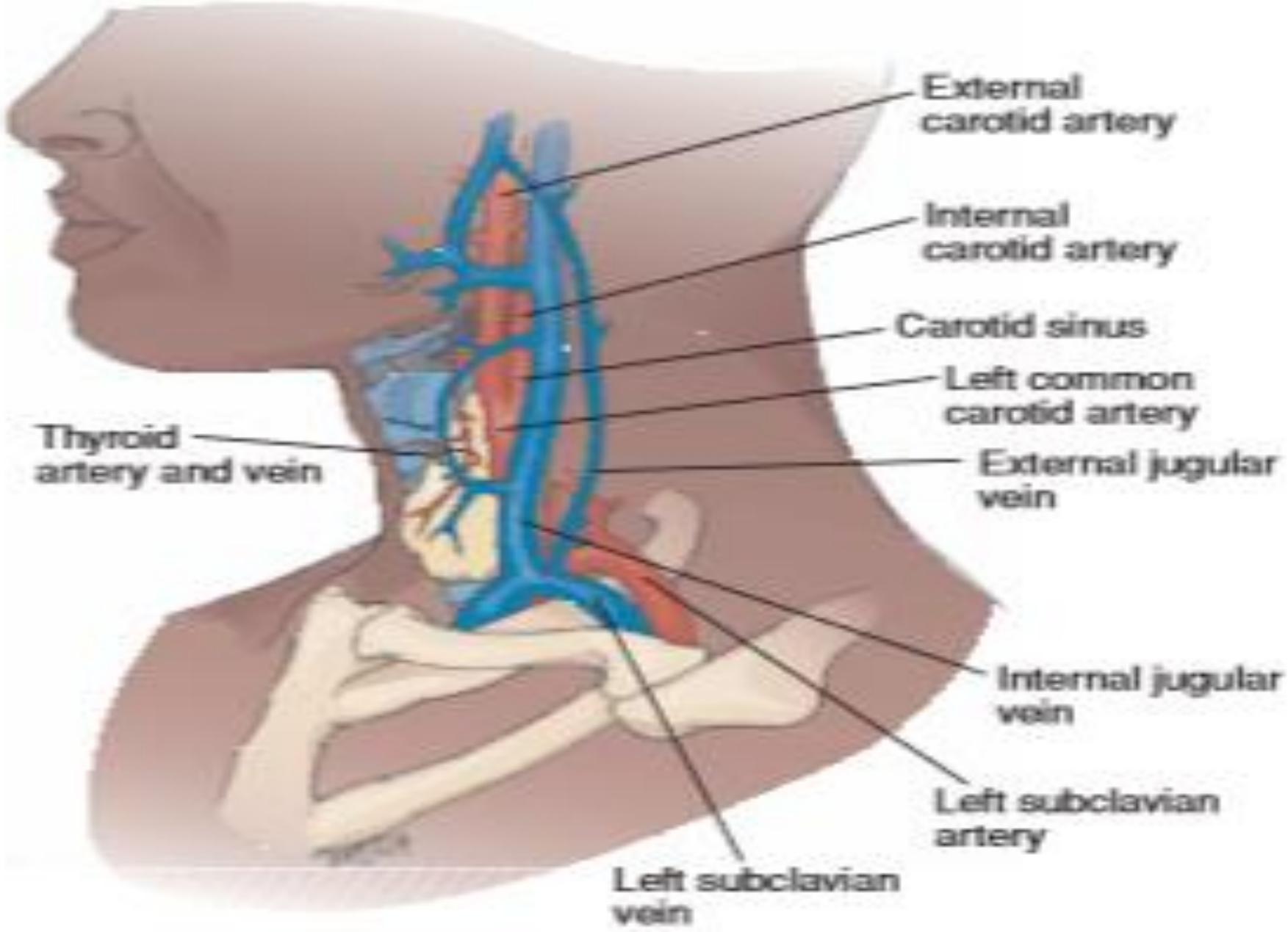



**FIGURE 21-5** Major neck vessels, including the carotid arteries and jugular veins.

# Health Assessment

**COLLECTING SUBJECTIVE DATA: THE NURSING HEALTH HISTORY**

- Subjective data collected about the heart and neck vessels helps the nurse to identify abnormal conditions that may affect the client's ability to perform activities of daily living (ADLs) and to full his or her role and responsibilities.

- When compiling the nursing history of current complaints or symptoms, personal and family history, and lifestyle and health practices, remember to thoroughly explore signs and symptoms that the client brings to your attention either intentionally or inadvertently.

# COLDSPA to describe chest pain

**Character**: describe your chest pain includes stabbing, burning, crushing, squeezing, or tightness.

**Onset**: when did it start

**Location**: where is the pain? Does it radiate to any other area? Where?

**Duration**: How long does the pain last? How often do you experience the pain?

**Severity**: Rate the pain on a scale of 0 to 10, with 10 being the worst possible pain.

**Patterns**: what brings on the pain (activity, stress, eating, sexual activity, weather change, extreme cold or heat, lying flat, resting), What relieves the pain (nitroglycerin, rest).

**Associated Factors**: Do you have any other symptoms with this pain? Shortness of breath [dyspnea], perspiration [diaphoresis], pale clammy skin, nausea, vomiting, heart beat skips or speeds up.

# Other symptoms

- Tachycardia and palpitation
  - Fatigue
  - Dyspnea
  - Nocturia
  - Nocturial dyspnea
  - Cough
  - Dizziness
  - Cyanosis and pallor
- Family history
- Life style

# COLLECTING OBJECTIVE DATA: PHYSICAL EXAMINATION

**Preparing the Client**

- Explain that they will need to expose the anterior chest.
- Explain to the client that it is necessary to assume several different positions (left lateral and sitting-up).
- Explain that you will need to place the client in the supine position with the head elevated to about 30 degrees during auscultation and palpation of the neck vessels and inspection, palpation, and auscultation of the precordium.

# Equipment

- Stethoscope with bell and diaphragm
- Small pillow
- Penlight or movable examination light
- Watch with second hand
- Centimeter rulers (two)

# INSPECTION

**Observe the jugular venous pulse.**

- Inspect the jugular venous pulse by standing on the right side of the client. The client should be in a supine position with the torso elevated 30-40 degree. Make sure the head and torso are on the same plane.

- Ask the client to turn the head slightly to the left. Shine a tangential light source onto the neck to increase visualization of pulsations as well as shadows.

- Next, inspect the suprasternal notch or the area around the clavicles for pulsations of the internal jugular veins.

# Observe the jugular venous pulse.

Normal findings:

- The jugular venous pulse is not normally visible with the client sitting upright. This position fully distends the vein, and pulsations may or may not be discernible.

Abnormal findings:

Fully distended jugular veins with the client's torso elevated more than 45 degree indicate increased central venous pressure that may be the result of right ventricular failure, pulmonary hypertension, pulmonary emboli, or cardiac tamponade.

**Evaluate jugular venous pressure**

- Evaluate jugular venous pressure by watching for distention of the jugular vein.
- It is normal for the jugular veins to be visible when the client is supine.
- To evaluate jugular vein distention, position the client in a supine position with the head of the bed, 30, 45, 60 and 90 degrees.
- At each increase of the elevation, have the client's head turned slightly away from the side being evaluated. Using tangential lighting, observe for distention, protrusion, or bulging.

Normal findings:

- The jugular vein should not be distended, plugging or protruded at 45 degrees or greater.

Abnormal findings:

- Distention, plugging, or protrusion at 45, 60, or 90 (document the degree) degrees indicates RT side heart failure.

# Auscultation and Palpation

- Auscultate the carotid arteries if the client in middle-aged or older or you suspect cardiovascular disease. Place the bell of the stethoscope over the carotid artery and ask the client to hold his or her breath for a moment so that breath sounds do not conceal any vascular sound.

Normal findings:

- No blowing or swishing or other sounds are heard.
- Pulses are equally strong; a 2+ or normal with no variation in strength from beat to beat.
- Contour is normally smooth and rapid on the upstroke and slower and less abrupt on the downstroke. The strength of the
- Pulse is evaluated on a scale form 0 to 4 as follows:

**Pulse Amplitude Scale**

- 0 = Absent
- 1+ =Weak
- 2+ = Normal
- 3+ = Increased
- 4+ = Bounding

Abnormal findings:

- A bruit, a blowing or swishing sound caused by turbulent blood flow through a narrowed vessel, is indicative of occlusive arterial disease (more than two third is occluded).
- Pulse inequality may indicate arterial constriction or occlusion in one carotid.
- Weak pulse may indicates hypovolima, shock, or decreased cardiac output.
- A bounding, firm pulse may indicate hypervolemia or increased cardiac output.

**Palpate the carotid arteries.**

- Palpate each carotid artery alternately by placing the pads of the index and middle fingers medial to the sternocleidomastoid muscle on the neck.

- Note amplitude, and contour of the pulse, elasticity of the artery, and any thrill.

Normal findings:

- Arteries are elastic and no thrills are noted.

Abnormal findings:

- Loss of elasticity may indicates atherosclerosis.
- Thrills may indicate a narrowing of the artery.

# Heart (Precordium) : Inspection

**Inspect pulsations**

- With the client in the supine position with the head of the bed 30-45 degrees, stand on the client's right side and look for the apical impulse and any abnormal pulsations.

- Normal: The apical impulse may or may not be visible. If apparent, it would be in the mitral area (LT midclavecular line, $4^{th}$ or $5^{th}$ intercostal space).

- Abnormal: Pulsations, which may also be called heaves or lifts, other than the apical pulsation are considered abnormal and should be evaluated.

# PALPATION

**Palpate the apical impulse.**

- Remain on the client's right side and ask the client to remain supine. Use one or two finger pads to palpate the apical impulse in the mitral area.

- Normal: The apical impulse is palpated in the mitral area and may be a size of 1-2cm. Amplitude is small and may not be palpable in obese client.

- Abnormal: The apical impulse may be impossible to palpate in clients with pulmonary emphysema.
  - If the size more than 1-2 cm, displaced, more forceful, or of longer duration, suspect cardiac enlargement.

- **Palpate for abnormal pulsations.** Use your palmar surfaces to palpate the apex, left sternal border, and base.

- Normally: No pulsations or vibrations are palpated.
- A thrill or a pulsation is usually associated with a grade IV or higher murmur.



FIGURE 21-11 Locate the apical impulse with the finger pads (A); then palpate the apical impulse with the palmar surface (B).

# AUSCULTATION

- Auscultate heart rate and rhythm. Place the diaphragm of the stethoscope at the apex and listen closely to the rate and rhythm of the apical impulse.

- Normally: rate 60-100 beat/min with regular rhythm. A regularly irregular rhythm, such as sinus arrhythmia when the heart rate increases with inspiration and decreases with expiration, may be normal in young adults.

- Abnormal: Bradycardia, tachycardia, irregular rhythm need further evaluation.

**Auscultate to identify S1 and S2.**

- Auscultate the 1st heart sound (S1 or Lub) and the sencond heart sound (S2 or Dubb).
- S1 starts systole, and S2 starts diastole. The space, or systolic pause.
  - **If you are experiencing difficulty differentiating S1 from S2, palpate the carotid pulse: the harsh sound that you hear from the carotid pulse is S1.**

**Auscultate for extra heart sounds.**

- Use the diaphragm first then bell to auscultate over the entire heart area.
- Auscultate during the diastolic pause.

- Normally no sounds are heard.

- A physiologic S3 heart sound is a benign finding commonly heard at the beginning of the diastolic pause in children, adolescents, and young adults.

- The physiological S3 usually subsides upon standing or sitting up.

- A physiologic S4 heart sound may be heard near the end of diastole in well-conditioned athletes and adult over 40 or 50 with no evidence of heart disease, especially after exercise.

- Abnormal: A pathologic S3 (ventricular gallop) may be heard with ischemic heart disease, hyperkinetic state (anemia) or restrictive myocardial disease.

- A pathologic S4 (atrila gallop) toward the left side of the precordium may be heard with coronary artery disease, hypertensive heart disease, cardiomyopathy, and aortic stenosis.

- A pathologic S4 toward the right side of the precordium may be heard with pulmonary hypertension and pulmonic stenosis.

## Auscultate for murmurs

- A murmur is a swishing sound caused by turbulent blood flow through the heart valves or great vessels.
- Auscultate for murmurs across the entire heart area.
- Use the diaphragm and the bell of the stethoscope in all areas of auscultation because murmurs have a variety of pitches.

- Normally: no murmurs are heard (some midsystolic mummers may present in healthy heart).

- Abnormal: Pathologic midsystolic, pansystolic, and diastolic murmurs.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# Analysis of Data: Diagnostic Reasoning

- **Selected Nursing Diagnoses**

**Health Promotion Diagnoses**

- Readiness for Enhanced Self-health Management: Desired information on exercise and low-fat diet

**Risk Diagnoses**

- Risk for Sexual Dysfunction related to misinformation or lack of knowledge regarding sexual activity and heart disease
- Risk for Ineffective Denial related to smoking and obesity

**Actual Diagnoses**

- Fatigue related to decreased cardiac output
- Activity Intolerance related to compromised oxygen transport secondary to heart failure
- Acute Pain: Cardiac related to an inequality between oxygen supply and demand
- Anxiety
- Ineffective Tissue Perfusion: Cardiac related to impaired circulation

Thank you