



# American Board of Internal Medicine®

## 2020-2021 Update in Hospital Medicine Self-Assessment Module

*83-W 20-01*

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## Common Abbreviations

The following abbreviations may be used in this examination:

ALT	alanine aminotransferase
AST	aspartate aminotransferase
BMI	body mass index
CSF	cerebrospinal fluid
eGFR	estimated glomerular filtration rate
HDL	high-density lipoprotein
HIV	human immunodeficiency virus
INR	international normalized ratio
LDL	low-density lipoprotein
RBC	red blood cell
WBC	white blood cell

## Introduction

### Copyright

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### **Please read the following information carefully.**

On successful completion of this module, you will receive 10 points of self-evaluation of medical knowledge credit in the Maintenance of Certification Program.

### Instructions

Read each one-best-answer question in the module and indicate your answer by clicking in the appropriate box. You should use educational resources (e.g., online medical references, textbooks, journal articles) to assist in answering the questions. Suggested resources are listed in the Education Resources section of the CME information.

On each question screen, the Help button will provide you with technical information and instructions on how to navigate through the module, including submitting your completed module. For common abbreviations that may appear in this module, click the "Resources" button on the right side of the screen.

CME information for this module, including CME expiration date, may be reviewed by clicking the "CME Credit for the ABIM Maintenance of Certification Program" link in the left-hand column.

### Laboratory Studies and Reference Ranges

Reference ranges for laboratory test reports are included in the text of the ABIM exam questions. **As is true in practice, interpretation of a particular patient's test result in relation to the reference range depends on the clinical context.** For example, reference ranges for tests assessing lipid or glucose metabolism may not be applicable in certain clinical settings; ABIM reference ranges should not be confused with patient-specific targets for such tests.

### Information on specific studies

The National Cancer Institute advises that there is no specific normal or abnormal level of prostate-specific antigen (PSA) in the blood. Therefore, ABIM is reporting "no specific normal or abnormal level" in place of the reference range for PSA.

The comprehensive metabolic panel contains the following assays: Albumin, alanine and aspartate aminotransferases (ALT and AST), alkaline phosphatase, total bilirubin, blood urea nitrogen, calcium, creatinine, electrolytes (sodium, potassium, chloride, and bicarbonate), glucose, and total protein.

Unless noted otherwise in examination questions:

- Arterial blood gas studies are done at sea level with the patient breathing room air
- Reticulocyte counts are uncorrected
- Tuberculin skin tests are done with purified protein derivative (PPD) at intermediate strength (5 TU)
- Electrocardiograms are recorded at normal standard and speed
- Lung volumes are determined by body plethysmography

**Illustrations and Multimedia (if applicable)**

Some questions are accompanied by illustrations, such as radiographs, electrocardiograms, photographs of physical or histologic findings, videos, and charts. All electrocardiograms are recorded at normal standard and speed unless otherwise specified.

**Criteria for successful completion**

In order to successfully complete this module and receive Maintenance of Certification credit, you must answer every question. Submission of this module will not be accepted until answers have been provided for every question.

# 1

A 60-year-old man who has type 2 diabetes mellitus, hypertension, and hyperlipidemia is brought to the emergency department with emesis containing bright-red blood and followed by black stools. He has no history of alcohol use disorder, cirrhosis, or varices. He has been taking approximately 800 mg of ibuprofen every other day for aches.

Vital signs are normal. Physical examination is unremarkable except for mild epigastric tenderness without rebound.

Hemoglobin is 10.2 g/dL [14–18].

Intravenous pantoprazole (80 mg) is given, and a pantoprazole infusion is started. Urgent esophagogastroduodenoscopy shows a gastric ulcer in the anterior body of the stomach, with a clean base and flat pigmented spots. Testing for *H. pylori* is negative. The patient was admitted to the hospital and remains hemodynamically stable without evidence of further bleeding.

Which of the following therapeutic regimens should now be given to provide the best cost-to-benefit ratio and prevent rebleeding?

- (A) Intermittent high-dose oral pantoprazole
- (B) Intermittent high-dose intravenous pantoprazole
- (C) Intermittent intravenous ranitidine
- (D) Intravenous infusion of pantoprazole

## 2

An 83-year-old woman is admitted to the hospital with fever, nonproductive cough, shortness of breath, and weakness for the past two days. Her medical history is significant for hypertension, coronary artery stent placement, and atrial fibrillation. She has not had a previous episode of pneumonia. Her most recent hospitalization was for a drug-eluting coronary stent placement four months ago. Current outpatient medications are lisinopril (20 mg daily), metoprolol (25 mg daily), clopidogrel (75 mg daily), and apixaban (5 mg twice daily). She has no known medication allergies.

On examination, the patient is awake and alert but uncomfortable. Temperature is 38.0 C (100.4 F), pulse rate is 125 per minute, respirations are 20 per minute, and blood pressure is 138/85 mm Hg. Oxygen saturation by pulse oximetry is 94%.

Laboratory studies:

Hemoglobin	12.8 g/dL [12–16]
Leukocyte count	13,000/ $\mu$ L [4000–11,000]
Platelet count	296,000/ $\mu$ L [150,000–450,000]
Blood urea nitrogen	20 mg/dL [8–20]
Serum creatinine	1.40 mg/dL [0.50–1.10]
eGFR	35 mL/min/1.73 m <sup>2</sup>
Serum electrolytes	
Sodium	139 mEq/L [136–145]
Potassium	4.1 mEq/L [3.5–5.0]
Bicarbonate	27 mEq/L [24–28]

Chest radiograph shows an opacity in the right middle lobe; no other effusions are noted. Electrocardiogram reveals atrial fibrillation with a heart rate of 122 per minute.

In addition to intravenous fluids and rate control, initiation of which of the following antibiotic management strategies is most appropriate now?

- (A) Ceftriaxone
- (B) Ceftriaxone and azithromycin
- (C) Vancomycin, ceftriaxone, and levofloxacin
- (D) Vancomycin, piperacillin–tazobactam, and levofloxacin

### 3

A 50-year-old woman comes to the emergency department with fatigue and dyspnea on exertion for several months. She has not had orthopnea or paroxysmal nocturnal dyspnea, chest pain, fevers, chills, weight loss, hematuria, melena, or hematochezia. Medical history is significant for Roux-en-Y gastric bypass 10 years ago for medically complicated obesity, type 2 diabetes mellitus, obstructive sleep apnea prior to her surgery that has since resolved, and anxiety. Current outpatient medications are ferrous sulfate (325 mg daily), calcium–vitamin D (600 mg twice daily), oral vitamin B<sub>12</sub> (1000 mcg daily), and vitamin E (400 IU daily).

Pallor is noted on physical examination. Cardiopulmonary examination is normal. The abdomen is obese and nontender. No peripheral edema is present.

Laboratory studies:

Hemoglobin	7.1 g/dL [12–16]
Mean corpuscular volume	100 fL [80–98]
Leukocyte count	3000/ $\mu$ L [4000–11,000]
Segmented neutrophils	12% [50%–70%]
Platelet count	135,000/ $\mu$ L [150,000–450,000]
Serum vitamin B12	350 pg/mL [200–800]
Serum ferritin	20 ng/mL [11–307]

Peripheral blood film shows ring sideroblasts. Upper and lower endoscopies show no evidence of ulcers or bleeding sites.

Which of the following studies would be most helpful at this time to determine the cause of her laboratory abnormalities?

- (A) Measurement of trace element levels including copper and zinc
- (B) Measurement of serum lead level
- (C) Measurement of anti-tissue transglutaminase IgA antibodies and total IgA
- (D) Bone marrow biopsy

## 4

A 60-year-old woman is admitted to the hospital for symptom management of worsening dyspnea on exertion and orthopnea for the past two months. Her baseline status three months ago was NYHA class II heart failure (ejection fraction of 40%). Medical history is otherwise significant for well-controlled scleroderma, type 2 diabetes mellitus, and stage 2 chronic kidney disease. She has a history of a duodenal ulcer due to nonsteroidal anti-inflammatory drug use. One year ago, hemoglobin was 11.6 g/dL [12–16], and mean corpuscular volume was 89 fL [80–98].

Laboratory studies (today):

Hemoglobin	9.0 g/dL [12–16]
Mean corpuscular volume	79 fL [80–98]
Serum creatinine	1.20 mg/dL (previously 1.10–1.40) [0.50–1.10]
eGFR	49 mL/min/1.73 m <sup>2</sup>
Serum <i>N</i> -terminal-pro-B-type natriuretic peptide	1800 pg/mL (previously 800) <i>[high probability of heart failure: 1200 or greater]</i>
Serum ferritin	20 ng/mL [11–307]
Transferrin saturation	10% [20%–50%]

Peripheral blood film shows hypochromic red blood cells. Echocardiogram shows a left ventricular ejection fraction of 38% and a dilated inferior vena cava.

In addition to diuresis and consultation with gastroenterology, which of the following is the best management strategy to improve this patient's symptoms?

- (A) Transfusion of 1 unit of packed red blood cells to keep hemoglobin greater than 10 g/dL
- (B) Administer intravenous iron sucrose, 300 mg now and subsequently weekly until 1 g dose is reached
- (C) Initiate supplementation with oral ferrous sulfate, 325 mg three times daily
- (D) Initiate erythropoietin-stimulating agent and oral ferrous sulfate, 325 mg three times daily

## 5

An 85-year-old woman presents with community-acquired pneumonia. During the hospital stay, thyroid-function testing reveals a serum TSH of 8.1 mU/L [0.5–4.0] and a serum free thyroxine (T<sub>4</sub>) of 1.1 ng/dL [0.8–1.8]. The patient reports long-standing mild fatigue and occasional constipation. She also has hypertension and obesity. BMI is 35.

Which of the following should you recommend regarding this patient's thyroid function?

- (A) No treatment or follow-up is needed
- (B) No treatment is needed now; recommend follow-up with her primary care provider for periodic thyroid testing
- (C) Check thyroid peroxidase antibody (anti-TPO); if positive, start levothyroxine
- (D) Start levothyroxine

## 6

A 67-year-old man is in the intensive care unit following a left hemispheric cerebrovascular accident. The patient underwent fibrinolysis 24 hours ago and has mild speech difficulty. He has type 2 diabetes mellitus. Plasma glucose levels have averaged between 200 and 300 mg/dL [70–99] during the past 24 hours; he is receiving low-intensity sliding-scale short-acting insulin. The patient is now able to take oral nutrition but is eating minimally. You are consulted regarding management of his insulin. Current outpatient medications are insulin glargine (20 units at bedtime), metformin (1000 mg twice daily), and enalapril (10 mg daily).

Which of the following management strategies should you recommend for this patient?

- (A) Insulin infusion to maintain plasma glucose levels between 80 and 130 mg/dL
- (B) Basal, prandial, and corrective dosing insulin to maintain plasma glucose levels between 80 and 130 mg/dL
- (C) Increased intensity of sliding-scale insulin to maintain plasma glucose levels between 140 and 180 mg/dL
- (D) Basal insulin plus corrective insulin dosing to maintain plasma glucose levels between 140 and 180 mg/dL

# 7

A 70-year-old man who is of Asian-Indian descent is admitted to the hospital with abdominal pain and fever. On arrival, temperature is 38.9 C (102.0 F), pulse rate is 100 per minute, respirations are 20 per minute, and blood pressure is 110/60 mm Hg. The patient was hospitalized for sepsis due to a urinary tract infection during a trip to India within the past month; he was treated with meropenem and vancomycin. Medical history is significant for type 2 diabetes mellitus that requires insulin, hypertension, and stage 4 chronic kidney disease.

## Laboratory studies:

Hemoglobin	9.7 g/dL [14–18]
(Baseline)	10.5 g/dL)
Leukocyte count	17,000/ $\mu$ L [4000–11,000]
Segmented neutrophils	90% [50%–70%]
Blood urea nitrogen	45 mg/dL [8–20]
Serum creatinine	2.00 mg/dL [0.70–1.30]
(Baseline)	1.80 mg/dL)
eGFR	33 mL/min/1.73 m <sup>2</sup>
Serum total bilirubin	1.0 mg/dL [0.3–1.0]
Serum electrolytes	
Sodium	135 mEq/L [136–145]
Potassium	4.7 mEq/L [3.5–5.0]
Bicarbonate	19 mEq/L [23–28]
Serum aminotransferases	
ALT	47 U/L [10–40]
AST	98 U/L [10–40]
Serum alkaline phosphatase	130 U/L [30–120]
Serum lactic acid	3.8 mg/dL [6–19]
Urinalysis	
WBCs	4–10/hpf
Leukocyte esterase	Negative
Nitrites	Negative

Chest radiograph shows low lung volumes with no effusions or opacities. Abdominal computed tomography with oral contrast shows no evidence of diverticulitis, intra-abdominal abscess, or obstruction.

Intravenous fluids and broad-spectrum antibiotics with meropenem, vancomycin, and levofloxacin are started. Blood cultures return positive for yeast.

In addition to placing the patient on contact isolation pending further identification, initiation of which of the following is most appropriate at this time?

- (A) Intravenous fluconazole, 400 mg daily
- (B) Caspofungin, loading dose followed by maintenance dose
- (C) Intravenous liposomal amphotericin B, 5 mg/kg
- (D) Intravenous voriconazole, 400 mg twice daily

## 8

A 73-year-old woman is admitted to the hospital with cellulitis of the lower extremity. She develops left arm and leg weakness, left-arm sensory loss, and slurred speech. Medical history is negative for diabetes mellitus, recent surgery, injuries, or bleeding and is otherwise normal. She does not take oral anticoagulation. Her only outpatient medication is atorvastatin. She is receiving intravenous vancomycin for cellulitis.

Coagulation parameters, platelet count, and plasma glucose are normal.

Temperature is 37.0 C (98.6 F), pulse rate is 68 per minute, and blood pressure is 170/90 mm Hg.

Non-contrast computed tomography (CT) of the head shows no evidence of hemorrhage. By the time the CT scan is completed, four hours have passed since the patient was last known to have normal neurologic function. Neurovascular and neurosurgery are not available at this hospital.

Which of the following is the best next step?

- (A) Administer blood pressure–lowering medication intravenously
- (B) Administer alteplase infusion based on weight
- (C) Perform magnetic resonance imaging perfusion/diffusion with diffusion-weighted imaging and fluid-attenuated inversion recovery (DWI-FLAIR)
- (D) Transfer the patient for neuroendovascular consultation for mechanical thrombectomy

# 9

A 54-year-old woman who has a history of opioid use disorder is admitted to the hospital with right upper abdominal pain, nausea, and vomiting. She is found to have acute cholecystitis and undergoes laparoscopic cholecystectomy. You are consulted by the general surgeon to assist with management of her pain medications perioperatively. Her only outpatient medication is sublingual buprenorphine–naloxone (8 mg–2mg daily).

In addition to multimodal pain management and short-acting opioids for breakthrough pain, which of the following should you order to provide adequate pain relief and reduce the chance of relapse of this patient's opioid use disorder?

- (A) Continue current dosage of buprenorphine–naloxone divided into four times daily dosing
- (B) Continue buprenorphine–naloxone at a reduced once-daily dose
- (C) Discontinue buprenorphine–naloxone
- (D) Discontinue buprenorphine–naloxone and start methadone

# 10

A 55-year-old man who has type 2 diabetes mellitus and chronic obstructive pulmonary disease comes to the emergency department (ED) with shortness of breath, cough, and fever. Physical examination and chest radiograph are consistent with right lower-lobe pneumonia.

The patient is hypotensive in the ED, and blood pressure does not respond after administration of intravenous (IV) fluids. IV fluids are continued, and vasopressors and antibiotics are started. He is admitted to the intensive care unit for close monitoring.

Platelet count and serum creatinine are normal. He has no recent history of bleeding.

Which of the following therapies to help prevent venous thromboembolism in the hospital would provide the best cost-to-benefit value?

- (A) Sequential compression devices only
- (B) Low-molecular-weight heparin only
- (C) Low-molecular-weight heparin and sequential compression devices
- (D) No indication for prevention

# 11

An otherwise healthy 45-year-old man sustained fractures of his left ankle, left foot, and right humerus after a motorcycle collision. He underwent surgical repair of his fractures seven days ago and is now on surgery service awaiting discharge to a rehabilitation facility. The patient feels well and has no acute complaints. Hospital medicine service has been assisting and co-managing the patient's care.

The patient does not take any outpatient medications. Current inpatient medications are enoxaparin at a prophylactic dose, oxycodone, and ibuprofen.

His platelet count has dropped to  $89,000/\mu\text{L}$  [ $150,000\text{--}450,000$ ] from a baseline of  $450,000/\mu\text{L}$  on admission. Hemoglobin is  $11.0\text{ g/dL}$  [ $14\text{--}18$ ], and leukocyte count is  $9000/\mu\text{L}$  [ $4000\text{--}11,000$ ].

Which of the following should you do next?

- (A) Discontinue enoxaparin and order heparin-PF4 antibody immunoassay and lower-extremity venous Doppler ultrasonography screening
- (B) Discontinue enoxaparin, order heparin-PF4 antibody immunoassay, and start a direct oral anticoagulant
- (C) Discontinue enoxaparin, order serotonin-releasing assay, and start a parenteral direct thrombin inhibitor such as argatroban
- (D) Continue enoxaparin and order no further testing

# 12

A 62-year-old man who has stage 2 chronic kidney disease (baseline serum creatinine 1.60 mg/dL [0.70–1.30]) was admitted after lumbar laminectomy surgery. His only medications are oxycodone and acetaminophen for pain. Routine postoperative laboratory studies are shown:

Laboratory studies:

Blood urea nitrogen	43 mg/dL [8–20]
Serum creatinine	4.10 mg/dL [0.70–1.30]
eGFR	15 mL/min/1.73 m <sup>2</sup>
Serum electrolytes	
Sodium	137 mEq/L [136–145]
Potassium	6.2 mEq/L [3.5–5.0]
Chloride	107 mEq/L [98–106]
Bicarbonate	23 mEq/L [23–28]

Electrocardiogram reveals peaked T waves. The patient is given intravenous calcium gluconate, insulin, and dextrose. You are consulted about further treatment.

Which of the following is accurate about sodium polystyrene sulfonate?

- (A) It carries a risk of gastrointestinal ischemia, which can be fatal
- (B) It causes potassium to move from the bloodstream into cells
- (C) It antagonizes the action of hyperkalemia on cell membranes, reducing the risk of arrhythmia
- (D) It has little effect on serum potassium in patients who are not acidemic

# 13

A 60-year-old woman is admitted to the hospital because of hematemesis. Symptoms started one hour before arrival in the emergency department. She has no history of alcohol use or cirrhosis.

Esophagogastroduodenoscopy shows a duodenal ulcer with evidence of recent bleeding. The ulcer is treated endoscopically. The patient is discharged on a proton pump inhibitor (PPI).

Both prescription and nonprescription PPIs are widely used.

Which of the following adverse effects should clinicians be aware of in long-term users of PPIs?

- (A) Dementia
- (B) Acute kidney injury
- (C) Symptomatic pulmonary infection
- (D) Vitamin B1 deficiency

# 14

A 33-year-old woman is admitted to the hospital for a newly diagnosed pulmonary embolism. She previously was found to have systemic lupus erythematosus after she was evaluated for a malar rash and arthritis; antinuclear antibodies and antibodies to double-stranded DNA were positive. She has been maintained on daily hydroxychloroquine, with excellent results. Testing was positive for lupus anticoagulant in the past, but she has never had an arterial or venous thromboembolic (VTE) event until now. The patient does not smoke cigarettes, has not had any recent surgery, and has never been pregnant. She uses a copper intrauterine device for contraception.

Laboratory studies (current):

Lupus anticoagulant	Positive
Anticardiolipin antibodies	Positive
Beta <sub>2</sub> -glycoprotein I antibodies	Negative

The patient is started on unfractionated heparin.

Which of the following is the most effective treatment plan on discharge for this patient?

- (A) Dose-adjusted vitamin K antagonist with a target INR of 2 to 3
- (B) Dose-adjusted vitamin K antagonist with a target INR of 3 to 4
- (C) Standard-dose rivaroxaban
- (D) Standard-dose apixaban

# 15

A 24-year-old man is admitted to the hospital for pneumonia that has not responded to outpatient therapy with levofloxacin. His medical history is significant for HIV infection (he currently receives antiretroviral therapy), prior alcohol use disorder, depression, and anxiety. Intravenous vancomycin and piperacillin–tazobactam are started.

On hospital day 2, symptoms have improved, but blood cultures are positive for gram-positive cocci in pairs and chains. The patient demands to be discharged by the end of the day and states that he will leave against medical advice (AMA) if needed, despite being told of the blood culture results.

He is seen by psychiatry and deemed to have capacity. Your case manager suggests an AMA discharge designation for this patient if he chooses to leave.

Which of the following statements is most accurate about the AMA discharge designation?

- (A) Patients who are discharged AMA are more likely to be readmitted within 30 days
- (B) Patients who are discharged AMA and are readmitted within 30 days count toward a hospital readmissions penalty
- (C) AMA discharge designations are more likely to provide clinicians protection from medical liability
- (D) Patients who are discharged AMA will likely have their hospital charges denied by insurance

# 16

A 68-year-old man is evaluated because of shortness of breath, paroxysmal dyspnea, and orthopnea. He has a history of coronary artery disease with an ischemic cardiomyopathy (ejection fraction of 30%), NYHA class III heart failure, paroxysmal atrial fibrillation, and hypertension. Current outpatient medications are amiodarone, lisinopril, rivaroxaban, furosemide, spironolactone, and carvedilol. He has undergone three-vessel coronary artery bypass and placement of an automatic implantable defibrillator. The patient is noted to be in atrial fibrillation with rapid ventricular response and acute heart failure.

The patient's heart rate is controlled with intravenous digoxin. Diuresis is achieved with intravenous furosemide. The current admission is his third in the past nine months for similar symptoms despite adhering to his medication regimen.

Which of the following should you recommend to decrease the patient's risk for mortality and frequency of hospitalizations for heart failure?

- (A) Initiation of oral digoxin for heart-rate control
- (B) Initiation of oral non-dihydropyridine calcium channel blocker for heart-rate control
- (C) Consultation with cardiology for antiarrhythmic medication adjustment
- (D) Consultation with electrophysiology cardiology

# 17

A 61-year-old man who has hypertension is brought to the emergency department with right facial droop and right arm weakness. Current outpatient medication is hydrochlorothiazide. Symptoms resolve after one hour.

Computed tomography of the head is negative. Magnetic resonance imaging of the brain reveals a lacunar left hemispheric infarction. Computed tomography angiography shows minimal atherosclerotic disease of the carotids and intracranial vessels. Echocardiogram is normal. Telemetry monitoring is unremarkable.

Which antithrombotic regimen would you choose to discharge the patient on to decrease risk of recurrent ischemic event?

- (A) Aspirin indefinitely
- (B) Aspirin and clopidogrel for three months, followed by aspirin indefinitely
- (C) Aspirin and clopidogrel for 21 days, followed by aspirin indefinitely
- (D) Rivaroxaban indefinitely

# 18

A 76-year-old man comes to the emergency department because he has had palpitations for the past 24 hours. The patient is found to be in atrial fibrillation with a heart rate of 122 beats per minute. He is admitted to the hospital for monitoring. Medical history is remarkable for hypertension, coronary artery disease, and peptic ulcer disease; he underwent elective left heart angiography with placement of a drug-eluting stent three weeks ago. Current outpatient medications are famotidine, metoprolol, aspirin, lovastatin, and clopidogrel.

Heart rate is controlled with intravenous beta-adrenergic blocking agents and is converted to sinus rhythm. Electrocardiogram is otherwise normal. Serial cardiac enzymes are normal.

Which of the following would be most effective to prescribe on discharge to balance antithrombotic and bleeding risk?

- (A) Dose-adjusted vitamin K antagonist and aspirin
- (B) Dose-adjusted vitamin K antagonist, aspirin, and clopidogrel
- (C) A direct oral anticoagulant and clopidogrel
- (D) A direct oral anticoagulant, clopidogrel, and aspirin
- (E) Aspirin and clopidogrel

# 19

A 40-year-old woman is evaluated because of nausea, vomiting, abdominal pain, and dehydration for two days. She has not had fever, chills, dysuria, or flank pain. Medical history is significant for obesity and type 2 diabetes mellitus. She recently started a low-carbohydrate diet and exercise program to lose weight. Current medications are insulin glargine, metformin, and canagliflozin.

Temperature is 36.8 C (98.2 F), pulse rate is 110 per minute, respirations are 24 per minute, and blood pressure is 110/70 mm Hg. Physical examination reveals dry mucous membranes and mild diffuse abdominal pain with palpation.

Laboratory studies:

Leukocyte count	10,000/ $\mu$ L [4000–11,000]
Differential	Normal
Plasma glucose	190 mg/dL [70–99]
Blood urea nitrogen	35 mg/dL [8–20]
Serum creatinine	1.40 mg/dL [0.50–1.10]
eGFR	47 mL/min/1.73 m <sup>2</sup>
Serum electrolytes	
Sodium	138 mEq/L [136–145]
Potassium	5.5 mEq/L [3.5–5.0]
Chloride	102 mEq/L [98–106]
Bicarbonate	10 mEq/L [23–28]
Serum lipase	Normal
Serum lactic acid	1.8 mmol/L [0.7–2.1]
Serum beta-hydroxybutyrate	2 mmol/L [less than 0.4]
Arterial blood pH	7.12 [7.38–7.44]
Urinalysis	
WBCs	5–10/hpf
Nitrites	Negative
Leukocyte esterases	Positive
Ketones	Positive

In addition to the administration of a bolus of intravenous normal saline, which of the following is the most appropriate next step in management?

- (A) Initiate sodium bicarbonate drip and intravenous antiemetics
- (B) Order blood cultures, start broad-spectrum antibiotics, and continue home medications
- (C) Initiate 0.45% normal saline infusion, intravenous antiemetics, and long-acting insulin with corrective dosing
- (D) Initiate 5% dextrose in 0.45% normal saline infusion and insulin infusion

## 20

A 75-year-old man who has hypertension is in the hospital for treatment of pneumonia. He has responded well and is ready for discharge. During his hospitalization, his systolic blood pressure (BP) has ranged from 150 to 170 mm Hg while his diastolic BP has remained at 100 mm Hg. He was continued on his home medications, including hydrochlorothiazide (12.5 mg orally daily) and simvastatin (40 mg orally daily). He reports that his BP is typically better controlled at home. He has no history of diabetes mellitus.

Which of the following is the most appropriate action at discharge?

- (A) Recommend no change
- (B) Add lisinopril
- (C) Add a beta-adrenergic blocking agent
- (D) Add amlodipine

# 21

A 72-year-old woman comes to the emergency department because of weakness. She has a history of non-small cell lung cancer, for which she was treated in the past.

Pulse rate is 82 per minute, respirations are 14 per minute, and blood pressure is 135/80 mm Hg. Oxygen saturation by pulse oximetry is 95%. On physical examination, the patient has flat neck veins. Cardiopulmonary examination is normal. She has no pedal edema. Neurologic examination is intact.

Laboratory studies:

Serum creatinine	1.00 mg/dL [0.50–1.10]
eGFR	56 mL/min/1.73 m <sup>2</sup>
Serum thyroid-stimulating hormone	3.1 $\mu$ U/mL [0.5–4.0]
Serum sodium	123 mEq/L [136–145]
Serum uric acid	3 mg/dL [3.0–7.0]
Urine osmolality	300 mOsm/kg H <sub>2</sub> O [38–1400]
Urine fractional excretion of sodium	Greater than 1%
Urine-to-plasma electrolyte ratio	Greater than 1

The patient is admitted to the hospital for correction of hyponatremia; she is placed on fluid restriction of 1L free water daily. Serum sodium increases to 124 mEq/L.

Which of the following treatment options for hyponatremia would be most affordable and provide the most effective results for this patient?

- (A) Tolvaptan
- (B) Oral urea
- (C) Fluid restriction, 500 cc daily
- (D) Demeclocycline

## 22

A 72-year-old woman who has hypertension and heart failure with preserved ejection fraction is admitted to the hospital for palpitations and new-onset atrial fibrillation with rapid ventricular response. Current outpatient medications are losartan and hydrochlorothiazide.

Laboratory studies:

Hemoglobin	13 g/dL [12–16]
Platelet count	375,000/ $\mu$ L [150,000–450,000]
Serum creatinine	1.00 mg/dL [0.50–1.10]
eGFR	56 mL/min/1.73 m <sup>2</sup>

Transthoracic echocardiogram shows a left ventricular ejection fraction of 65%, mild left ventricular diastolic dysfunction, moderate mitral regurgitation, aortic valve sclerosis, and normal inferior vena cava diameter. The patient converts to sinus rhythm after rate control is achieved with oral metoprolol. She is being readied for discharge.

Which of the following anticoagulation or antithrombotic regimens would be preferred for this patient?

- (A) No anticoagulation
- (B) Aspirin, 325 mg daily
- (C) Warfarin titrated to an INR of 2 to 3
- (D) Non–vitamin K oral anticoagulant

## 23

A 55-year-old radiology technician who is HIV seropositive is evaluated because of jaundice, nausea, vomiting, fevers, chills, and general weakness. He reports acquiring HIV from heterosexual contact. The patient was recently homeless for 15 months, but for the past six months he has had stable housing. He reports no international travel.

The patient is unable to keep food down and is admitted to the hospital overnight.

Liver enzymes are markedly elevated, CD4 lymphocyte count is  $850/\mu\text{L}$  [ $530\text{--}1570/\mu\text{L}$ ], and serologic testing is positive for acute hepatitis A infection. Serologies for hepatitis B and C are negative.

This is the fourth patient you have seen recently who has hepatitis A.

Which of the following patient characteristics would have been an indication for this patient to receive a hepatitis A vaccine prophylactically?

- (A) Employment as a healthcare worker
- (B) Recent homelessness
- (C) HIV status
- (D) Heterosexual activity

## 24

A 45-year-old man is found to have left lower-extremity cellulitis after evaluation in the emergency department. Medical history is significant for cirrhosis with portal hypertension as manifested clinically with pancytopenia, esophageal varices, and ascites. The patient was given normal saline in the emergency department for a slightly low blood pressure before it was discovered that the blood pressure was at baseline. Current outpatient medications are spironolactone, nadolol, and furosemide.

Laboratory studies (on admission):

Hemoglobin	10 g/dL [14–18]
Leukocyte count	3400/ $\mu$ L [4000–11,000]
Platelet count	25,000/ $\mu$ L [150,000–450,000]
INR	2.3
Serum creatinine	1.10 mg/dL [0.70–1.30]
eGFR	Greater than 60 mL/min/1.73 m <sup>2</sup>
Serum total bilirubin	2.9 mg/dL [0.3–1.0]
Serum albumin	2.4 g/dL [3.5–5.5]

The patient is recovering from cellulitis when he starts to have increased abdominal girth and discomfort. He is afebrile and not in pain.

Which of the following is the most appropriate next step to limit complications due to paracentesis?

- (A) Paracentesis without further testing or transfusions
- (B) Administration of desmopressin
- (C) Thromboelastography and transfuse coagulation products and platelets as directed by laboratory studies
- (D) Repeat prothrombin time/INR and platelet count with transfusion of fresh frozen plasma for INR greater than 1.7 and platelet count greater than 50,000/ $\mu$ L
- (E) Measurement of serum fibrinogen and transfusion of cryoprecipitate for level less than 120 mg/dL

## 25

A 29-year-old woman is brought to the emergency department following focal seizure activity consisting of rhythmic jerking of her right arm and leg. After the seizure, the patient becomes confused, agitated, and combative.

Temperature is 38.3 C (100.9 F), and pulse rate is 121 per minute; the remainder of vital signs are normal. Neurologic examination is nonfocal.

Computed tomography of the head shows no acute intracranial abnormality. Lumbar puncture is recommended to evaluate for CNS infection.

Which of the following has been shown to reduce the risk of post-dural puncture headache?

- (A) Supine bed rest for 30 minutes after the lumbar puncture
- (B) Fluid supplementation
- (C) Ultrasonography-guided lumbar puncture
- (D) Use of an atraumatic spinal needle

## 26

A 35-year-old man is brought to the emergency department (ED) because of shortness of breath, nausea, and a skin rash. He has shellfish and peanut allergies. Earlier in the night, he ate a steak at a restaurant; he did not knowingly eat any shellfish or peanuts. Medical history is otherwise remarkable for exercise-induced asthma and remote appendectomy. The patient had been well until 30 minutes prior to admission. He does not take any outpatient medications.

In the ED, temperature is 37.2 C (99.0 F), pulse rate is 120 per minute, respirations are 26 per minute, and blood pressure is 110/70 mm Hg. Oxygen saturation by pulse oximetry is 92%. Physical examination reveals a generalized blanching, pruritic rash, swollen lips, and lung wheezing.

Intravenous fluids with crystalloids are started.

Which of the following should you recommend?

- (A) Intravenous methylprednisolone and intravenous antihistamine
- (B) Intravenous epinephrine and intravenous promethazine
- (C) Intramuscular epinephrine and intravenous methylprednisolone
- (D) Intramuscular epinephrine and intravenous antihistamine

## 27

A 49-year-old woman is admitted to the hospital with fever, abdominal pain, nausea, and elevated liver enzymes. She had elective cholecystectomy two years ago.

Temperature is 39.0 C (102.2 F), pulse rate is 105 per minute, respirations are 18 per minute, and blood pressure is 105/60 mm Hg. Skin examination reveals a yellowish discoloration. The middle-upper to right-upper abdomen is tender to palpation. Bowel sounds are reduced. No peritoneal signs are noted.

Laboratory studies:

Leukocyte count	15,000/ $\mu$ L [4000–11,000]
Serum total bilirubin	3.4 mg/dL [0.3–1.0]
Serum aminotransferases	
ALT	140 U/L [10–40]
AST	100 U/L [10–40]
Serum alkaline phosphatase	180 U/L [30–120]

The patient is admitted to the hospital floor and started on piperacillin–tazobactam.

Blood cultures are positive for gram-negative rods later identified as *Klebsiella pneumoniae* and sensitive to piperacillin–tazobactam and quinolones. Endoscopic retrograde cholangiopancreatography is performed with successful removal of a common bile duct stone.

On hospital day 4, the patient has been afebrile for 48 hours with normalization of liver biochemical studies and leukocyte count.

Which of the following should you choose as the patient's antibiotic therapy?

- (A) Continue intravenous antibiotic therapy for seven days and transition to oral ciprofloxacin for a total of 14 days
- (B) Continue intravenous antibiotic therapy for five days and transition to oral ciprofloxacin for a total of 10 days
- (C) Continue intravenous antibiotic therapy for a total of 10 days
- (D) Transition to oral ciprofloxacin for a total of seven days of therapy

## 28

Your hospital has organized a task force to implement high-value care protocols. One of its targets is to align telemetry usage with current guidelines.

Which of the following patients would benefit the most from telemetry monitoring at this time?

- (A) A 72-year-old man with chronic atrial fibrillation who is admitted to the medical floor for pneumonia; he is hemodynamically stable and rate controlled
- (B) A 64-year-old woman with a medical history consisting only of hypertension who is admitted to the observation unit for chest pain that has occurred intermittently for the past three months and worsens in the supine position; electrocardiogram and cardiac biomarkers are normal
- (C) A 50-year-old man status post bone marrow transplantation for acute myeloid leukemia who is admitted to the hematology floor 24 hours ago with a diagnosis of infective endocarditis; he has a leukocyte count of  $13,000/\mu\text{L}$  [4000–11,000], platelet count of  $90,000/\mu\text{L}$  [150,000–450,000], serum creatinine of 1.50 mg/dL [0.70–1.30], temperature of 38.2 C (100.8 F), pulse rate of 95 per minute, blood pressure of 110/65 mm Hg, and oxygen saturation of 88% by pulse oximetry
- (D) A 79-year-old woman admitted with a non-ST elevation myocardial infarction 72 hours ago and who underwent successful revascularization within 90 minutes of arrival; she is without any arrhythmias and is awaiting skilled nursing-home placement

## 29

A 44-year-old woman comes to the emergency department with substernal pain that radiates to her jaw. Her symptoms last for 30 minutes and are associated with nausea and vomiting. She has a history of hypertension and hypercholesterolemia. Current outpatient medications are metoprolol and atorvastatin.

Initial electrocardiogram shows inferior T-wave inversions. Repeat electrocardiogram 30 minutes later shows upright T waves.

Initial serum cardiac troponin I is 0.05 ng/mL [*0.04 or less*]. Second serum cardiac troponin I is 1.0 ng/mL, and third is 0.5 ng/mL. Serum creatinine is normal.

A non-ST elevation myocardial infarction is diagnosed, and the patient undergoes cardiac catheterization on hospital day 2. She is found to have non-obstructive coronary disease.

Which of the following should you do next?

- (A) Discharge home with medical management of coronary artery disease, adding aspirin and clopidogrel to her daily regimen
- (B) Discharge home with no changes to current outpatient medication regimen
- (C) Search for other causes of troponin elevation before discharging home
- (D) Repeat cardiac catheterization with angiography on hospital day 3

## 30

A 53-year-old black man is evaluated because of recurrent diarrhea following hernia repair six months ago. After his surgery, he received appropriate intravenous antibiotic prophylaxis but subsequently was found to have *Clostridioides (Clostridium) difficile* infection. A course of guideline-based therapy was administered, but three to four weeks after complete resolution, the diarrhea recurred. Vancomycin was started, but after stopping therapy the diarrhea again developed. The patient then was treated with pulsed and tapered vancomycin.

Now he is hospitalized for his third recurrence of diarrhea and is again found to have *C. difficile* infection. He has not had hypotension, ileus, or megacolon. Leukocyte count is 12,000/ $\mu$ L [4000–11,000].

Which of the following should you recommend?

- (A) Oral rifaximin, 550 mg two times daily for ten days
- (B) Oral vancomycin, 500 mg four times daily, and parenteral metronidazole, 500 mg every eight hours
- (C) Oral vancomycin, 500 mg four times daily, and vancomycin retention enema, 500 mg every six hours
- (D) Fecal microbiota transplant