Infectious Diseases in the Emergency Department: Review Questions

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QUESTIONS

Choose the single best answer for each question.

Questions 1 and 2 refer to the following case.

An 82-year-old man weighing 154 lb with chronic kidney disease and a history of hemorrhagic stroke that occurred 2 months prior presents to the emergency department (ED) with cough and confusion. Rectal temperature is 104.1°F, respiratory rate is 32 breaths/min, and oxygen saturation is 91% on room air. On examination, rhonchi are noted as well as a pronounced neurologic deficit from his previous stroke. Laboratory testing reveals leukopenia and a blood urea nitrogen level of 70 mg/dL. A chest radiograph reveals a left lower lobe consolidation. The patient is diagnosed with community-acquired pneumonia (CAP).

1. **In addition to providing supplemental oxygen and antipyretics, which of the following is the most appropriate in the management of this patient?**
   (A) Administer an intravenous (IV) macrolide and discharge home on oral formulation
   (B) Administer oral doxycycline within 4 hours and admit to a floor bed for observation
   (C) Obtain blood cultures, administer IV piperacillin-tazobactam, and admit to the intensive care unit (ICU)
   (D) Obtain blood cultures, administer IV ceftriaxone and a respiratory fluoroquinolone, and admit to the ICU
   (E) Obtain blood cultures, administer IV vancomycin within 4 hours, and admit to the ICU

2. **While in the ED, the patient becomes transiently hypotensive, which resolves with 1 L of normal saline administered as an IV bolus. A serum lactate level is 6.2 mmol/L. Which of the following interventions has been shown to reduce mortality in this setting?**
   (A) Corticosteroids
   (B) Early goal-directed therapy (EGDT)
   (C) Mechanical ventilation with tidal volumes of 10 mL/kg and low respiratory rate
   (D) Procalcitonin
   (E) Recombinant-activated protein C

3. **A 77-year-old man presents to the ED with a 5-day history of burning and aching on his left flank. He developed a rash 1 day prior to presentation. Physical examination reveals an erythematous rash with clusters of clear vesicles in a single dermatome distribution on his back. Which of the following is the preferred treatment?**
   (A) Acyclovir
   (B) Gabapentin
   (C) Lidocaine 5% patch
   (D) Prednisone
   (E) Valcyclovir

4. **A 25-year-old man presents to the ED for evaluation of multiple skin eruptions. The patient reports that he may have been bitten by a spider. Physical examination reveals a well-appearing man with normal vital signs and multiple raised red lesions with necrotic areas. Given the high prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in the area, the patient is diagnosed with community-acquired MRSA (CA-MRSA). Which of the following is the most appropriate antibiotic?**
   (A) Cephalexin orally
   (B) Ciprofloxacin orally
   (C) Erythromycin orally
   (D) Trimethoprim-sulfamethoxazole (TMP-SMX) orally
   (E) Vancomycin intravenously

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5. **A 44-year-old man presents to the ED with 16 hours of fever, headache, and neck stiffness. On physical examination, the patient is alert and oriented with a normal neurologic examination except for meningismal signs. Antibiotics and dexamethasone are ordered. Which of the following is true when using dexamethasone to treat meningitis?**
   (A) Administration increases the risk of gastrointestinal bleeding
   (B) Administration should occur before or with the first dose of antibiotics
   (C) Administration increases blood-brain permeability
   (D) Administration should continue until symptoms resolve

ANSWERS AND EXPLANATIONS

1. **(D) Obtain blood cultures, administer IV ceftriaxone and a respiratory fluoroquinolone, and admit to the ICU.** The 2007 Joint Infectious Diseases Society of America/American Thoracic Society guidelines on management of adult CAP recommend the use of severity of illness scores, such as CURB-65 (confusion, uremia, respiratory rate, low blood pressure, age ≥ 65 yr) or prognostic scoring systems (eg, Pneumonia Severity Index), to assist in determining candidates for outpatient therapy.[1] Patients with 1 or more major criteria (septic shock requiring vasopressors or respiratory failure requiring mechanical ventilation) or 3 or more minor criteria (respiratory rate > 30 breaths/min; Pao_2/Fio_2 ratio < 250; multilobar infiltrates; confusion; blood urea nitrogen > 20 mg/dL; leukopenia resulting from infection; thrombocytopenia; hypothermia; or hypotension requiring aggressive fluid resuscitation) should be admitted to the ICU.[1] Pre-antibiotic blood cultures should be obtained for all CAP patients requiring ICU admission. Patients admitted to an ICU should receive a β-lactam and either azithromycin or a respiratory fluoroquinolone. If *Pseudomonas* or CA-MRSA is suspected, antibiotic choice should be altered accordingly. Rather than supporting a specific time frame in which to initiate therapy, the guidelines recommend that the first dose of antibiotics be administered in the ED;[1] however, the Joint Commission and the Centers for Medicare and Medicaid Services core measures require hospitals to publicly report time to first dose of antibiotics, with a goal of 4 hours from hospital arrival. This patient's CURB-65 and Pneumonia Severity Index scores exclude outpatient treatment. Although this patient does not meet any major criteria, he does have 3 minor criteria suggesting that admission to the ICU is appropriate. Piperacillin-tazobactam or vancomycin alone are inappropriate antibiotic choices for managing CAP.

2. **(B) EGDT.** This patient has severe sepsis. Sepsis is defined by the presence of an infection and the systemic inflammatory response syndrome (eg, hyper/hypothermia, heart rate > 90 bpm, tachypnea, altered mental status, leukocytosis/leukopenia/bandemia, or elevated C-reactive protein or procalcitonin levels).[2] Severe sepsis is sepsis plus the presence of organ dysfunction or evidence of tissue hypoperfusion (serum lactate > 4 mmol/L). EGDT consists of administering IV fluids, vasopressors, packed red blood cells, and inotropic agents to target a central venous pressure of 8 to 12 mm Hg, a mean arterial pressure of 65 to 90 mm Hg, and a central venous oxygen saturation of greater than 70% within 6 hours of identification.[3] EGDT reduced absolute mortality by 16.5% in patients with severe sepsis or septic shock compared with standard therapy in a single-center randomized trial.[4] Similar mortality reductions have been found in other studies using historical controls or comparing actual mortality with predicted mortality using APACHE II scores.[5] Corticosteroids have been shown to reduce mortality in patients with vasopressor-dependent septic shock, in those requiring mechanical ventilation, and in those who fail a cosyntropin stimulation test. However, this finding has recently been disputed in a large trial not yet published. Recombinant-activated protein C, an endogenous anticoagulant with anti-inflammatory properties, has been shown to reduce mortality in patients with an APACHE II score of 25 or more, sepsis-induced multiorgan failure, septic shock, or sepsis-induced acute respiratory distress syndrome who have no absolute contraindication related to bleeding risk (including a hemorrhagic stroke within 3 months, as in this patient). Elevated procalcitonin levels may be sensitive markers of bacterial sepsis, but procalcitonin has no therapeutic role. Protective ventilation strategies using low tidal volumes (6 mL/kg) have been associated with a reduction in mortality.

3. **(E) Valcyclovir.** Valcyclovir is the preferred treatment for this patient with classic herpes zoster. Antiviral therapy with or without corticosteroids is the mainstay of acute management of herpes zoster. Valcyclovir and famcyclovir have a superior pharmacokinetic profile and simpler dosing regimens than acyclovir.[6] Gabapentin is one of several options for postherpetic neuralgia, but it is not generally indicated in the acute setting. Lidocaine patches are used to treat postherpetic neuralgia and should only

be applied to well-healed skin with no active lesions. Anticonvulsants (nortriptyline or desipramine) and capsaicin cream can also be used for the treatment of postherpetic neuralgia.

4. **(D) TMP-SMX orally.** Oral TMP-SMX is the appropriate treatment for a well-appearing patient with CA-MRSA. CA-MRSA isolates have high rates of susceptibility to TMP-SMX, rifampin, vancomycin, and linezolid.[7,8] Many isolates of CA-MRSA are resistant to fluoroquinolones and erythromycin; thus, these antibiotics are not recommended to treat CA-MRSA infection. In most areas, clindamycin and doxycycline are potential treatment options. It is important for clinicians to be aware of local organism susceptibility patterns to appropriately treat MRSA infection.

5. **(B) Administration should occur before or with the first dose of antibiotics.** Dexamethasone administered before or with the first dose of antibiotics improves outcomes in patients with acute bacterial meningitis. The recommended dose for adults is 10 mg intravenously every 6 hours for 4 days.[9] This treatment plan does not increase the risk of gastrointestinal bleeding. Of note, dexamethasone decreases the blood-brain permeability, which could impede penetration of vancomycin into the subarachnoid space. Treatment failures have been noted in adults receiving vancomycin and dexamethasone. In children, treatment with dexamethasone did not reduce levels of vancomycin in cerebrospinal fluid.

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