11. You are working in a community hospital ICU in central California and you are called to evaluate a 55-year-old man for sepsis. The patient's daughter states that he has a history of sarcoidosis and diabetes and takes prednisone (40 mg/d for 4 months) and metformin. He works on a local farm and has been complaining of a headache and difficulty keeping food down. No one else in the home is sick. He is somnolent, difficult to arouse, and groans with flexion of his neck. Vital signs demonstrate a fever to 39.4°C, heart rate of 125/min, BP of 85/35 mm Hg, respiratory rate of 35/min, and Spo_2 of 90% on 6 L nasal cannula. CT scanning of the brain showed no abnormalities. He has received 30 mL/kg of fluids intravenously, blood cultures were sent, and a lumbar puncture was performed. In addition to ceftriaxone, which of the following do you recommend next?

A. Vancomycin, ampicillin, and dexamethasone
B. Transesophageal echocardiography
C. Induced hypothermia to 32°C-34°C
D. Intracranial pressure monitoring with a goal intracranial pressure <30 mm Hg

12. A 62-year-old man presents with hematemesis and is admitted to the ICU. He has a history of ethanol abuse, tobacco abuse, hypertension, and diabetes. On admission, his BP is 105/60 mm Hg and heart rate is 80/min. His hemoglobin is 8 g/dL (80 g/L). He is started on an infusion of lactated Ringer's solution and transferred to the ICU, where he complains of substernal chest discomfort and shortness of breath. The rhythm shown in Figure 1 is seen on the monitor. What is the most likely mechanism of this arrhythmia?

Figure 1.

A. Increased automaticity
B. Early afterdepolarizations
C. Delayed afterdepolarizations
D. Reentry

13. A 43-year-old man who had a cadaveric kidney transplant at age 25 due to hypertension and chronic glomerular nephritis is admitted to the ICU for acute respiratory failure requiring intubation. His immunosuppressive medications include tacrolimus, prednisone, and mycophenolate mofetil. His vital signs include a temperature of 38.0°C, BP of 100/75 mm Hg, and heart rate of 130/min. Ventilator settings are a tidal volume of 7 mL/kg predicted body weight; rate, 18/min; PEEP, 8 cm H_2O; and FIO_2 of 0.60.

Pertinent labs include a WBC count of 5,700/μL (5.7×10^9/L), platelet count of 200×10^3/μL (200×10^9/L), and creatinine of 3.9 mg/dL (344.76 μmol/L). His chest radiograph is shown (Figure 1). Sputum cultures grow *Pneumococcus*.

Which of the following has not been shown to correlate with mortality in this patient?

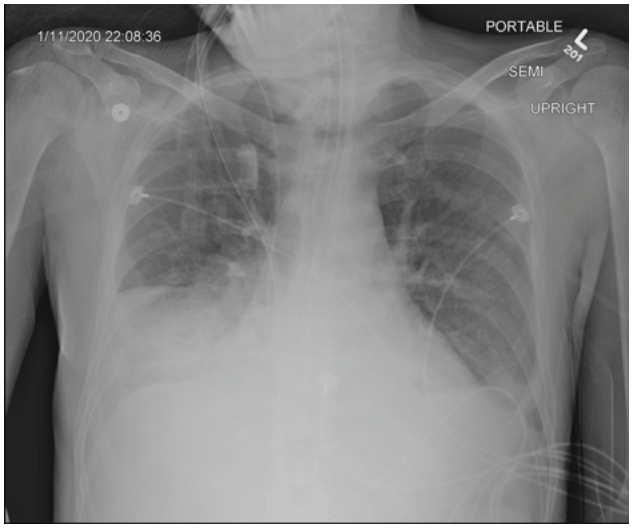

Figure 1. Chest radiograph.

A. Respiratory failure
B. Thrombocytosis
C. Graft function
D. Immunosuppressant regimen

14. A 60-year-old man with type 2 diabetes mellitus, hypertension, and obesity (BMI, 34 kg/m^2) is admitted to the medical ICU with acute pancreatitis in the setting of hypertriglyceridemia (triglycerides >1,000 mg/dL [11.30 mmol/L]). He is intubated, sedated, and placed on lung-protective ventilation. He develops shock and receives 10 L of intravascular crystalloid volume resuscitation in the first 24 h. On hospital day 2, he develops worsening hypoxemic respiratory failure, with new hypercapnia and acute kidney injury. Ventilator pressures have increased to a peak pressure of 42 cm H_2O and a plateau airway pressure of 38 cm H_2O, from 34 cm H_2O and 28 cm H_2O, respectively. He is sedated (Richmond Agitation-Sedation Scale score, -5), with BP of 88/52 mm Hg on high-dose norepinephrine and heart rate of 128/min. Lung exam shows bronchial breath sounds bilaterally, and his cardiac exam is remarkable only for tachycardia. His abdomen is distended and tense, with epigastric tenderness to palpation and absent bowel sounds. He has 3+ edema. His urine output has decreased to 10 mL/h over the last several hours. Laboratory data are notable for leukocytosis; creatinine of 2.4 mg/dL (212.16 μmol/L), which has increased from 1.4 mg/dL (123.76 μmol/L) on admission; and lactate of 43.24 mg/dL (4.8 mmol/L).

Which of the following is most consistent with this clinical presentation?

A. Lung sliding bilaterally on pleural ultrasound
B. Rare B lines on lung ultrasound
C. Intravesical pressure of 30 mm Hg
D. Passive leg raise with 5% increase in pulse pressure

15. A 68-year-old woman presents to the ED with hematemesis and melena. Her medical history includes diabetes, coronary artery disease, and atrial fibrillation. Six months ago, she underwent coronary artery bypass graft surgery for multivessel coronary disease with reduced ejection fraction. Her postoperative course was complicated by renal failure, atrial fibrillation, congestive heart failure, superficial thrombophlebitis, and a splenic infarct. The patient is anticoagulated for persistent atrial fibrillation. She now presents with upper GI bleeding, presumptively from peptic ulcer disease. Her hemoglobin is 5 g/dL (50 g/L). Her heart rate is 110/min, with BP of 85/40 mm Hg. The patient is on warfarin with a point-of-care international normalized ratio of 4.5. In addition to mobilizing an endoscopy team, administering proton pump inhibitor therapy, initiating appropriate RBC transfusions, and securing IV access, the best next step is administration of which of the following?

A. Tranexamic acid
B. Four-factor prothrombin complex concentrate (Kcentra™)
C. Fresh frozen plasma
D. Andexanet alfa

16. The concept of mechanical power as an important determinant of ventilator-induced lung injury (VILI) has been proposed by several groups in recent years. Mechanical power incorporates established VILI determinants such as static and dynamic stress and strain and adds to them the effects of which of the following?

A. F_{IO_2}
B. Chest wall compliance
C. Respiratory rate
D. Regional distribution of ventilation

17. A 75-year-old man presents to the ED with fever, productive cough, dyspnea, and feeling faint. He has the following data: BP is 105/50 mm Hg (mean arterial pressure [MAP] is 68 mm Hg) after 1.5 L of IV fluids and no vasopressor support. His baseline BP is 130/80 mm Hg. His heart rate is 110/min, respiratory rate is 24/min, Spo_2 is 92% breathing 50% oxygen by face mask, and temperature is 38.5°C. He has altered mental status and a Glasgow Coma Scale (GCS) score of 14. His urine output via an indwelling bladder catheter is 25 mL/h (estimated at 600 mL/d). His WBC count is 15,500/μL (15.50×10^9/L), serum lactate is 24.32 mg/dL (2.7 mmol/L), serum creatinine is 1.3 mg/dL (114.92 μmol/L), platelet count is 200×10^3/μL (200×10^9/L), and serum bilirubin is 1.0 mg/dL (17.10 μmol/L). His Pao_2 is 70 mm Hg while breathing 50% oxygen by face mask. A chest radiograph reveals lobar consolidation consistent with pneumonia.

How would you classify his condition according to the international consensus definitions for sepsis using (1) systemic inflammatory response syndrome (SIRS)-based sepsis criteria initially published in 1992 and reaffirmed in 2001, called Sepsis-2 (S-2), and (2) Sepsis-3 (S-3) criteria published in 2016?

A. Sepsis by S-2 criteria and sepsis by S-3 criteria
B. Severe sepsis by S-2 criteria and sepsis by S-3 criteria
C. Severe sepsis by S-2 criteria and septic shock by S-3 criteria
D. Septic shock by S-2 criteria and septic shock by S-3 criteria

18. Which of the following statements concerning ultrasound evaluation of the diaphragm in patients undergoing mechanical ventilation (MV) in the ICU is true?

A. Patients with either thickening or thinning of the diaphragm over the first week of ventilatory support have longer weaning periods and ICU length of stay as compared with patients with no change in diaphragm thickness.
B. Given diaphragm thickness, measurements by ultrasound require confirmation by CT scanning to ensure reliability and reproducibility.
C. Diaphragm thinning offers no additional information beyond a general muscle exam to detect ICU-acquired weakness.
D. Patients with diaphragm thickening over the first week of mechanical ventilation have lower rates of tracheostomy.

19. A previously healthy 65-year-old woman is admitted from the ED to your ICU with septic shock and acute hypoxemic respiratory failure complicating pneumonia. Her BP is 79/41 mm Hg (mean arterial pressure [MAP] is 52 mm Hg), heart rate is 113/min, respiratory rate is 26/min, and Spo_2 is 95%. The patient has received 2.5 L (30 mL/kg) of lactated Ringer's solution IV and is now receiving norepinephrine infusion at 25 μg/min. She was just endotracheally intubated and remains sedated and paralyzed after rapid sequence intubation. She is being supported by mechanical ventilation using volume control, with a rate of 26/min, tidal volume of 420 mL (8 mL/kg), FIO_2 of 0.5, and PEEP of 10 cm H_2O. A brief bedside cardiac ultrasound demonstrates normal left ventricular and right ventricular function with normal to small cavity size of both the left ventricle and right ventricle. You examine the display of her arterial pressure (Figure 1) and perform a fast flush test (Figure 2). Which of the following options presents the best course of action?

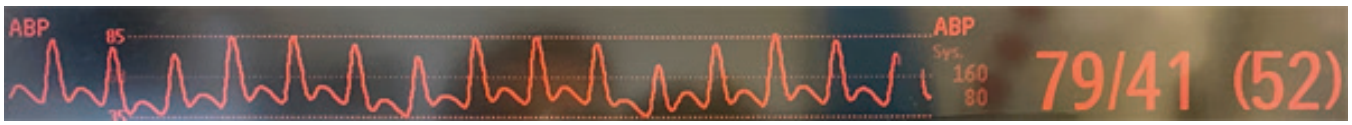

Figure 1. Arterial pressure display.

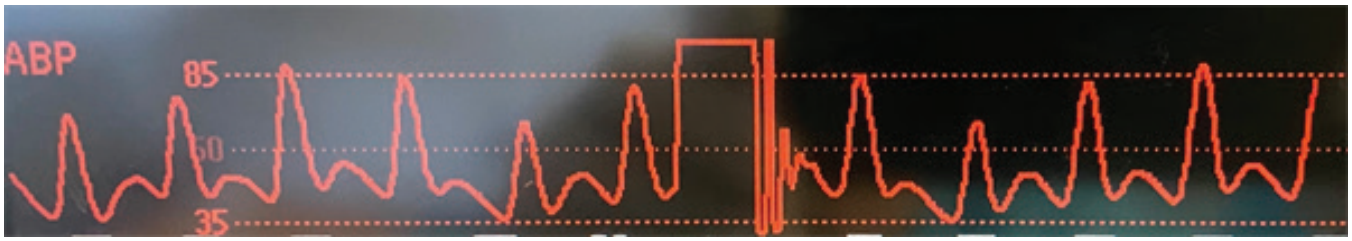

Figure 2. Arterial waveform with fast flush test.

A. Administer additional IV fluid but troubleshoot the arterial catheter and tubing for air bubbles or kinks.
B. Minimize additional IV fluid and reduce the norepinephrine infusion rate, since the actual BP is probably significantly higher than the BP measured from the arterial line.
C. Minimize additional IV fluid and replace norepinephrine infusion with dopamine infusion and titrate to achieve MAP of 80 mm Hg.
D. Administer additional IV fluid and titrate norepinephrine to achieve MAP of 65 mm Hg.

20. A 65-year-old man presents with subacute confusion, weakness, and chest pain. Brain MRI (Figure 1) and chest CT scanning (Figure 2) images are shown. Transbronchial biopsy shows noncaseating granulomas; BAL shows no microorganisms. The patient is diagnosed with and treated for neurosarcoidosis, by administration of IV methylprednisolone. On day 5, the patient continues to have low-grade fevers without obvious improvement; blood cultures are drawn. Three days later, weakly acid-fast gram-positive bacilli are identified on blood cultures. The patient's clinical status is slowly deteriorating, with worsening encephalopathy and multiple organ dysfunction syndrome. What are the most common side effects of the primary antibiotic treatment for his illness?