Probe to Pass: High Yield US for the Fellowship Exam

Peninsula University Hospital

MCQ EXAMINATION — 20 QUESTIONS

Topic areas: Lung Ultrasound · RUSH Protocol · Cardiac Tamponade · Massive PE · Acute Cholecystitis · Acute Appendicitis

INSTRUCTIONS

- 20 questions — one best answer for each
- Select ONE answer only (A, B, C, or D)
- Record answers on the answer sheet provided
- Allowed time: 30 minutes
- No negative marking

SECTION 1 — Lung Ultrasound

1. Which of the following is a recognised feature of B-lines on lung ultrasound?

A) Comet tail appearance arising from the pleural line
B) Hypoechoic and ill-defined
C) Extending more than 7.5 cm into the lung field
D) Not Moving in concert with lung sliding when sliding is present

2. A patient with B-lines on lung ultrasound does NOT have cardiogenic pulmonary oedema. Which of the following is the LEAST likely alternative cause?

A) ARDS
B) Pneumothorax
C) Pulmonary fibrosis
D) Viral pneumonitis

3. Which of the following ultrasound findings is MOST specific for pneumonia rather than cardiogenic pulmonary oedema?

A) Bilateral B-lines
B) Spine sign with hepatisation of lung tissue
C) Pleural effusion
D) Absent A-lines

4. Which colour Doppler finding on lung ultrasound supports a diagnosis of pneumonia?

A) Absence of pulmonary arterial flow
B) Pulmonary arterial and venous flow within consolidated lung
C) Hyperaemia of the parietal pleura
D) Absence of colour flow in a subpleural consolidation confirms necrosis

5. The 'shred sign' on lung ultrasound is characterised by:

A) A well-defined echogenic interface at the pleural line
B) An irregular, shredded border between aerated and consolidated lung
C) Hyperechoic vertical artefact lines extending to the screen edge
D) Complete absence of lung sliding

SECTION 2 — RUSH Protocol

6. A 70-year-old male presents with syncope and hypotension. You perform a RUSH protocol. Which of the following correctly completes the mnemonic HIMAP?

A) Heart, IVC, Morrison's Pouch, Aorta, Pericardium
B) Heart, IVC, Morrison's Pouch (and LUQ), Aorta, Pulmonary
C) Heart, IVC, Morrison's Pouch, Appendix, Pulmonary
D) Heart, Inferior mesenteric artery, Morrison's Pouch, Aorta, Pelvis

7. On RUSH protocol assessment of the IVC in a spontaneously breathing patient, which finding is most consistent with a volume-responsive state?

A) IVC > 2.5 cm with < 50% respiratory variation
B) IVC < 1.5 cm with marked respiratory collapse
C) IVC 2.0 cm with no respiratory variation
D) IVC > 2.5 cm with > 50% respiratory variation

8. On RUSH protocol, which cardiac finding would be MOST consistent with massive pulmonary embolism as the cause of haemodynamic compromise?

A) Severely impaired LV systolic function with dilated LV
B) Large pericardial effusion with diastolic RV collapse
C) Severely dilated RV with McConnell's sign and D-shaped LV in PSAX
D) Hyperdynamic LV with small cavity size

SECTION 3 — Cardiac Tamponade

9. Right atrial systolic collapse on echocardiography has which of the following sensitivity and specificity for cardiac tamponade?

A) 60% sensitivity, 95% specificity
B) 94% sensitivity, 100% specificity
C) 77% sensitivity, 94% specificity
D) 100% sensitivity, 60% specificity

10. For right atrial collapse to be considered a reliable sign of tamponade physiology, it should persist for what duration of the cardiac cycle?

A) More than one-quarter of the cardiac cycle
B) More than one-third of the cardiac cycle
C) More than one-half of the cardiac cycle
D) Any visible collapse is sufficient

11. Which Doppler finding is most consistent with tamponade physiology at the mitral valve?

A) Transmitral E wave variation > 10% with respiration

B) Transmitral E wave variation > 25% with respiration
C) Transtricuspid variation > 25% with respiration
D) Transmitral E wave variation > 40% with respiration

12. Which of the following statements about IVC assessment in cardiac tamponade is CORRECT?

A) A collapsing IVC strongly suggests tamponade
B) A distended, non-collapsing IVC is highly specific for tamponade
C) A distended, non-collapsing IVC is non-specific but its absence argues strongly against tamponade
D) IVC assessment has no role in the diagnosis of tamponade

SECTION 4 — Massive Pulmonary Embolism

13. McConnell's sign in massive pulmonary embolism is defined as:

A) Akinesia of the entire right ventricle with preserved LV function
B) Akinesia of the RV apex with preserved motion of the mid-free wall
C) Akinesia of the RV mid-free wall with preserved motion at the apex
D) Diastolic collapse of the RV free wall

14. The '60-60 sign' on echocardiography for massive PE refers to:

A) Heart rate > 60 bpm and systolic BP < 60 mmHg
B) RVOT acceleration time < 60 ms and PASP < 60 mmHg
C) RV/LV ratio > 60% and IVC diameter > 60 mm
D) SpO2 < 60% with ETCO2 < 60 mmHg

15. In massive PE, a D-shaped LV in the parasternal short axis view results from:

A) LV volume overload
B) Flattening of the interventricular septum due to RV pressure overload
C) Pericardial effusion compressing the LV
D) Paradoxical septal motion from LBBB

SECTION 5 — Acute Cholecystitis

16. Which ultrasound finding is MOST specific for acute cholecystitis?

A) Gallbladder wall thickening > 4 mm
B) Pericholecystic fluid
C) Positive sonographic Murphy's sign
D) Impacted stone in the gallbladder neck with sonographic Murphy's sign

17. The tensile fundus sign in acute cholecystitis has which approximate diagnostic accuracy?

A) Sensitivity 96%, specificity 74%
B) Sensitivity 74%, specificity 96%
C) Sensitivity 33%, specificity 90%
D) Sensitivity 74%, specificity 74%

18. Which ultrasound finding of the gallbladder suggests perforation has occurred?

A) Wall thickness > 6 mm
B) Pericholecystic fluid in the bare area of the gallbladder
C) Positive sonographic Murphy's sign
D) Gallbladder length > 10 cm

SECTION 6 — Acute Appendicitis

19. Which of the following ultrasound appearances is diagnostic of acute appendicitis?

A) A compressible, fluid-filled tubular structure of 5 mm outer diameter in the RLQ
B) An aperistaltic, non-compressible, blind-ending tube with outer diameter > 6 mm
C) A non-compressible RLQ mass of any size
D) Hyperechoic periappendiceal fat with a normal appendix diameter

20. Loss of wall stratification on ultrasound in the context of appendicitis implies:

A) Catarrhal (early) appendicitis
B) Normal appendix
C) Necrosis
D) Perforation

ANSWER SHEET

Name: _____ Date: _____ Score: _____ / 20

Q	A	B	C	D
1	○	○	○	○
2	○	○	○	○
3	○	○	○	○
4	○	○	○	○
5	○	○	○	○
6	○	○	○	○
7	○	○	○	○
8	○	○	○	○
9	○	○	○	○
10	○	○	○	○
11	○	○	○	○
12	○	○	○	○
13	○	○	○	○
14	○	○	○	○
15	○	○	○	○
16	○	○	○	○
17	○	○	○	○
18	○	○	○	○
19	○	○	○	○
20	○	○	○	○

ANSWER KEY & EXPLANATIONS

For facilitator / self-directed learning use.

Q1 Correct answer: **A**

All others incorrect

Q2 Correct answer: **B**

Pneumothorax causes absent pleural sliding and A-line pattern, not B-lines. ARDS, pulmonary fibrosis, contusion, and pneumonitis are all recognised causes of B-lines.

Q3 Correct answer: **B**

The spine sign (extension of the spine shadow above the diaphragm due to consolidated lung acting as acoustic window) and hepatisation are specific features of consolidation / pneumonia. Bilateral B-lines and effusions can occur in both conditions.

Q4 Correct answer: **B**

Colour Doppler demonstrating pulmonary arterial and venous flow within consolidated lung confirms pulmonary origin of the consolidation, supporting pneumonia. Its presence differentiates infectious consolidation from infarction.

Q5 Correct answer: **B**

The shred sign represents the irregular, fractal-like border between aerated and consolidated/atelectatic lung — it is one of the five key sonographic features of pneumonia.

Q6 Correct answer: **B**

The RUSH protocol components are: H = Heart, I = IVC, M = Morrison's Pouch (RUQ/LUQ), A = Aorta, P = Pulmonary. All five together constitute the HIMAP/RUSH assessment.

Q7 Correct answer: **B**

An IVC < 1.5 cm that collapses significantly with inspiration suggests low right atrial pressure and likely volume responsiveness in spontaneously breathing patients. A dilated, non-collapsing IVC suggests elevated right atrial pressure.

Q8 Correct answer: **C**

Massive PE causes acute RV pressure overload — dilated RV, McConnell's sign (akinesis of mid-free wall with preserved apex), flattening of the IV septum producing a D-shaped LV in PSAX, and dilated IVC.

Q9 Correct answer: **B**

Right atrial systolic collapse has 94% sensitivity and 100% specificity for tamponade. Right ventricular diastolic collapse has lower sensitivity (60–90%) but similarly high specificity (95–100%).

Q10 Correct answer: **B**

Right atrial collapse persisting for more than one-third of the cardiac cycle is required to meet the diagnostic threshold. Brief, transient collapse may be a normal variant.

Q11 Correct answer: **B**

Tamponade physiology at the mitral valve is inferred by a transmitral E wave peak velocity variation > 25% with respiration. At the tricuspid valve, the threshold is > 40% — this reflects exaggerated ventricular interdependence.

Q12 Correct answer: **C**

A distended, non-collapsing IVC is non-specific for tamponade (many conditions cause it), but its absence makes tamponade less likely. It is a supportive rather than diagnostic finding.

Q13 Correct answer: **C**

McConnell's sign is akinesia of the RV mid-free wall with paradoxically preserved or hyperdynamic motion at the apex (77% sensitivity, 94% specificity for PE). This pattern is due to relative preserved force at the apex from LV tethering.

Q14 Correct answer: **B**

The 60-60 sign: RVOT acceleration time (AT) < 60 ms AND PA systolic pressure < 60 mmHg. Together these suggest acute PE rather than chronic pulmonary hypertension (where PASP would usually be > 60 mmHg).

Q15 Correct answer: **B**

Acute RV pressure overload in massive PE causes the IV septum to flatten and bow toward the LV (septal shift), producing the characteristic D-shaped LV appearance in PSAX view. This indicates severe RV strain.

Q16 Correct answer: **D**

A combination of impacted stone at the GB neck/cystic duct with a positive sonographic Murphy's sign is highly specific. The tensile fundus sign (74% sensitivity, 96% specificity) is also highly specific. Wall thickening alone and pericholecystic fluid are non-specific.

Q17 Correct answer: **B**

The tensile fundus sign (indentation of the abdominal wall by a tense, over-distended gallbladder) has 74% sensitivity and 96% specificity for acute cholecystitis.

Q18 Correct answer: **B**

Pericholecystic fluid specifically in the bare area (between the liver and GB) suggests GB perforation. Other signs of gangrene/perforation include mucosal discontinuity, loss of mucosal sonoreflectivity, gas in the GB wall, and adjacent complex collections.

Q19 Correct answer: **B**

Appendicitis is diagnosed on US by an aperistaltic, non-compressible, blind-ending tube with outer diameter > 6 mm. Compressibility argues strongly against appendicitis. Note: USS measurements are typically 1–2 mm less than CT.

Q20 Correct answer: **C**

Normal 5-layer wall stratification implies non-necrotic (catarrhal) appendicitis. Loss of wall stratification implies necrosis. Gas locules within the appendiceal wall indicate gangrene, a further advanced stage.