CHAPTER 3

Cardiovascular Disorders

WHERE TO FOCUS

The adult cardiovascular diagnoses shown in **Table 3–1** are likely to appear on the certification exam.

Table 3–1 Adult Cardiovascular Diagnoses

Diagnosis	What to Know

Primary Hypertension	• Risk factors and comorbid conditions
	• U.S. Preventive Services Task Force (USPSTF) guidelines for hypertension screening in adults
	• Eighth Joint National Committee (JNC-8) and American College of Cardiology/American Heart Association (ACC/AHA) guidelines
	  ◦ Diagnostic criteria
	  ◦ Target blood pressures
	  ◦ Drug classes used for initial monotherapy: calcium-channel blockers, thiazide diuretics, angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs)
	• Lifestyle modifications—weight loss, physical activity
	• Antihypertensive treatment—efficacy of each drug class, side effects, contraindications, laboratory monitoring, evaluation of drug therapy, adding a second agent
	• **Monitoring Considerations: Home blood pressure monitoring (HBPM) and ambulatory blood pressure monitoring (ABPM) are useful in assessing hypertension control and are commonly tested on certification exams.**

Secondary Hypertension	• Possible etiologies (e.g., renal artery stenosis, pheochromocytoma) • When to suspect secondary hypertension • **Resistant Hypertension: Consider evaluating for secondary causes of hypertension in patients who remain hypertensive despite using three or more antihypertensive agents, especially if one is a diuretic.**

(*continues*)

Diagnosis	What to Know
Heart Failure	• Risk factors (including medications that may precipitate heart failure) and comorbid conditions • Classic clinical presentation • Work-up and diagnostic testing • Assessment of New York Heart Association (NYHA) Functional Classification • Indications for referral • Management: drug therapy for heart failure (beta blockers, ACE inhibitors) and drugs to avoid in patients with heart failure • **Pharmacologic Focus: Highlight medications that reduce mortality in heart failure with reduced ejection fraction (HFrEF), including ACE inhibitors, ARBs, beta blockers, and aldosterone antagonists. For patients with heart failure with preserved ejection fraction (HFpEF), focus on managing comorbidities such as hypertension and atrial fibrillation.** • Indications for referral: recognizing signs of acute decompensation
Peripheral Artery Disease (PAD)	• Risk factors and comorbid conditions • Classic clinical presentation • Diagnostic testing: ankle-brachial index measurement, angiography • Management: smoking cessation, antiplatelet therapy • **Management: Nonpharmacologic interventions such as supervised exercise therapy play a key role in PAD management. Smoking cessation is also crucial and is a focus area for exam questions.**
Heart Murmurs and Valve Disorders	• Risk factors for development of valvular disease and septal defects • Assessment and diagnosis of murmurs based on physical exam findings • Recognizing indications for referral: diastolic murmur, high-grade thrill, significant or concerning symptoms • Management of benign murmurs

PEARLS FOR THE CERTIFICATION EXAM—CARDIOVASCULAR

- There are two well-respected organizations that have produced guidelines for the management of hypertension in primary care. The American College of Cardiology/American Heart Association (ACC/AHA) published their most recent guidelines in 2017, and the Eighth Joint National Committee (JNC-8) published its guidelines in 2014. The two guidelines are very similar. As you study for the certification exam, focus on recommendations supported by *both* guidelines. The certification exam is likely to include content on which both groups agree.
- Review all stages of hypertension and treatment recommendations (**Table 3–2**).

Table 3–2 Hypertension Stages (AHA/ACC Guidelines)

Hypertension Stage	Blood Pressure Range	Treatment Recommendations
Stage 1 hypertension	130–139 OR 80–89 mmHg	Lifestyle modification, consider pharmacotherapy if atherosclerotic cardiovascular disease (ASCVD) >10%
Stage 2 hypertension	≥ 140 OR 90 mmHg	Consider initiating pharmacotherapy with two agents of different classes

- Although direct oral anticoagulants (DOACs) are increasingly preferred for the prevention of thrombotic events in atrial fibrillation and venous thromboembolism, warfarin is still used in practice. The certification exam may ask you to initiate or titrate a warfarin dose based on the patient's international normalized ratio (INR). Know the target INR for warfarin treatment of these conditions.
- The goal of hyperlipidemia treatment is to reduce the risk of atherosclerotic cardiovascular disease (ASCVD), which includes stroke, heart attack, and peripheral artery disease (PAD).
- Heart murmurs:
  - To identify a heart murmur, follow this three-step process (**Figure 3–1**):
    1. *Determine if the murmur is systolic or diastolic.* Place one hand on the carotid pulse and use the other hand to auscultate the murmur. If the murmur is heard at the same time the pulse is felt, the murmur is systolic.
       - Systolic murmurs may be innocent or significant.
       - Diastolic murmurs are always significant and pathologic.
    2. *Identify where the murmur is heard best on the chest.* Listening points on the chest are named according to the valve heard best at that location:
       - *Aortic:* Second intercostal space at the right sternal border
       - *Mitral:* Heard best in the fifth intercostal space at the midclavicular line
    3. *Identify if the murmur has associated signs or symptoms.* If the murmur is accompanied by concerning symptoms, refer the patient to cardiology.
  - In adults, the aortic and mitral valves cause most significant valve issues. To remember which valve disorders are systolic and diastolic, we use a mnemonic about an American football quarterback who was voted Superbowl most valuable player (MVP) several times using his "ARMS." (Peyton Manning is a National Football League [NFL] quarterback who won MVP in the Superbowl five times. If you prefer, you can change the quarterback in the mnemonic to Patrick Mahomes, who was a three-time MVP as of 2024.)
    - Systolic murmurs: "Mr. Peyton Manning as MVP"
      - Mr.: Mitral regurgitation
      - Peyton Manning: Physiologic murmur
      - As: Aortic stenosis
      - MVP: Mitral valve prolapse
    - Diastolic murmurs: "ARMS"
      - AR: Aortic regurgitation
      - MS: Mitral stenosis
- Review common cardiac rhythms and their appearance on an electrocardiogram (ECG) rhythm strip. Familiarize yourself with the following rhythms: normal sinus rhythm, sinus bradycardia, sinus tachycardia, supraventricular tachycardia, atrial flutter, and atrial fibrillation.

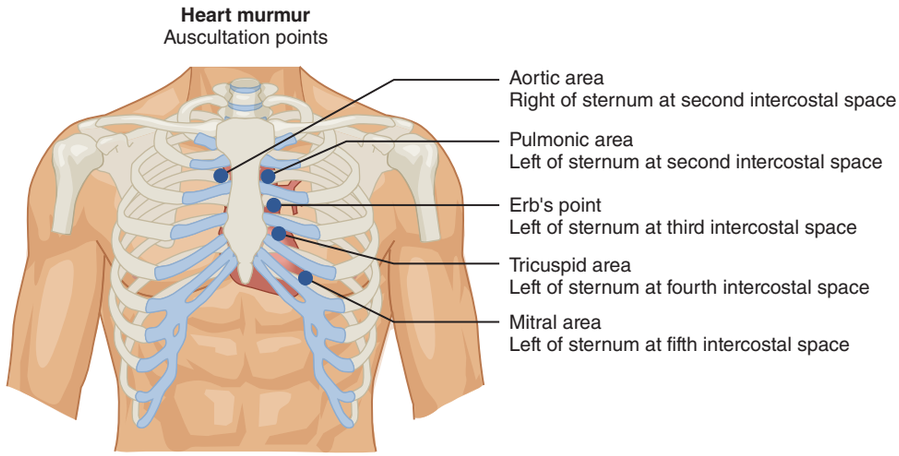

Figure 3–1 Auscultation points for heart murmurs. This diagram illustrates the key locations for listening to heart murmurs. The aortic valve is best heard at the right second intercostal space, the pulmonic valve at the left second intercostal space, the tricuspid valve along the lower-left sternal border, and the mitral valve at the fifth intercostal space along the midclavicular line. Proper identification of heart sounds at these points helps in diagnosing specific cardiac conditions.

Exam Questions and Rationales

1. An adult patient reports that their parent was recently diagnosed with an abdominal aortic aneurysm (AAA). The nurse practitioner educates the patient about risk factors for the condition. Which of the following places the patient at the highest risk for the development of an abdominal aortic aneurysm?
   a. Alcohol consumption
   b. Cigarette smoking
   c. Female sex
   d. Diabetes mellitus

2. An angiotensin-converting enzyme (ACE) inhibitor should not be used in patients who have:
   a. diabetes with proteinuria.
   b. hypertension.
   c. hyperkalemia.
   d. congestive heart failure.

3. The nurse practitioner (NP) assesses a patient and auscultates a carotid bruit. How does the NP interpret this finding?
   a. A carotid bruit is indicative of an impending stroke.
   b. A patient with a carotid bruit requires anticoagulation.
   c. The patient likely has generalized atherosclerosis.
   d. The presence of a carotid bruit is a meaningless finding.

4. An asymptomatic adult patient with atrial fibrillation uses warfarin for anticoagulation. Today, the patient's international normalized ratio (INR) is 4.0. What is the most appropriate action by the nurse practitioner?
   a. Hold warfarin until INR returns to the therapeutic range.
   b. Immediately refer patient to the emergency department.
   c. Administer vitamin K in the clinic and repeat labs in 2 hours.
   d. Continue the patient's current regimen without changes.

5. An adult patient was diagnosed with atrial fibrillation in the emergency department over the weekend. The patient was instructed to follow up with their primary care provider to discuss anticoagulation. The nurse practitioner (NP) is teaching the patient about direct oral anticoagulants (DOACs). What does the NP tell the patient about this class of medications?
   a. DOAC therapy is only recommended for patients who cannot take warfarin.
   b. Warfarin is more expensive than DOACs.
   c. Effective anticoagulation occurs within a few hours of beginning treatment with a DOAC.
   d. Patients who take DOACs require frequent laboratory monitoring.

6. When calculating the CHA_2DS_2-VASc score, the nurse practitioner understands that the score is used to:
   a. predict the risk of stroke in patients with atrial fibrillation.
   b. identify patients requiring inpatient treatment of community-acquired pneumonia.
   c. decide whether a rapid antigen detection test (RADT) should be ordered.
   d. confirm that vascular studies are indicated to rule out deep vein thrombosis (DVT).

1. Correct Answer: B

   Rationale: To answer this question, look for the risk factor that is most closely associated with the development of AAA. Smoking greatly increases the risk of developing an AAA. Other risk factors for AAA include family history, hypertension, coronary artery disease, PAD, and age greater than 50. Alcohol consumption is not directly associated with increased risk. Males are at higher risk than females for developing AAA. Diabetes mellitus is negatively associated with the development of AAA, but it is not the greatest risk factor listed.

2. Correct Answer: C

   Rationale: To answer this question correctly, identify which answer choice is a contraindication to the use of ACE inhibitors. ACE inhibitors block aldosterone production, which interferes with the normal excretion of potassium into the urine. The resorption of potassium can lead to hyperkalemia, so patients with hyperkalemia at baseline should avoid ACE inhibitors. ACE inhibitors are otherwise a safe and effective choice, recommended for first-line treatment of primary hypertension. In patients who have diabetes with proteinuria and comorbid hypertension, ACE inhibitors can decrease proteinuria, preserving renal function. ACE inhibitors are safe and effective for use in congestive heart failure because they cause vasodilation, decreasing arteriolar and venous resistance.

3. Correct Answer: C

   Rationale: A carotid bruit is an audible vascular sound caused by turbulent blood in the carotid artery. Carotid bruits indicate the presence of generalized atherosclerosis. In asymptomatic individuals, a carotid bruit is a poor predictor of impending stroke or stroke risk. For this reason, the U.S. Preventive Services Task Force (USPSTF) does not recommend screening asymptomatic patients for carotid artery stenosis. Carotid bruits do not determine if a patient requires anticoagulation. Although carotid bruit is a nonspecific finding, the finding is not meaningless. The patient should be assessed for atherosclerotic risk factors that may be modified to reduce the risk of cardiovascular disease.

4. Correct Answer: A

   Rationale: In patients who use warfarin as anticoagulation for atrial fibrillation, the INR goal for most patients is 2.0 to 3.0. The patient's current INR of 4.0 is above the normal therapeutic range; however, significant bleeding is not likely until the INR exceeds 5.0. The NP would recommend holding warfarin until the INR returns to the therapeutic range. Warfarin can then be resumed at a reduced dose. The patient is hemodynamically stable without signs of bleeding, so immediate emergency room evaluation is unnecessary. Vitamin K administration requires close monitoring and is not given in the primary care setting. It would be inappropriate to continue the current regimen because the patient is above the therapeutic threshold. A dose reduction is necessary.

5. Correct Answer: C

   Rationale: DOACs provide effective anticoagulation within a few hours of administration, making this the best answer choice. Both DOACs and warfarin are effective anticoagulants used in atrial fibrillation. DOAC therapy is preferable in most patients because of its safety profile and ease of administration compared with warfarin. DOAC medications can be expensive, preventing their use in some patients. Warfarin is a cost-effective alternative. Warfarin treatment requires frequent INR monitoring to ensure that drug levels remain therapeutic.

6. Correct Answer: A

   Rationale: The CHA_2DS_2-VASc score is an assessment tool that predicts the 1-year risk of stroke in patients with atrial fibrillation. The higher the CHA_2DS_2-VASc score, the greater the patient's risk of stroke. Patients with high CHA_2DS_2-VASc scores may be prescribed anticoagulation to prevent strokes. The CURB-65 is an assessment tool that classifies pneumonia severity and differentiates patients who can be safely treated as outpatients versus those who would benefit from inpatient treatment. The Centor criteria are a scoring system that considers risk factors for *Streptococcus* pharyngitis. Patients with a Centor criteria score of 3 or more are recommended to have an RADT to identify "strep throat." The Wells criteria are used to quantify the risk of DVT based on patient characteristics to determine whether imaging studies are indicated.

17. An adult patient presents with the following lipid panel results.

Total cholesterol:	210 mg/dL
Low-density lipoprotein:	130 mg/dL
High-density lipoprotein:	42 mg/dL
Triglycerides:	190 mg/dL

The nurse practitioner diagnoses the patient with:
   a. hypobetalipoproteinemia.
   b. hyperlipidemia.
   c. hyperglyceridemia.
   d. hypolipidemia.

18. An adult patient presents to the clinic for follow-up of dyslipidemia management. The patient has been taking a high-intensity statin for the past 6 months. The nurse practitioner knows that the target of high-intensity statin therapy has been met when the:
   a. low-density lipoprotein (LDL) level has decreased by 30–49%.
   b. LDL level has decreased by more than 50%.
   c. 10-year atherosclerotic cardiovascular disease (ASCVD) risk has decreased by 30–49%.
   d. 10-year ASCVD risk has decreased by 50%.

19. A 55-year-old male with hypertension (HTN) presents to the clinic with concerns about increasing blood pressure. The patient's blood pressure has been well controlled with two antihypertensive medications for the past 5 years. Today, the patient's blood pressure is 155/94. What is the appropriate first step for the nurse practitioner to address the patient's blood pressure elevation?
   a. Order renal ultrasound to assess for renal artery stenosis.
   b. Refer the patient to cardiology for management of resistant hypertension.
   c. Add a third antihypertensive agent to reduce the blood pressure to less than 130/80.
   d. Ask the patient about his use of prescribed and over-the-counter medications.

20. The nurse practitioner (NP) is caring for a patient who has consistently elevated blood pressure. To make a diagnosis of essential hypertension, the NP understands that the patient must have:
   a. an underlying disease contributing to elevated blood pressure (BP).
   b. two or more readings above the patient's blood pressure goal.
   c. a history of either diabetes or chronic kidney disease.
   d. protein found in the urine on an in-office urine dipstick analysis.

21. A young adult patient visits the primary care clinic to discuss an elevated blood pressure (BP) reading of 142/88 mmHg at a health fair last week. The nurse practitioner (NP) confirms that the patient's BP is elevated at 146/84. The NP recommends lifestyle modifications to improve the patient's BP. Which of the following lifestyle modifications is expected to produce the largest decrease in systolic BP?
   a. Losing 10 pounds of excess body weight
   b. Exercising for 150 minutes each week
   c. A low-sodium, low-fat diet with fruit and vegetables
   d. Sleeping for 7–9 hours every night

17. Correct Answer: B

Rationale: This patient has elevations in total cholesterol (TC), LDL, and triglyceride (TG) levels, which is termed *hyperlipidemia*. Hyperlipidemia can be defined as elevations in any of these levels, although LDL and triglyceride levels are typically of greatest importance in practice. The decision to treat hyperlipidemia with statin therapy is based on the patient's overall risk of atherosclerotic events, not lipid levels alone. Hypobetalipoproteinemia is a disorder of chronically low apolipoprotein B and LDL levels, suspected when LDL levels are less than 80 mg/dL. *Hyperglyceridemia* is not an accepted term; however, *hypertriglyceridemia* is, and it is defined as triglyceride levels above 150 mg/dL. *Hypolipidemia* is defined as abnormally low levels of TC below 120 mg/dL or LDL below 50 mg/dL.

18. Correct Answer: B

Rationale: The target of high-intensity statin therapy is a reduction in the LDL level of at least 50%. Patients are stratified to receive high- or medium-intensity statin therapy based on their calculated 10-year ASCVD risk, with a target of achieving significant LDL reductions. Although the ultimate purpose of dyslipidemia treatment is to reduce a patient's risk of major atherosclerotic disease, the LDL level is a valuable proxy for measuring the impact of statin therapy. LDL is a highly atherogenic lipid and has the greatest influence on the development of cardiovascular disease. Reducing LDL levels significantly reduces the risk of major atherosclerotic events. Moderate-intensity statins reduce the LDL level by 30–49%. The amount of reduction that statins produce in the 10-year ASCVD risk estimation depends on multiple factors and may vary from person to person.

19. Correct Answer: D

Rationale: The NP should begin with a thorough assessment, looking for common causes of acute blood pressure (BP) elevations. The patient's BP elevation is unexpected, given his history of good control for the past several years. A common reason for an acute change in BP is a change in medication. BP can increase if a patient is nonadherent to prescribed antihypertensives or if new medications are added to the patient's regimen. Common over-the-counter (OTC) medications that increase BP include nonsteroidal anti-inflammatory drugs (NSAIDs), decongestants, herbal supplements, and caffeine. After ruling out common causes of BP elevations, the NP should consider the possibility of secondary hypertension, suspected when patients have an acute increase in previously well-controlled hypertension. Secondary hypertension is also suspected when BP is not well controlled with three or more medications, develops before age 30 in non-Black patients without risk factors, is severe and accompanied by end-organ damage, develops before puberty, or causes electrolyte disorders. Following the nursing process, assessment takes priority over imaging, referral, and the addition of new medications.

20. Correct Answer: B

Rationale: To diagnose essential hypertension (also known as *primary hypertension*), the NP must verify that the patient's BP is elevated on more than one occasion, with at least one elevated reading performed outside the clinical setting, if possible. Secondary hypertension is diagnosed when the BP is elevated as a result of an underlying disorder. A patient is not required to have a history of diabetes or chronic kidney disease to be diagnosed with essential hypertension. However, diabetes and renal impairment are common comorbidities that may affect the pharmacologic management of hypertension. Proteinuria, or protein in the urine, is not required to make a diagnosis of essential hypertension. Proteinuria is a complication that can occur when hypertension injures the kidneys.

21. Correct Answer: C

Rationale: A healthy, low-fat diet of unprocessed foods can improve systolic BP by up to 11 mmHg. Additionally, reducing sodium intake can decrease BP by 5–6 mmHg. An ideal diet contains fresh fruits, vegetables, lean meats, and dietary fiber from whole grains, with limited alcohol and refined sugar consumption. Weight loss reduces the systolic BP by approximately 1 mmHg per kilogram of weight lost. A patient who loses 10 pounds of excess body weight can be expected to lower the systolic BP by 4–5 mmHg. Regular physical activity, defined as 30 minutes of moderate-intensity activity five times per week, can decrease BP by 5–8 mmHg. Inadequate sleep is a known contributor to the development of hypertension. Sleeping 7–9 hours each night is a healthy lifestyle habit that supports healthy BP, although the degree to which it affects systolic BP reduction is undetermined.