



# Medicine

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**Robert S. Urban  
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Roger D. Smalligan**

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# Medicine

PreTest® Self-Assessment and Review  
14<sup>th</sup> Edition

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# Introduction

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*Medicine: PreTest® Self-Assessment and Review, 14th Edition*, is intended to provide medical students, as well as house officers and physicians, with a convenient tool for assessing and improving their knowledge of medicine.

The 500 questions in this book are similar in format and complexity to those included in Step 2 CK of the United States Medical Licensing Examination (USMLE). They may also be a useful study tool for Step 3 and for the National Board of Medical Examiners (NBME) medical student exam for the internal medicine clerkship.

For multiple-choice questions, the **one best** response to each question should be selected. For matching sets, a group of questions will be preceded by a list of lettered options. For each question in the matching set, select **one** lettered option that is **most** closely associated with the question.

Each question in this book has a corresponding answer and a short discussion of various issues raised by the question and its answer. A listing of references for the entire book follows the last chapter.

To simulate the time constraints imposed by the qualifying examinations for which this book is intended as a practice guide, the student or physician should allot about one minute for each question. After answering all questions in a chapter, as much time as necessary should be spent in reviewing the explanations for each question at the end of the chapter.

Attention should be given to all explanations, even if the examinee answered the question correctly. Those seeking more information on a subject should refer to the reference materials listed or to other standard texts in medicine.

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To the medical students, residents, faculty, and staff of Texas Tech University School of Medicine—in pursuit of excellence.

# Infectious Disease

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## Questions

1. A 30-year-old man complains of fever and sore throat for several days. The patient presents to you today with additional complaints of hoarseness, difficulty breathing, and drooling. On examination, the patient is febrile and has inspiratory stridor. Which of the following is the best course of action?

  - a. Begin outpatient treatment with ampicillin.
  - b. Culture throat for beta-hemolytic streptococci.
  - c. Admit to intensive care unit and obtain otolaryngology consultation.
  - d. Obtain chest x-ray.
  - e. Obtain Epstein-Barr serology.
2. A 70-year-old patient with long-standing type 2 diabetes mellitus presents with complaints of pain in the left ear with purulent drainage. On physical examination, the patient is afebrile. The pinna of the left ear is tender, and the external auditory canal is swollen and edematous. The white blood cell count is normal. Which of the following organisms is most likely to grow from the purulent drainage?

  - a. *Pseudomonas aeruginosa*
  - b. *Streptococcus pneumoniae*
  - c. *Candida albicans*
  - d. *Haemophilus influenzae*
  - e. *Moraxella catarrhalis*
3. A 25-year-old male student presents with the chief complaint of rash. He denies headache, fever, or myalgia. A slightly pruritic maculopapular rash is noted over the abdomen, trunk, palms of the hands, and soles of the feet. Inguinal, occipital, and cervical lymphadenopathy is also noted. Hypertrophic, flat, wart-like lesions are noted around the anal area. Laboratory studies show the following:

Hct: 40%  
Hgb: 14 g/dL  
WBC: 13,000/ $\mu$ L  
Diff: 50% segmented neutrophils, 50% lymphocytes

Which of the following is the most useful laboratory test in this patient?

  - a. Human papillomavirus (HPV) serology
  - b. Rapid Plasma Reagin (RPR) test
  - c. Nucleic acid amplification test for *Chlamydia*
  - d. Blood cultures
  - e. Biopsy of perianal lesions

4. A 35-year-old previously healthy man develops cough with purulent sputum over several days. On presentation to the emergency room, he is lethargic. Temperature is 39°C (102°F), pulse is 110, and blood pressure is 100/70 mm Hg. He has rales and dullness to percussion at the left base. There is no rash. Flexion of the patient's neck when supine results in spontaneous flexion of hip and knee. Neurologic examination is nonfocal. There is no papilledema. A lumbar puncture is performed in the emergency room. The cerebrospinal fluid (CSF) shows 8000 leukocytes/ $\mu$ L, 90% of which are polymorphonuclear cells. Glucose is 30 mg/dL with a peripheral glucose of 80 mg/dL. CSF protein is elevated to 200 mg/dL. CSF Gram stain is pending. Which of the following is the correct treatment option?
- Begin acyclovir for herpes simplex encephalitis.
  - Obtain emergency magnetic resonance imaging (MRI) scan before beginning treatment.
  - Begin dexamethasone, followed by ceftriaxone and vancomycin, for pneumococcal meningitis.
  - Begin ceftriaxone, vancomycin, and ampicillin to cover both pneumococci and *Listeria*.
  - Begin high-dose penicillin for meningococcal meningitis.
5. A 56-year-old woman presents with a 3-day history of fever, headache, fatigue, and myalgia, along with nausea and vomiting. She reports cough with minimal hemoptysis but denies abdominal pain and dysuria. About a week ago, she came back from a month-long missionary trip to a small village in Liberia. She had received appropriate pre-travel vaccines including the yellow fever vaccine. She was also compliant with her malaria prophylaxis as prescribed. On examination, she is tachypneic, tachycardic, and in mild respiratory distress. She has generalized petechiae but no other rashes or lymphadenopathy. What is the most likely infectious pathogen?
- Plasmodium malariae*
  - Salmonella typhi*
  - Influenza virus
  - Ebola virus
  - Mycobacterium tuberculosis*
6. A 79-year-old nursing home patient presents with fever, confusion, productive cough, and shortness of breath. He has diabetes, hypertension, and dementia. He takes insulin, metoprolol, and aspirin. He is allergic to eggs, sulfa, and angiotensin-converting enzyme inhibitors. He is diagnosed with a left lower lobe health care-associated pneumonia. On admission, he is given linezolid, meropenem, and levofloxacin. His condition improves markedly, and on the fifth hospital day he is ready to be discharged back to his nursing home. His sputum and blood cultures grow *Klebsiella pneumoniae*. It is resistant to ampicillin and cefazolin but susceptible to ceftriaxone, piperacillin/tazobactam, meropenem, ciprofloxacin, and trimethoprim/sulfamethoxazole. Which of the following statements regarding discharge antibiotics is correct?
- Discharge the patient on the same intravenous antibiotics since his condition improved on them.
  - Discharge the patient on oral trimethoprim/sulfamethoxazole.
  - Discharge the patient on oral amoxicillin.
  - Discharge the patient on oral ciprofloxacin.
  - Discharge the patient on intravenous piperacillin/tazobactam.

**7.** A 19-year-old male patient presents with a 1-week history of malaise and anorexia followed by fever and sore throat. On physical examination, the throat is inflamed without exudate. There are a few palatal petechiae. Cervical adenopathy is present. The liver span is 12 cm and the spleen is palpable.

Throat culture: negative for group A streptococci

Hgb: 12.5 g/dL, Hct: 38%

Reticulocytes: 4%

WBC: 14,000/ $\mu$ L

Segmented neutrophils: 30%

Lymphocytes: 60%

Monocytes: 10%

Total bilirubin: 2.0 mg/dL (normal 0.2-1.2)

Lactate dehydrogenase (LDH) serum: 260 IU/L (normal 20-220)

Aspartate aminotransferase (AST): 60 U/L (normal 8-40 U/L)

Alanine aminotransferase (ALT): 55 U/L (normal 8-40 U/L)

Alkaline phosphatase: 40 IU/L (normal 35-125)

Which of the following is the most important initial test combination to order?

- Liver biopsy and hepatitis antibody
- Streptococcal screen and antistreptolysin O (ASO) titer
- Peripheral blood smear and heterophile antibody
- Toxoplasma IgG and stool sample
- Lymph node biopsy and cytomegalovirus serology

**8.** A 30-year-old man presents with right upper quadrant (RUQ) pain. He has been well except for an episode of diarrhea that occurred 4 months ago, just after he returned from a missionary trip to Mexico. He has lost 7 lb. He is not having diarrhea. His blood pressure is 140/70, pulse 80, and temperature 37.5°C (99.5°F). On physical examination there is RUQ tenderness without rebound. There is some radiation of the pain to the shoulder. The liver is percussed at 14 cm. There is no lower quadrant tenderness. Bowel sounds are normal and active. Which of the following is the most appropriate next step in evaluation of the patient?

- Serology and RUQ ultrasound
- Stool for ova and parasite
- Blood cultures
- Diagnostic aspirate
- Empiric broad-spectrum antibiotic therapy

**9.** An 80-year-old female patient complains of a 3-day history of a painful rash extending over the right half of her forehead and down to her right eyelid. There are weeping vesicular lesions on physical examination. Which of the following is the most likely diagnosis?



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- a. Impetigo
- b. Adult chickenpox
- c. Herpes zoster
- d. Coxsackie A virus
- e. Herpes simplex virus

**10.** A 58-year-old woman presents to her internist with a 2-day history of low-grade fever and RUQ abdominal pain. She reports nausea but denies vomiting or diarrhea. On physical examination, she is pale and jaundiced. Her temperature is 38.3°C (100.9°F). She has reduced air entry at the right lung base and has RUQ tenderness without rigidity or rebound tenderness. Bowel sounds are normal. Her white blood cell count is 16,000/ $\mu$ L and urinalysis shows no red or white blood cells. Which of the following is the most likely diagnosis?

- a. Right-sided pyelonephritis
- b. Right lower lobe pneumonia
- c. High retrocecal appendicitis
- d. Cholangitis
- e. Gastritis

**11.** A 35-year-old man complains of inability to close his right eye. Examination shows facial nerve weakness of the right side of the face; both forehead and lower face are involved. There are no other cranial nerve abnormalities, and the rest of the neurological examination is normal. The patient is afebrile. Examinations of the heart, chest, abdomen, and skin show no additional abnormalities. There is no lymphadenopathy. About 1 month ago the patient was seen by a dermatologist for a bull's-eye



skin rash 2 weeks after returning from a camping trip in upstate New York. Which of the following is the most likely diagnosis?

- a. Sarcoidosis
- b. Idiopathic Bell palsy
- c. Lyme disease
- d. Syphilis
- e. Lacunar infarct

**12.** A 67-year-old man presents to the emergency department in mid-August with fever, headache, and right arm and leg weakness. His symptoms progressed over the preceding 2 days. He has diabetes mellitus controlled with oral hypoglycemic agents. He is retired, denies recent travel, and spends most of his afternoons gardening. On physical examination he appears healthy but confused. He has neck rigidity and 4 out of 5 strength in his right arm and leg. Cranial nerve examination is within normal limits. CT head is negative. Lumbar puncture reveals a white blood cell count of 158 with predominance of lymphocytes and 21 red blood cells. Cerebrospinal fluid (CSF) glucose level is normal, while CSF protein level is mildly elevated. Which of the following is the most likely diagnosis?

- a. Embolic stroke
- b. West Nile virus (WNV) encephalitis
- c. Subarachnoid hemorrhage
- d. Bacterial meningitis
- e. Tuberculous meningitis

**13.** A 59-year-old man undergoes coronary bypass surgery. He receives vancomycin prophylactically for 24 hours. On the ninth postoperative day, he develops a fever of 39.8°C (103°F) with a heart rate of 115 beats/min and a blood pressure of 105/65 mm Hg. The surgical site is healing well with no redness or discharge. His white blood cell count is 14,000/mm<sup>3</sup> and urinalysis reveals many white blood cells per high-power field. Blood and urine cultures grow a non-lactose-fermenting oxidase-positive gram-negative rod. Which of the following antibiotics is most appropriate to treat this infection?

- a. Moxifloxacin
- b. Ceftriaxone
- c. Imipenem
- d. Trimethoprim-sulfamethoxazole
- e. Tigecycline

**14.** You are a physician in charge of patients who reside in a nursing home. Several of the patients have developed influenza-like symptoms, and the community is in the midst of an influenza A outbreak. None of the nursing home residents have received the influenza vaccine. Which course of action is most appropriate?

- a. Give the influenza vaccine to all residents who do not have a contraindication to the vaccine (ie, allergy to eggs).
- b. Give the influenza vaccine to all residents who do not have a contraindication to the vaccine; also

give oseltamivir for 2 weeks to all residents.

- c. Give amantadine alone to all residents.
- d. Give azithromycin to all residents to prevent influenza-associated pneumonia.
- e. Do not give any prophylactic regimen, but treat with oseltamivir if a clinical outbreak should occur.

**15.** A 60-year-old male patient complains of low back pain, which has intensified over the past 3 weeks. He had experienced some fever at the onset of the pain. He was treated for acute pyelonephritis about 4 months ago. Physical examination shows tenderness over the L2-3 vertebra and paraspinal muscle spasm. Laboratory data show an erythrocyte sedimentation rate of 80 mm/h and elevated C-reactive protein. Which of the following statements is correct?

- a. Hematogenous osteomyelitis rarely involves the vertebra in adults.
- b. The most likely initial focus of infection was soft tissue.
- c. Blood cultures will be positive in most patients with this process.
- d. An MRI scan is both sensitive and specific in defining the process.
- e. Surgery will be necessary if the patient has osteomyelitis.

**16.** A 39-year-old man with sickle cell anemia is admitted with cough, rusty-colored sputum, and shaking chills. Physical examination reveals rales and bronchial breath sounds in the left posterior chest. The patient's sputum grows penicillin-resistant *S pneumoniae*. Which of the following best describes the mechanism of penicillin resistance in this *S pneumoniae*?

- a. Penicillinase production
- b. Reduced cell wall permeability to penicillin
- c. Altered penicillin binding protein
- d. Penicillin efflux pump
- e. Down regulation of cell wall porins

**17.** A family of four presents to the emergency room with sudden-onset abdominal cramps, nausea, and vomiting. None of them has fever or diarrhea. Four hours earlier, they had lunch at a roadside restaurant. They ate a variety of grilled meats, fried rice, and seasoned vegetables. What is the most likely mechanism of their symptoms?

- a. Ingestion of preformed toxins.
- b. Bacterial invasion of stomach and small intestine wall.
- c. Proliferation of ingested bacteria with subsequent production of toxin active against small bowel mucosal cells.
- d. Bacterial invasion of large intestine wall.
- e. Secondary malabsorption caused by the pathogen's overgrowth in the proximal small intestine.

**18.** A 61-year-old woman presents to the hospital with perforated diverticulitis. She undergoes laparotomy and left-sided hemicolectomy. She is started on intravenous fluids and broad-spectrum antibiotics through a central venous catheter. Her sepsis resolves, but she continues to have ileus and subsequently is started on total parenteral nutrition. On the 10th postoperative day, she develops new fever. Physical examination does not reveal any obvious foci of infection. Blood white blood cell

count is high with 6% bands but no eosinophils; her kidney and liver function tests are normal. Urine culture and blood cultures continue to be negative. Her chest x-ray is negative. CT abdomen and pelvis does not reveal any abscess or fluid collections. Despite multiple broad-spectrum antibiotics and changing her central venous catheter, she continues to be febrile with significant leukocytosis. Which of the following is the most likely cause of her fever of unknown origin?

- a. Drug fever
- b. Tumor fever
- c. Central fever
- d. Herpes simplex virus
- e. Candidemia

**19.** An 18-year-old woman presents with a 2-day history of sore throat. Which of the following constellation of symptoms and signs is most consistent with group-A streptococcal pharyngitis?

- a. Fever, anorexia, dysphagia, and hoarseness
- b. Fever, runny nose, cough, myalgia, and poor appetite
- c. Fever, no cough, tonsillar exudates, and tender anterior cervical lymphadenopathy
- d. Fever, cough, pharyngeal erythema, and dysphagia
- e. Fever, trismus, dysphagia, and neck swelling

**20.** A 78-year-old woman presents to the emergency room in mid-December with 1-week history of shortness of breath and dry cough. She denies fever but reports chills. She denies chest pain or sick contacts. She is up to date on her vaccination including influenza and pneumococcal vaccines. She has diabetes and hypertension. Her medications, which she takes regularly, include insulin, lisinopril, metoprolol, hydrochlorothiazide, and aspirin. On examination, she has basal rales with no wheezing. Heart examination reveals regular heart sounds with no gallops. She has 1+ lower limb edema. Blood white blood cell count is 12,000/ $\mu$ L with no bands. Her kidney function tests and liver enzymes are within normal levels. Chest x-ray shows basal opacities bilaterally. Which of the following supports a diagnosis of pneumonia?

- a. High B-natriuretic peptide level
- b. High procalcitonin level
- c. High D-dimer level
- d. High troponin level
- e. Low C-reactive protein

**21.** A 32-year-old male patient complains of fever and shortness of breath. There is no pleuritic chest pain or rigors and no sputum production. A chest x-ray shows diffuse perihilar infiltrates. The patient's condition worsens while on levofloxacin. A methenamine silver stain of bronchial washings shows cyst-like structures. Which of the following is correct?

- a. Definitive diagnosis can be made by serology.
- b. The organism will grow after 48 hours.
- c. History will likely provide important clues to the diagnosis.
- d. Cavitory disease is likely to develop.
- e. The infection is unlikely to recur.

- 22.** A 40-year-old woman cuts her finger while cooking in her kitchen. Two days later she becomes rapidly ill with fever and shaking chills. Her hand becomes painful and mildly erythematous. Later that evening her condition deteriorates as the erythema progresses and the hand becomes dusky red. Bullae and decreased sensation to touch develop over the involved hand. What is the most important next step in the management of this patient?
- Surgical consultation and exploration of the wound
  - Treatment with clindamycin for mixed aerobic-anaerobic infection
  - Treatment with penicillin for clostridial infection
  - Vancomycin to cover community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA)
  - Evaluation for acute osteomyelitis
- 23.** A 25-year-old man from East Tennessee has been ill for 5 days with fever, chills, and headache when he notes a rash that develops on his palms and soles. In addition to macular lesions, petechiae are noted on the wrists and ankles. The patient has recently returned from a summer camping trip. Which of the following is the most important aspect of the history?
- Exposure to contaminated springwater
  - Exposure to raw pork
  - Exposure to ticks
  - Exposure to prostitutes
  - Exposure to mosquitos
- 24.** A 49-year-old man has a history of athlete's foot but is otherwise healthy when he develops sudden onset of fever and pain in the right foot and leg. On physical examination, the foot and leg are fiery red with a well-defined indurated margin that appears to be rapidly advancing. There is tender inguinal lymphadenopathy. Which organism is the most likely cause of this infection?
- Staphylococcus epidermidis*
  - Tinea pedis
  - Streptococcus pyogenes*
  - Mixed anaerobic infection
  - Alpha-hemolytic streptococci
- 25.** An 18-year-old male patient has been seen in the clinic for urethral discharge. He is treated with IM ceftriaxone, but the discharge has not resolved and the culture has returned as no growth. Which of the following is the most likely etiologic agent to cause this infection?
- Ceftriaxone-resistant gonococci
  - Chlamydia psittaci*
  - Chlamydia trachomatis*
  - Herpes simplex virus
  - Chlamydia pneumoniae*
- 26.** A 70-year-old nursing home resident is admitted to the hospital for pneumonia and treated for 10

days with levofloxacin. She improves but develops diarrhea 1 week after discharge, with low-grade fever, mild abdominal pain, and 2 to 3 watery, nonbloody stools per day. Polymerase chain reaction (PCR) for *Clostridium difficile* toxin in a stool sample is positive. The patient is treated with oral metronidazole, but does not improve after 10 days. Diarrhea has increased and fever and abdominal pain continue. What is the best next step in the management of this patient?

- Obtain *C difficile* enzyme immunoassay.
- Continue metronidazole for at least 2 more weeks.
- Switch treatment to oral vancomycin.
- Hospitalize patient for fulminant *C difficile*-associated disease.
- Use fecal microbiota transplantation.

**27.** A college wrestler develops cellulitis after abrading his skin during a match. He is afebrile and appears well, but the lateral aspect of his arm is red and swollen with a draining pustule. Gram stain of the pus shows gram-positive cocci in clusters. Which of the following statements is correct?

- The patient will require hospital admission and treatment with intravenous vancomycin.
- The organism will almost always be sensitive to oxacillin.
- The organism is likely to be sensitive to trimethoprim-sulfamethoxazole.
- Community-acquired methicillin-resistant staphylococci have the same sensitivity pattern as hospital-acquired methicillin-resistant staphylococci.
- The infection is likely caused by streptococci.

**28.** A 27-year-old man has fever, macular rash, and lymphadenopathy. He had unprotected sex with a male partner 2 weeks before the onset of these symptoms and has just learned that the partner is infected with human immunodeficiency virus (HIV). The patient's rapid HIV test is negative. What is the best test to evaluate this patient for HIV infection?

- HIV enzyme-linked immunosorbent assay (ELISA)
- PCR for HIV RNA
- Western blot testing
- Glycoprotein 120 ELISA testing
- PCR for HIV DNA

**29.** A businessman traveling around the world asks about prevention of malaria. He will travel to India and the Middle East and plans to visit several small towns. What is the most appropriate advice for the traveler?

- Common sense measures to avoid malaria such as use of insect repellants, bed nets, and suitable clothing have not really worked in preventing malaria.
- The decision to use drugs effective against resistant-*P falciparum* malaria will depend on the knowledge of local patterns of resistance and the patient's very specific travel plans.
- Prophylaxis should be started the day of travel.
- Chemoprophylaxis has been proven to be entirely reliable.
- He should stay inside at the noon as this is the mosquito's peak feeding time.

**30.** A 36-year-old man with history of acute myelogenous leukemia is admitted to the ICU with neutropenic fever and low blood pressure that requires norepinephrine drip. The patient finished his first cycle of chemotherapy 10 days ago. He denies respiratory, gastrointestinal, or urinary symptoms. CBC reveals mild thrombocytopenia and an absolute neutro-phil count of  $100/\mu\text{L}$ . Urinalysis is within normal limits and chest x-ray does not show any infiltrate. Awaiting culture results, which of the following antibiotic regimens is most appropriate?

- a. Imipenem
- b. Vancomycin
- c. Vancomycin, piperacillin/tazobactam, and tobramycin
- d. Cefepime, levofloxacin, and amphotericin B
- e. Continue supportive measures awaiting culture results

**31.** A 62-year-old man presents to his new primary care physician for a first visit. The patient has not seen a doctor for more than 10 years. He has mild intermittent bronchial asthma. The patient is sexually active with a single long-term partner. He does not recall receiving any vaccines since childhood. Which of the following vaccines should be offered?

- a. Pneumococcal, influenza, zoster, and tetanus-diphtheria-acellular pertussis (Tdap)
- b. Pneumococcal, influenza, zoster, and tetanus-diphtheria (Td)
- c. Pneumococcal, influenza, and HPV
- d. Pneumococcal, influenza, and tetanus-diphtheria-acellular pertussis (Tdap)
- e. Pneumococcal, influenza, and meningococcal

**32.** A 60-year-old woman is admitted to the hospital in septic shock secondary to a urinary tract infection (UTI). The patient is started on antibiotics awaiting culture results. She improves with complete resolution of her symptoms. The patient continues to have a urinary catheter in place. On the 10th hospital day, she is discharged to a rehabilitation facility. As a part of the routine admission orders, urinalysis and culture are ordered. The patient denies fever, abdominal pain, nausea, or vomiting. The urinalysis shows 5 to 10 white blood cells and a negative dipstick for nitrite and leukocyte esterase, but the culture grows more than  $10^5$  colonies of *Candida albicans*. Which of the following is the best course of action?

- a. Start antifungal therapy with fluconazole
- b. Continue broad-spectrum antibiotics
- c. Remove the urinary catheter
- d. Encourage water intake and continue to observe
- e. Remove the urinary catheter and start liposomal amphotericin B

**33.** An 18-year-old high school student presents to the emergency room with a 1-day history of right knee pain, swelling, and redness. He is a quarterback on the school's football team. He remembers falling on the knee while practicing 2 days ago. The knee is tapped and 15 mL of cloudy fluid is sent for cell count, Gram stain, and culture. The Gram stain shows gram-positive cocci in clusters. Which of the following is the best course of action?

- a. Start vancomycin and consult orthopedic surgery.
- b. Consult orthopedic surgery.

- c. Start linezolid awaiting culture results.
- d. Start ceftriaxone.
- e. Start telavancin and order MRI of the knee.

**34.** A 40-year-old man presents to the emergency room with a 1-week history of fever, rigors, and generalized weakness. The patient denies recent travel or sick contacts but admits to intravenous drug use. On examination, he has splinter and subconjunctival hemorrhages. Cardiac examination shows a holosystolic murmur over the left lower sternal boarder. There are no other localizing signs. Chest x-ray and urinalysis are negative. After obtaining blood cultures, the patient is started on intravenous antibiotics and admitted to the medical floor. Twenty-four hours later, all sets of blood cultures grow gram-positive cocci in clusters. A transthoracic echocardiogram is negative for vegetations. Which of the following is the best course of action?

- a. Place a peripherally inserted central catheter (PICC) and start vancomycin.
- b. Repeat blood cultures to confirm the positive cultures were not contaminants.
- c. Order a transesophageal echocardiogram.
- d. Continue vancomycin till the patient becomes afebrile, then discharge him on PO linezolid to finish a total of 2 weeks.
- e. Order a three-phase bone scan.

**35.** A 20-year-old woman presents with a 2-day history of dysuria, lower abdominal pain, and low-grade fever. Her urine is cloudy with pyuria and abundant gram-positive bacteria. She is a college student who is sexually active with no previous history of sexually transmitted diseases. Which organism is most likely responsible for this woman's symptoms?

- a. *Enterococcus faecalis*
- b. *Escherichia coli*
- c. *Neisseria gonorrhoeae*
- d. *Staphylococcus saprophyticus*
- e. *Candida albicans*

## Questions 36 and 37

Select the fungal agent most likely responsible for the disease process described. Each lettered option may be used once, more than once, or not at all.

- a. *Histoplasma capsulatum*
- b. *Blastomyces dermatitidis*
- c. *Coccidioides immitis*
- d. *Cryptococcus neoformans*
- e. *Candida albicans*
- f. *Aspergillus fumigatus*
- g. *Mucor* species

**36.** A 48-year-old painter presents with fever, cough, and shortness of breath. His symptoms develop 10 days after he remodeled a house in Indiana. Chest x-ray shows interstitial infiltrates and hilar

lymphadenopathy.

**37.** A diabetic patient is admitted with elevated blood sugar and acidosis. The patient complains of headache and sinus tenderness and has black, necrotic material draining from the nares.

### Questions 38 and 39

Match each clinical description with the appropriate infectious agent. Each lettered option may be used once, more than once, or not at all.

- a. Herpes simplex virus
- b. Epstein-Barr virus
- c. Parvovirus B19
- d. *Listeria monocytogenes*
- e. *Acinetobacter baumannii*
- f. *Enterococcus faecalis*

**38.** A 33-year-old elementary school teacher presents with fever, sore throat, and diffuse, lacy rash. She subsequently develops arthralgia of small joints of the hand.

**39.** A 30-year-old pregnant woman develops severe sepsis with headache and neck stiffness after eating coleslaw, soft cheese, and cantaloupes at a potluck dinner. Two other women who attended the event develop self-limiting abdominal cramps, nausea, and vomiting.

### Questions 40 and 41

Match the clinical description with the most appropriate isolation precaution. Each lettered option may be used once, more than once, or not at all.

- a. Standard precautions
- b. Contact precautions
- c. Droplet precautions
- d. Airborne precautions

**40.** An 18-year-old college student presents with fever, headache, neck stiffness, and petechial rash on his ankles. Lumbar puncture shows abundance of white blood cells with extracellular as well as intracellular gram-negative diplococci.

**41.** A 60-year-old nursing home resident presents with a 3-day history of progressive shortness of breath and cough. The lung examination reveals right basilar crackles. The chest x-ray shows right lower lobe consolidation. Sputum culture grows methicillin-resistant *Staphylococcus aureus* (MRSA).

### Questions 42 to 45

Match the clinical description with the most likely etiologic agent. Each lettered option may be used



once, more than once, or not at all.

- a. *Aspergillus flavus*
- b. *Coccidioides immitis*
- c. Herpes simplex virus type 1
- d. Herpes simplex virus type 2
- e. Hantavirus
- f. Coxsackievirus B
- g. Human parvovirus

**42.** A 50-year-old develops sudden onset of bizarre behavior. CSF shows 80 lymphocytes; MRI shows temporal lobe abnormalities.

**43.** A patient with a previous history of tuberculosis now complains of hemoptysis. Chest x-ray reveals an upper lobe mass with a cavity and a crescent-shaped air-fluid level.

**44.** A Filipino patient develops a pulmonary nodule after travel through Arizona and South California.

**45.** A 35-year-old male patient complains of fever, cough, and sore throat. Several days later, he develops retrosternal chest pain, with diffuse ST-segment elevations on ECG.

# Infectious Disease

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## *Answers*

- 1. The answer is c.** This patient, with the development of hoarseness, breathing difficulty, and stridor, is likely to have acute epiglottitis. Because of the possibility of impending airway obstruction, the patient should be admitted to an intensive care unit for close monitoring. The diagnosis can be confirmed by indirect laryngoscopy or soft tissue x-rays of the neck, which may show an enlarged epiglottis. Otolaryngology consult should be obtained. The most likely organism causing this infection is *H influenzae*. Many of these organisms are lactamase producing and would be resistant to ampicillin. A third-generation cephalosporin or beta-lactamase-resistant semisynthetic penicillin would be appropriate empiric choices for therapy. Streptococcal pharyngitis can cause severe pain on swallowing, but the infection does not descend to the hypopharynx and larynx. Lateral neck films would be more useful than a chest x-ray. Classic finding on lateral neck films would be the thumbprint sign. Infectious mononucleosis often causes exudative pharyngitis and cervical lymphadenopathy but not stridor.
- 2. The answer is a.** Ear pain and drainage in an elderly diabetic patient must raise concern about malignant external otitis. The swelling and inflammation of the external auditory meatus strongly suggest this diagnosis. This infection usually occurs in older, poorly controlled diabetics and is almost always caused by *P aeruginosa*. It can invade contiguous structures including facial nerve or temporal bone and can even progress to meningitis. *Streptococcus pneumoniae*, *H influenzae*, and *M catarrhalis* frequently cause otitis media, but not external otitis. *Candida albicans* almost never affects the external ear.
- 3. The answer is b.** Diffuse rash involving palms and soles should suggest the possibility of secondary syphilis. The hypertrophic, wart-like lesions around the anal area, called *condyloma lata*, are specific for secondary syphilis. The VDRL slide test will be positive in all patients with secondary syphilis. Rash and lymphadenopathy would not be found if the perianal lesions were due to HPV. *Chlamydia* infections cause urethritis with mucopurulent discharge from the penile meatus but not the rash or hypertrophic skin changes. Blood cultures might be drawn to rule out bacterial infection such as chronic meningococcemia; however, the clinical picture is not consistent with a systemic bacterial infection. Biopsy of the condyloma is not necessary in this setting, as regression of the lesion with treatment will distinguish it from genital wart (*condyloma acuminatum*) or squamous cell carcinoma. Penicillin continues to be the drug of choice for all stages of syphilis.
- 4. The answer is c.** This previously healthy male has developed acute bacterial meningitis as evident by meningeal irritation with a positive Brudzinski sign, and a CSF profile typical for bacterial meningitis (elevated white blood cell count, high percentage of polymorphonuclear leukocytes, elevated protein, and low glucose). The patient likely has concomitant pneumonia. This combination suggests pneumococcal infection. Because of the potential for beta-lactam resistance, the

recommendation for therapy prior to availability of susceptibility data is ceftriaxone and vancomycin. A short course of dexamethasone started before or with the first dose of antibiotics is recommended in suspected bacterial meningitis cases. Dexamethasone decreases adverse neurological sequelae of meningitis and has been associated with lower mortality. Though herpes simplex can be seen in young healthy patients, the clinical picture and CSF profile are not consistent with this infection. The CSF in herpes simplex encephalitis shows a lymphocytic predominance and normal glucose. *Listeria monocytogenes* meningitis is a concern in alcoholic, immunocompromised, or elderly patients. Gram stain would show gram-positive rods. *Neisseria meningitidis* is the second commonest cause of bacterial meningitis but rarely causes pneumonia (the portal of entry is the nasopharynx). Although penicillin G still kills the meningococcus, empiric therapy should cover all likely pathogens until Gram stain and culture results are available. Because the patient has no papilledema and no focal neurologic findings, treatment should not be delayed to obtain CT or MRI scan.

**5. The answer is d.** The patient has a flu-like illness with hemorrhagic tendency as manifested by hemoptysis and petechiae. A hemorrhagic fever, which is worrisome for Ebola virus in this case, is the most likely diagnosis given her signs, symptoms, and recent travel to an area of Africa known to have Ebola virus present. Other hemorrhagic fever syndromes include yellow fever, dengue fever, Lassa fever, Marburg, and hantavirus. The pathogenesis of this illness involves vascular bed infection leading to microvascular damage and changes in vascular permeability with subsequent organ dysfunction. The patient should be admitted under strict airborne and contact precautions and supportive measures provided for any ensuing organ failure. There is no known effective antiviral therapy for Ebola virus, and vaccine development is in progress at the time of this writing. Furthermore, this symptomatic patient's close contacts should be identified and observed closely for 21 days since last exposure to the index patient's body fluids.

Malaria, caused by *Plasmodium* species, could present in a similar fashion but taking her malaria prophylaxis makes the diagnosis less likely. *S typhi* and *S paratyphi*, are the most common causes of typhoid fever in the returning traveler but the petechiae, hemoptysis, and lack of abdominal pain make this diagnosis unlikely. Influenza is endemic in the tropics year round, but hemorrhagic tendencies are uncommon with this viral infection. Tuberculosis has a subacute presentation and would be unlikely to present as an acute hemorrhagic fever.

**6. The answer is d.** The patient has health care-associated pneumonia. He was started on broad-spectrum antibiotics to cover likely pathogens, which include MRSA and resistant gram-negative bacteria such as *P aeruginosa*. His condition improved markedly and the culprit bacterium in his case was not as resistant as feared. Furthermore, his pneumonia was not complicated by cavitation or empyema, and he did not have vomiting or diarrhea to preclude finishing his antibiotic course orally. This case represents an opportunity for antibiotic de-escalation, which involves the practice of starting with a broad-spectrum empiric antibiotic regimen (designed to avoid inadequate therapy) combined with a commitment to change from broad to narrow-spectrum therapy and from multiple agents to fewer medications. Continuing all of the empirically chosen antibiotics puts this patient at risk for drug-drug interaction and *C difficile* infection and is not justifiable given the susceptible culprit isolated. De-escalation is an example of antimicrobial stewardship, a coordinated effort that aims at optimizing clinical outcomes while minimizing antibiotic toxicity, cost, and resistant bacteria selection. Discharging the patient on meropenem or piperacillin/tazobactam would have been an appropriate choice had this been a mixed infection (aspiration pneumonia, for example).

Trimethoprim/sulfamethoxazole is an inappropriate choice given the reported sulfa allergy. This patient's *Klebsiella* is resistant to ampicillin and cefazolin.

**7. The answer is c.** This young man presents with classic signs and symptoms of infectious mononucleosis. In a young patient with fever, pharyngitis, lymphadenopathy, and lymphocytosis, the peripheral blood smear should be evaluated for atypical lymphocytes. A heterophile antibody test should be performed. The symptoms described in association with atypical lymphocytes and a positive heterophile test are virtually always caused by Epstein-Barr virus. Neither liver biopsy nor lymph node biopsy is necessary. Workup for toxoplasmosis, cytomegalovirus infection, or HIV infection would be considered in heterophile-negative patients. Antistreptolysin O titer is used to diagnose acute rheumatic fever (ARF) but ARF causes joint and cardiac manifestations, not lymphadenopathy and hepatitis as in this case.

**8. The answer is a.** The history and physical examination suggest amebic liver abscess. Symptoms usually occur 2 to 5 months after travel to an endemic area. Diarrhea usually occurs first but resolves before the hepatic symptoms develop. The most common presentation for an amebic liver abscess is abdominal pain, usually in the RUQ. Amebic serology using enzyme immunoassay (EIA) is a sensitive test and is positive in more than 90% of patients. Ultrasound has 75% to 85% sensitivity and shows abscess with well-defined margins. Stool will not show the trophozoite at this stage of the disease process. Blood cultures and broad-spectrum antibiotics would be ordered in cases of pyogenic liver abscess, but this patient's travel history, the chronicity of his illness, and his lack of clinical toxicity suggest *Entamoeba histolytica* as the probable cause. Aspiration is not necessary unless rupture of abscess is imminent. Metronidazole remains the drug of choice for amebic liver abscess.

**9. The answer is c.** A painful vesicular rash in a dermatomal distribution strongly suggests herpes zoster, although other viral pathogens may also cause vesicles. Herpes zoster may involve the eyelid when the first or second branch of the fifth cranial nerve is affected. Prompt treatment with an antiviral such as acyclovir, valacyclovir, or famciclovir shortens symptomatic illness and decreases the chance of post-zoster neuralgia. Impetigo is a cellulitis caused by group A-hemolytic streptococci. It often involves the face and can occur after an abrasion of the skin. Its distribution is not dermatomal, and it rarely causes severe pain. Chickenpox produces vesicles in various stages of development that are diffuse and produce more pruritus than pain. Coxsackievirus can produce a morbilliform vesiculopustular rash, often with a hemorrhagic component and with lesions of the throat, palms, and soles. Herpes simplex virus (HSV) causes lesions of the lip (herpes labialis) but does not spread in a dermatomal pattern.

**10. The answer is d.** All of the given diagnoses can cause epigastric or RUQ abdominal pain, but jaundice makes cholangitis the most likely diagnosis. Fever, RUQ abdominal pain, and jaundice are called Charcot triad and are highly suggestive of cholangitis. The bacteria implicated in this infection include gut flora including Enterobacteriaceae and anaerobes. The negative urinalysis argues against UTI, and the presence of leukocytosis and fever would be unusual in uncomplicated gastritis. Upper abdominal pathologies are often associated with basal atelectasis and sometimes sympathetic effusion, accounting for the diminished breath sounds in this case. Right lower lobe pneumonia can cause abdominal pain, but you would expect cough with sputum production and signs of consolidation

on physical examination. Alongside broad-spectrum antibiotics, this patient needs abdominal ultrasound to evaluate the biliary tree; she might need endoscopic retrograde cholangiopancreatography (ERCP) or surgery to relieve any biliary obstruction.

**11. The answer is c.** This patient's symptoms and time course are consistent with stage 2 Lyme disease. A few weeks after a camping trip and presumptive exposure to the *Ixodes* tick, the patient developed a rash consistent with erythema migrans (stage 1). Secondary neurologic, cardiac, or arthritic symptoms occur weeks to months after the rash. Facial nerve palsy is one of the more common signs of stage 2 Lyme disease; it may be unilateral (as in this case) or bilateral. Stage 3 Lyme disease occurs months to years later and is characterized by recurrent and sometimes destructive oligoarticular arthritis. Sarcoidosis can cause facial palsy, but there are no other signs or symptoms (such as lymphadenopathy) to suggest this disease. Idiopathic Bell palsy would not account for the previous rash or the exposure history. Syphilis always needs to be considered in the same differential with Lyme disease, but the rash described would be atypical, and the neurologic findings of secondary syphilis are usually associated with mild meningeal inflammation. The upper motor neuron involvement of lacunar infarct would spare the upper forehead.

**12. The answer is b.** The patient's presentation and laboratory workup strongly suggest encephalitis. Currently, WNV is the most common cause of epidemic viral encephalitis in the United States; it is transmitted via mosquito bites hence cases present during summer months. The majority of WNV infections are subclinical or cause a flu-like illness called West Nile fever. Elderly and immunocompromised patients are at high risk for encephalitis. They present with headache, fever, altered level of consciousness, and, in some cases, focal weakness and extrapyramidal features such as tremor. HSV is the most common cause of endemic viral encephalitis. The virus has a predilection to involve the temporal lobes and to cause seizures.

Patients with bacterial meningitis have higher white blood cell counts with predominance of neutrophils, low CSF glucose levels, and elevated CSF protein levels.

The negative CT head despite symptoms present for 48 hours argues against an embolic stroke or subarachnoid hemorrhage. Patients with ischemic strokes do not have CSF pleocytosis, and patients with subarachnoid hemorrhage have much higher CSF red blood cell count. Tuberculosis can cause chronic aseptic meningitis and can be associated with cranial nerve palsies. The case at hand did not have any risk factors for tuberculosis.

**13. The answer is c.** The patient has a health care-associated UTI complicated by gram-negative bacteremia. The complete identification of gram-negative rods might take 48 hours. Knowing the ability of the growing bacteria to ferment lactose might help in the early prediction of the likely pathogen at hand. Among lactose fermenting gram-negative rods, Enterobacteriaceae such as *E coli* are most common. Among non-lactose-fermenting oxidase-positive gram-negative bacteria, *Pseudomonas aeruginosa* is most common. Ceftriaxone, imipenem, and trimethoprim-sulfamethoxazole can be used to treat UTIs while moxifloxacin and tigecycline do not achieve high enough concentration in urine to be used for this indication. Of the listed antibiotics, imipenem, which is a carbapenem beta-lactam antibiotic, is the only one with anti-pseudomonal activity. Antibiotics with anti-pseudomonal activity include certain penicillins (piperacillin/tazobactam and ticarcillin/clavulanic acid), cephalosporins (ceftazidime and cefepime), carbapenems (imipenem, meropenem, and doripenem), fluoroquinolones (ciprofloxacin and levofloxacin), and

aminoglycosides (gentamicin, tobramycin, and amikacin).

**14. The answer is b.** Influenza A is a potentially lethal disease in the elderly and chronically debilitated patient. In institutional settings such as nursing homes, outbreaks are likely to be particularly severe. Thus, prophylaxis is extremely important in this setting. All residents should receive the influenza vaccine unless they have known egg allergy (patients can choose to decline the vaccine). Since protective antibodies to the vaccine will not develop for 2 weeks, oseltamivir can be used for protection against influenza A during the interim 2-week period. Because of increasing resistance, amantadine is no longer recommended for prophylaxis. The best way to prevent influenza-associated pneumonia is to prevent the outbreak in the first place.

**15. The answer is d.** The presentation strongly suggests vertebral osteomyelitis. MRI is sensitive and specific for the diagnosis of vertebral osteomyelitis and is the diagnostic procedure of choice. MRI will reveal the extent of contiguous disc and soft tissue involvement and will help assess for pending neurological compromise. The vertebrae are a common site for hematogenous osteomyelitis. Prior UTI is often the primary mechanism for bacteremia and vertebral seeding. Blood cultures at the time of presentation are positive in fewer than half of all cases. Treatment requires 6 to 8 weeks of antibiotics, but surgery is rarely required for cure.

**16. The answer is c.** Multiple mechanisms account for bacterial antibiotic resistance. They can be classified into three major groups: enzymatic antimicrobial breakdown, reduced intracellular antibiotic concentration, and alteration of the antibiotic target. The above mechanisms can coexist. Penicillin resistance in *S pneumoniae* (and in *S aureus* and some gram-negative bacteria) is mediated through changing the antibiotic target. In the case of *S pneumoniae* that target is the penicillin-binding protein. Beta-lactamases are the most common example of the first mechanism. Beta-lactamase inhibitors such as sulbactam and tazobactam can inactivate those enzymes. Downregulation of small cell membrane channels (porins) prevents antibiotics from entering bacterial cells. On the other hand, some bacteria are able to pump the antibiotics that have already entered the cell out using efflux pumps. Those pumps can coexist in the setting of downregulated porins, both of which prevent the antibiotics from achieving high enough concentration at their intracellular site of action.

**17. The answer is a.** The symptoms and time of onset after consumption of contaminated food determine the pathogenesis and agents likely responsible for food-borne illness. Nausea and vomiting within 1 to 6 hours of consumption of food are caused by preformed toxins of *Bacillus cereus* and *S aureus* or heavy metals such as copper or zinc. Abdominal cramps and diarrhea that develop more than 8 hours after a meal are caused by *Campylobacter jejuni*, *E coli*, *Salmonella*, *Shigella*, and *Vibrio parahaemolyticus*. It takes more than 8 hours for the bacteria to proliferate in the gut, invade intestinal mucosa, and initiate the infection. Invasion of colonic mucosa is expected to cause diarrhea. Watery diarrhea can also be caused by enterotoxigenic *E coli*, *Vibrio cholerae*, and Norovirus. Enterotoxigenic *E coli* and *V cholerae*, in particular, produce toxins that target enterocytes and cause the previously described manifestations. *Yersinia enterocolitica* can cause fever and abdominal cramps without diarrhea—a presentation closely resembling acute appendicitis. Cryptosporidiosis, cyclosporiasis, and giardiasis cause diarrhea that can persist for 1 to 3 weeks. *Giardia* proliferates in the proximal small intestine and can cause malabsorption symptoms. The onset of symptoms in these parasitic diseases is more gradual; fever and systemic toxicity are absent.