

Sepsis: Review Questions

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QUESTIONS

Choose the single best answer for each question.

- 1. A 70-year-old woman who weighs 55 kg is admitted to the intensive care unit (ICU) with *Escherichia coli* urosepsis. On admission her blood urea nitrogen (BUN) is 25 mg/dL, and her serum creatinine is 1.4 mg/dL. She is treated with gentamicin 120 mg every 12 hours. A trough gentamicin level taken before the third dose is 1.8 µg/mL, and the dosage of gentamicin is not changed. By the eighth ICU day, her BUN and serum creatinine increase to 78 mg/dL and 4.3 mg/dL, respectively, and her urine output decreases. The gentamicin is stopped. Her serum creatinine peaks on the 12th hospital day and then declines to 2.3 mg/dL by the end of the third week. Which one of the following dosing/drug regimens is most likely to have reduced the risk of renal toxicity in this patient?**

 - Concomitant low-dose dopamine (2 µg/kg/min)
 - Gentamicin 200 mg once daily
 - Gentamicin 100 mg once daily
 - Tobramycin 100 mg every 12 hours
 - Netilmicin 100 mg every 12 hours
 - 2. A 67-year-old man with a history of chronic obstructive pulmonary disease (COPD), hypertension, and chronic renal failure is admitted to the ICU with community-acquired pneumonia. His treatment includes broad-spectrum antibiotics, corticosteroids, and inhaled β₂ stimulants. Due to a severe ileus and gastric intolerance, total parenteral nutrition is commenced. The patient's temperature normalizes after the third day in ICU, and his oxygenation improves. However, on the ninth hospital day he develops a fever with an increase in the peripheral leukocyte count. Antibiotics are stopped; and blood, urine, and sputum cultures are performed. *Candida krusei* is isolated from a single blood culture, and 60,000 CFU/mL of *C. krusei* is isolated from the urine. Which of the following is**
- the most appropriate next step in the management of this patient?**
- Remove, culture, and replace all vascular catheters.
 - Remove, culture, and replace all vascular catheters and begin intravenous (IV) fluconazole.
 - Remove, culture, and replace all vascular catheters and begin IV amphotericin.
 - Remove, culture, and replace all vascular catheters; replace urinary catheter; and begin amphotericin bladder irrigations.
 - Repeat the blood and urine cultures and observe the patient.
- 3. A 55-year-old man with a history of COPD is admitted to the ICU with severe community-acquired pneumonia and respiratory failure. A chest radiograph shows bilateral lower lobe consolidation. Gram's stain of the patient's sputum reveals numerous inflammatory cells as well as gram-negative and gram-positive organisms with no predominant organism. Which one of the following is the most appropriate empiric antibiotic regimen?**

 - Ceftazidime
 - Ceftriaxone and erythromycin
 - Erythromycin
 - Ampicillin with sulbactam and doxycycline
 - Cefuroxime

(turn page for answers)

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EXPLANATION OF ANSWERS

1. (C) Gentamicin 100 mg once daily. The half-life of aminoglycosides is considerably longer in the elderly because of decreased glomerular filtration with age. Because the diminution of glomerular function in the elderly is not necessarily reflected in a higher serum creatinine level, the calculated creatinine clearance is used to estimate the clearance of aminoglycosides. The clearance of aminoglycosides is linearly related to the endogenous creatinine clearance; therefore, the ratio of calculated to normal creatinine clearance closely approximates the ratio of aminoglycoside clearance. This patient's calculated creatinine clearance is approximately 35 mL/min. Using a daily dose of 5 mg/kg of gentamicin (or tobramycin or netilmicin) this patient should have received a daily dose of $(35/100) \times 5 \text{ mg/kg} \times 55 \text{ kg} = 96 \text{ mg}$ (rounded to 100 mg). No clinical data exist to suggest that the incidence of nephrotoxicity is less with either tobramycin or netilmicin. Data from several clinical studies suggest that a once-daily dosing regimen is at least as efficacious as the standard dosing regimen and may be less toxic.¹⁻³

2. (C) Remove, culture, and replace all vascular catheters and begin IV amphotericin. The risk factors for *Candida* intravascular infection include use of broad-spectrum antibiotics, total parenteral nutrition, and immunosuppressive therapy. Because a single positive blood culture is highly predictive of systemic candida infection, it should never be considered a contaminant. The initial treatment of *Candida* infections includes removal of all possible foci of infection, including removal of intravascular lines. Candidemia may resolve spontaneously after removal of intravascular catheters. However, increasing evidence suggests that metastatic foci of infection may develop in some patients even after catheter removal and may manifest as endophthalmitis, endocarditis, arthritis, or meningitis. Therefore, all critically ill patients with candidemia should be regarded as having systemic infection and should be treated accordingly.⁴ Fluconazole and amphotericin demonstrate similar effectiveness in treating candidemia in patients without neutropenia and without major immunodeficiency.^{5,6} However, both in vitro and clinical data have demonstrated *C. krusei* to be intrinsically resistant to fluconazole. Prolonged bladder catheterization in the critically ill patient is often accompanied by the appearance of candiduria. Candiduria usually reflects catheter colonization; however, rarely, *Candida* species may cause cystitis and/or retrograde renal parenchymal infection. The management of asymptomatic candiduria in the catheterized patient, in whom no suspicion of renal candidiasis or

renal obstruction exists, requires change of the indwelling catheter only, followed by observation. No data suggest that amphotericin B bladder irrigations prevent infections in colonized patients.

3. (B) Ceftriaxone and erythromycin. The etiologic agents of severe community-acquired pneumonia include *Streptococcus pneumoniae*, *Legionella* species, aerobic gram-negative bacilli, *Mycoplasma pneumoniae*, respiratory viruses, and *Haemophilus influenzae*. The presence of numerous inflammatory cells in the sputum indicates that the specimen is adequate. The absence of a predominant organism suggests that *Legionella* or *Mycoplasma* are likely pathogens. The chest radiograph is atypical for respiratory viruses. *Legionella* species are particularly likely to cause pneumonia in elderly patients with comorbid disease. According to the guidelines of the American Thoracic Society and the British Thoracic Society, the initial treatment of severe hospitalized community-acquired pneumonia should include a macrolide antibiotic together with a third-generation cephalosporin.^{7,8}

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