

LMC MEDICAL SOLUTION



USMLE Step 1

Cardiology · Heart murmurs & valvular disease

AMOSTRA GRÁTIS · FREE SAMPLE

Inside

High-yield notes · Maneuvers · Exam traps

Test yourself

5 Step 1-style questions with explanations

Um gostinho do material completo

Este é um trecho dos resumos de USMLE Step 1 da LMC: um tema de Cardiologia, do jeito que ele aparece no material completo. O conteúdo está em inglês, a língua da prova, para você já se acostumar com os termos que vai ver no dia.

1

Leia o resumo

Os sopros mais cobrados, organizados em cartões rápidos.

2

Domine as manobras

A tabela que resolve metade das questões de ausculta.

3

Teste-se

5 questões no estilo da prova, com gabarito comentado.

The big picture: timing tells you the valve

Timing	Think of	Classic location
Systolic (between S1 and S2)	Aortic stenosis, mitral regurgitation, mitral valve prolapse, tricuspid regurgitation, HOCM, VSD	Aortic area (RUSB) for AS; apex for mitral; LLSB for HOCM, VSD, TR
Diastolic (after S2)	Aortic regurgitation, mitral stenosis	Left sternal border for AR; apex for MS
Continuous	Patent ductus arteriosus	Left infraclavicular area

Exam trap: diastolic murmurs are always pathologic. A soft systolic murmur in a healthy child or pregnant woman may be physiologic (flow murmur), but a diastolic one always needs investigation.

Systolic murmurs

● Systolic ● Diastolic ● Continuous

● Aortic stenosis

CRESCENDO-DECRESCENDO · RUSB → CAROTIDS

- Systolic ejection murmur; may start with an **ejection click** (bicuspid valve)
- Severe: soft or single S2, **pulsus parvus et tardus** (weak, delayed carotid pulse)
- Causes: age-related calcification (older adults), **bicuspid valve** (presents earlier)

Buzzword: SAD = Syncope, Angina, Dyspnea on exertion. Once symptomatic, survival drops sharply without valve replacement.

● Mitral regurgitation

HOLOSYSTOLIC · APEX → AXILLA

- High-pitched, "blowing" murmur
- Causes: mitral valve prolapse, ischemic heart disease, **papillary muscle rupture** after MI, LV dilation, rheumatic fever, endocarditis
- Louder with handgrip and squatting

Buzzword: new holosystolic apical murmur + acute pulmonary edema days after an MI = papillary muscle rupture.

● Mitral valve prolapse

MIDSYSTOLIC CLICK + LATE SYSTOLIC MURMUR · APEX

- Most common valvular lesion; myxomatous degeneration
- Associated with Marfan syndrome, Ehlers-Danlos, ADPKD
- Anything that **lowers preload** (Valsalva, standing) brings the click **earlier**

● Hypertrophic cardiomyopathy

HARSH SYSTOLIC · LLSB · NO CAROTID RADIATION

- Autosomal dominant sarcomere mutations (β -myosin heavy chain, myosin-binding protein C)
- Classic cause of **sudden cardiac death in young athletes**; S4 common
- Louder with Valsalva and standing; softer with squatting and handgrip

Buzzword: the murmur that behaves the opposite of the others.

● Ventricular septal defect

HOLOSYSTOLIC · HARSH · LLSB

- Most common congenital heart defect
- The **smaller** the defect, the **louder** the murmur
- Large untreated defect → Eisenmenger syndrome (reversal to right-to-left shunt, cyanosis)

● Tricuspid regurgitation

HOLOSYSTOLIC · LLSB

- Louder with **inspiration** (right-sided murmur)
- Classic association: **endocarditis in IV drug users**
- Pulsatile liver and prominent jugular v waves

Bedside maneuvers: the table that solves the question

Maneuver	What changes	Effect on murmurs
Inspiration	↑ venous return to the right heart	Right-sided murmurs louder (tricuspid, pulmonary)
Squatting / passive leg raise	↑ preload (squatting also ↑ afterload)	Most murmurs louder · HOCM softer · MVP click later
Handgrip	↑ afterload	MR, AR and VSD louder · AS and HOCM softer
Valsalva (strain) / standing	↓ preload	Most murmurs softer · HOCM louder · MVP click earlier, murmur longer

Diastolic and continuous murmurs

● Aortic regurgitation

EARLY DIASTOLIC DECRESCENDO · LEFT STERNAL BORDER

- **Wide pulse pressure:** bounding "water-hammer" pulses, head bobbing
- Causes: aortic root dilation (Marfan syndrome, tertiary syphilis), bicuspid valve, endocarditis, rheumatic fever
- Louder with handgrip; best heard leaning forward, end-expiration

● Mitral stenosis

OPENING SNAP + DIASTOLIC RUMBLE · APEX

- Almost always a late consequence of **rheumatic fever**
- Shorter S2–opening snap interval = more severe stenosis
- Enlarged left atrium → atrial fibrillation, thrombi, dysphagia, **hoarseness**

Buzzword: young woman with childhood sore throats, AF and an opening snap.

● Patent ductus arteriosus

CONTINUOUS "MACHINE-LIKE" · LEFT INFRACLAVICULAR

- Associated with prematurity and congenital rubella
- Close it: NSAIDs (indomethacin, ibuprofen) or acetaminophen
- Keep it open (ductal-dependent lesions): prostaglandin E1

Memory hook

ORDER OF THE VALVES

Systolic: **Aortic stenosis** and **Mitral regurgitation** are the two most tested. Diastolic: their "opposites", **Aortic regurgitation** and **Mitral stenosis**. Learn one pair, and the other follows.

5 pearls to take into the exam

1. **HOCM and MVP** get louder or longer with less preload; almost everything else gets softer.
2. **Holosystolic** = MR, TR, VSD. **Ejection (crescendo-decrescendo)** = AS, HOCM.
3. **Rheumatic fever** hits the mitral valve first; mitral stenosis is almost always rheumatic.
4. **Papillary muscle rupture** usually happens 2–7 days after MI; the posteromedial muscle is most vulnerable (single blood supply from the posterior descending artery).
5. **Lens dislocation:** upward in Marfan syndrome, downward in homocystinuria.

5 Step 1–style questions

Responda antes de virar a página. Marque sua resposta e confira o gabarito comentado em seguida.

QUESTION 1

A 74-year-old man comes to the physician after fainting while climbing stairs. He also reports chest tightness on exertion over the past few months. Examination shows a harsh crescendo-decrescendo systolic murmur heard best at the right upper sternal border, radiating to both carotid arteries, with a soft S2 and a weak, delayed carotid upstroke. Which of the following is the most likely underlying cause of his condition?

- ☐ (A) Rheumatic heart disease
- ☐ (B) Bicuspid aortic valve
- ☐ (C) Age-related calcific degeneration of the valve
- ☐ (D) Infective endocarditis
- ☐ (E) Aortic root dilation

QUESTION 2

A 16-year-old basketball player is evaluated for chest discomfort during practice. His father died suddenly at age 35. Auscultation reveals a harsh systolic murmur at the left lower sternal border that becomes louder when he stands up from a squatting position and during the Valsalva maneuver. Which of the following would most likely decrease the intensity of this murmur?

- ☐ (A) Valsalva maneuver
- ☐ (B) Abrupt standing
- ☐ (C) Squatting
- ☐ (D) Amyl nitrite inhalation
- ☐ (E) Sublingual nitroglycerin

QUESTION 3

A 32-year-old woman has progressive shortness of breath, palpitations and, more recently, hoarseness. She recalls frequent sore throats in childhood that were never treated. Her pulse is irregularly irregular. Auscultation at the apex reveals an opening snap followed by a low-pitched diastolic rumble. Which of the following best explains her hoarseness?

- (A) Direct laryngeal involvement by rheumatic fever
- (B) Compression of the left recurrent laryngeal nerve by an enlarged left atrium
- (C) Vocal cord paralysis from an embolic stroke
- (D) Laryngeal edema from right heart failure
- (E) Adverse effect of digoxin

QUESTION 4

A 61-year-old man develops sudden severe dyspnea and hypotension 4 days after an inferior wall myocardial infarction. Examination shows a new holosystolic murmur at the apex radiating to the axilla, and crackles over both lung fields. Which of the following is the most likely cause?

- (A) Rupture of the left ventricular free wall
- (B) Rupture of the posteromedial papillary muscle
- (C) Rupture of the interventricular septum
- (D) Postinfarction (Dressler) pericarditis
- (E) Left ventricular aneurysm

QUESTION 5

A 25-year-old man who is unusually tall, with long arms and fingers, is referred for an eye exam that shows upward dislocation of both lenses. His blood pressure is 150/50 mm Hg, and an early diastolic decrescendo murmur is heard along the left sternal border. A mutation in the gene encoding which of the following proteins is most likely responsible?

- (A) Type III collagen
- (B) Fibrillin-1
- (C) Elastin
- (D) Type I collagen
- (E) Cystathionine β -synthase

How did you do?

Leia a explicação de todas as questões, inclusive das que acertou: é ali que estão as pegadinhas.

1. C Aortic stenosis · calcific

Syncope and angina on exertion with a crescendo-decrescendo murmur radiating to the carotids, a soft S2 and pulsus parvus et tardus point to severe aortic stenosis. In an older adult, the most common cause is age-related calcification. A bicuspid valve (B) causes stenosis earlier in life; rheumatic disease (A) usually affects the mitral valve too; aortic root dilation (E) causes regurgitation, not stenosis.

2. C HOCM · maneuvers

A young athlete with exertional symptoms, family history of sudden death and a murmur that increases with less preload has hypertrophic cardiomyopathy. Squatting increases preload and afterload, enlarging the ventricle and reducing the outflow obstruction, so the murmur gets softer. Valsalva, standing, amyl nitrite and nitroglycerin all reduce preload or afterload and make it louder.

3. B Mitral stenosis · Ortner syndrome

An opening snap with a diastolic rumble at the apex, atrial fibrillation and a history of untreated streptococcal pharyngitis indicate rheumatic mitral stenosis. The enlarged left atrium can compress the left recurrent laryngeal nerve, causing hoarseness (Ortner syndrome); it can also compress the esophagus, causing dysphagia.

4. B Post-MI complication

A new holosystolic apical murmur radiating to the axilla with acute pulmonary edema a few days after an MI is acute mitral regurgitation from papillary muscle rupture. The posteromedial muscle is usually supplied only by the posterior descending artery, often from the right coronary artery, so it is most vulnerable in inferior infarcts. Septal rupture (C) causes a holosystolic murmur at the left sternal border; free wall rupture (A) causes tamponade.

5. B Marfan syndrome

Tall stature, long limbs and fingers, upward lens dislocation and aortic regurgitation from aortic root dilation (wide pulse pressure, early diastolic murmur) are classic for Marfan syndrome, caused by mutations in FBN1, the gene for fibrillin-1. Cystathionine β -synthase deficiency (E) causes homocystinuria, with downward lens dislocation; type III collagen defects (A) cause vascular Ehlers-Danlos syndrome.

5 de 5

Excelente: você domina o tema. O material completo ajuda a manter esse nível em todos os sistemas.

3 ou 4

Boa base, mas as pegadinhas de manobras e complicações ainda pegam. É exatamente o que os resumos organizam.

0 a 2

Ótimo momento para começar com um material focado no que mais cai.

Gostou da amostra?

O material completo segue este mesmo formato em todos os sistemas cobrados no Step 1: o essencial organizado, as pegadinhas destacadas e revisão rápida para os dias antes da prova.

Cardiology

Pulmonology

Renal

Gastroenterology

Endocrinology

Reproductive

Neurology

Psychiatry

Musculoskeletal

Hematology & Oncology

Immunology

Microbiology

Pharmacology

Biochemistry & Genetics

Biostatistics & Ethics

Organizado por sistema

Estude na mesma ordem do seu banco de questões e revise qualquer tema em minutos.

Feito para aprovado/reprovado

Foco no conteúdo essencial, sem se perder em detalhes raros.

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