**Case Vignette:**

**History of Present Illness:** A 62-year-old man presented to the hospital 7 days ago with a ruptured aneurysm leading to a subarachnoid hemorrhage and now requires ventilator support. He complained of having “the worst headache of his life” before admission to the hospital.

**Medical History:** Previous coiling of aneurysms; hypertension

**Social History:** Nonsmoker, nondrinker

**Medications before admission:** Lisinopril 20 mg daily; amlodipine 10 mg daily

**Allergies:** NKDA (no known drug allergies)

**Vital Signs (today):** Temperature (Temp) 39.2°C (102.6°F); blood pressure (BP) 86/69 mm Hg; respiratory rate (RR) 25 breaths/minute; heart rate (HR) 95 beats/minute

**Laboratory Values (today):** Potassium 5.2 mg/dL; SCr 3.2 mg/dL ;WBC 20 x 103/mm3; platelet count 76,000/mm3 ; lactate is 5.5 mmol/L; all other values within normal limits;

**Arterial Blood Gas:** pH 7.29, Pao2 85 mm Hg, Paco2 32 mm Hg, HCO3 19 mEq/L

**Procedure Data:** The chest radiograph from today (day 7 of hospitalization) shows consolidation in the right lower lobe. The patient had a central venous line placed 6 days ago (on admission).

**Other Data:** N/A

**Question 1**

The patient has required 3.5 L of normal saline (NS). His BP after the fluid boluses is 84/62 mm Hg, and he is given a preliminary diagnosis of pneumonia. Which of the following is the MOST specific classification for this patient’s condition?

1. Systemic inflammatory response syndrome (SIRS)
2. Sepsis
3. Severe sepsis
4. Septic shock

Answer: 4. Septic shock

Rationale: The correct answer is option 4, septic shock. The patient meets the criteria for septic shock (severe sepsis with hypotension, despite adequate fluid resuscitation). To meet the criteria for SIRS, a patient must have two of the following (Temp greater than 38°C, HR greater than 90 beats/minute, RR greater than 30 breaths/minute or Paco2 less than 32 mm Hg, and a WBC greater than 12 x 103 cells/mm3). Systemic inflammatory response syndrome may occur with or without the presence of infection. Sepsis is defined as the presence of a source of infection plus systemic manifestations of infection. Severe sepsis is sepsis plus organ dysfunction, hypotension, or hypoperfusion defined as lactic acidosis, systolic blood pressure (SBP) of less than 90, or SBP of 40 mm Hg or more from baseline. Systemic inflammatory response syndrome, sepsis, and severe sepsis (options 1–3 do not best describe the status of this patient, who has a source of infection and remains hypotensive despite adequate fluid [3.5 L of NS] resuscitation) and therefore meets the criteria of septic shock.

Citation: Dellinger RP, Levy MM, Rhodes A, et al. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock. Crit Care Med 2013;41:580-637.

**Question 2**

Blood cultures are ordered for this patient. Which statement best describes the number and site from which they should be drawn?

1. Two sets of cultures drawn percutaneously
2. Two sets of cultures drawn from the central line
3. One set of cultures drawn percutaneously and one set of cultures drawn from the central line
4. Two sets of cultures drawn percutaneously and two sets of cultures drawn from the central line

Answer: 3. One set of cultures drawn percutaneously and one set of cultures drawn from the central line

Rationale: Because the patient had a central venous line placed more than 48 hours earlier, one set of cultures should be drawn percutaneously and one set through the central line (option 3). All other options are incorrect.

Citation: Dellinger RP, Levy MM, Rhodes A, et al. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock. Crit Care Med 2013;41:580-637.

**Question 3**

What is the most appropriate empiric antibiotic regimen for this patient?

1. Ceftriaxone and vancomycin
2. Ceftriaxone, vancomycin and fluconazole
3. Piperacillin/tazobactam and vancomycin
4. Piperacillin/tazobactam, vancomycin and fluconazole

Answer: 3. Piperacillin/tazobactam and vancomycin

Rationale: At 7 days of admission, the patient would be considered to have a nosocomial infection (hospital-acquired pneumonia) and would need antipseudomonal coverage (option 3 is correct). The patient does not have risk factors for fungal infection (prior antibiotics, immunocompromised), so fluconazole is not needed (options 2 and 4 are incorrect). However, this patient does need antipseudomonal coverage, which option 1 does not provide.

Citations:

1. Dellinger RP, Levy MM, Rhodes A, et al. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock. Crit Care Med 2013;41:580-637.

2. Niederman MS, Craven DE, Bonten MJ. American Thoracic Society and Infectious Diseases Society of America (ATS/IDSA). Guideline for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. Am J Respir Crit Care Med 2005;171:388-416.

**Question 4**

Because fluid therapy alone failed to resolve the patient’s hypotension, vasopressor therapy with norepinephrine is initiated. Which is an appropriate resuscitation goal within the first 6 hours for this patient?

1. Central venous pressure (CVP) of 6 mm Hg
2. Central venous oxygen saturation (Scvo2) of 70% or greater
3. Mean arterial pressure (MAP) of 40 mm Hg or more
4. Lactic acid level of 4.5 mmol/L or higher

Answer: 2. Scvo2 of 70% or greater

Rationale: According to the Surviving Sepsis Campaign guidelines, appropriate goals for resuscitation include all of the aforementioned metrics; however, MAP should be 65 mm Hg or more (option 3 is incorrect), and Scvo2 should be 70% or higher, making option 2 correct. Target CVP would be 12 mm Hg or more in patients who are mechanically ventilated to account for impediment in filling (option 1 is incorrect). Normalization of lactate levels, not continued elevation, is a target, option 4 is incorrect).

Citation: Dellinger RP, Levy MM, Carlet JM, et al. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock: 2008. Intensive Care Med 2008;34:17-60.

**Question 5**

Three days later, *Klebsiella pneumoniae* is isolated from the bronchoalveolar lavage as the patient’s source of infection, and culture reveals that it is susceptible to the patient’s empiric regimen. The patient has been weaned from all pressor agents. What is the most appropriate total length of antibiotic therapy in this patient, assuming a good clinical response?

1. 3–5 days
2. 7–10 days
3. 12–14 days
4. 15–21 days

Answer: 2. 7–10 days

Rationale: Answer 2 is the correct option. Patients with sepsis should be treated with at least 7–10 of appropriate antibiotics (option 2). Longer courses of therapy are appropriate in patients with MRSA (methicillin-resistant *Staphylococcus aureus*) bacteremia or some fungal or viral infections and infections caused by *Pseudomonas* (options 3 and 4 are incorrect). Option 1 is incorrect because the duration of antibiotics is too short.

Citation: Dellinger RP, Levy MM, Rhodes A, et al. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock. Crit Care Med 2013;41:580-637.