Cardiovascular System

United States Medical Licensing Examination (USMLE) Step 1

7 to 11% of Step 1 · 8 sections · content outline and specifications

The cardiovascular system is about 7 to 11% of Step 1. Questions test how the heart and vessels work and what goes wrong. You must read pressures, volumes, murmurs, and ECG findings and link them to a mechanism. Many items take two steps: first find the disease, then answer about its cause, finding, drug, or complication. Pharmacology questions ask how a drug works or why it causes an adverse effect, not detailed treatment plans. Embryology and coronary anatomy also appear often.

You should be able to: After this guide, you should be able to read a cardiovascular vignette, name the disease, and explain its mechanism, its key finding, and how its main drugs work.

Every section: the key point and the trap

1 Hemodynamics and pressure-volume reasoning

Cardiac output equals stroke volume times heart rate. Mean arterial pressure equals cardiac output times systemic vascular resistance.

Trap: Do not change two things at once. Ask which one variable the scenario changes (preload, afterload, or contractility) and hold the others fixed.

2 Dysrhythmias and antiarrhythmic drugs

Read the ECG in order: rate, rhythm, P waves, PR interval, QRS width, QT interval.

Trap: Mobitz I and Mobitz II both drop beats. Look at the PR interval before the dropped beat: it grows in Mobitz I and stays the same in Mobitz II.

3 Heart failure and its drugs

Systolic failure is a weak ventricle with a low ejection fraction. Diastolic failure is a stiff ventricle with a preserved ejection fraction.

Trap: Do not mix up the cause of edema. Heart failure raises hydrostatic pressure. Liver and kidney disease lower oncotic pressure. Lung injury raises permeability.

4 Ischemic heart disease and complications of infarction

Stable angina is fixed narrowing; unstable angina and infarction come from a plaque rupture with a clot. Vasospasm causes brief ST elevation with normal arteries.

Trap: Match the complication to the day. A new apical murmur on day 4 is papillary muscle rupture, not a new infarct. Pericarditis in the first days is different from Dressler syndrome weeks later.

5 Diseases of the myocardium and pericardium

Dilated cardiomyopathy: alcohol, viral myocarditis, doxorubicin, genetic causes, and late-stage disease. The ventricle is large and weak.

Trap: Thick walls with high voltage suggest hypertrophy. Thick walls with low voltage suggest an infiltrative disease such as amyloid.

6 Valvular heart disease and endocarditis

Aortic stenosis: crescendo-decrescendo systolic murmur at the right upper sternal border; older adults or a bicuspid valve.

Trap: A click means prolapse; a snap means stenosis. Murmurs from the right heart get louder with inspiration; most left heart murmurs do not.

7 Blood pressure, lipids, and vascular disorders

Secondary hypertension clues: low potassium with low renin (primary aldosteronism), episodes of sweating and palpitations (pheochromocytoma), an abdominal bruit (renal artery stenosis).

Trap: High aldosterone with high renin points to a kidney cause such as renal artery stenosis. High aldosterone with low renin points to the adrenal gland.

8 Congenital heart disease and embryology

Left-to-right shunts (ventricular septal defect, atrial septal defect, patent ductus arteriosus) do not cause early cyanosis.

Trap: Do not confuse the septum defects. Infundibular shift is tetralogy, failed spiraling is transposition, and failed truncal fusion is truncus arteriosus.

Key terms

Preload: The filling of the ventricle at the end of diastole.

Afterload: The pressure the ventricle must work against to eject blood.

Contractility: The strength of contraction at a given preload and afterload.

Pulsus paradoxus: A fall of more than 10 mm Hg in systolic pressure during inspiration.

Shunt: Blood flow that passes from one circulation to the other through an abnormal opening.

Vegetation: A mass of fibrin, platelets, and microbes on a heart valve.

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