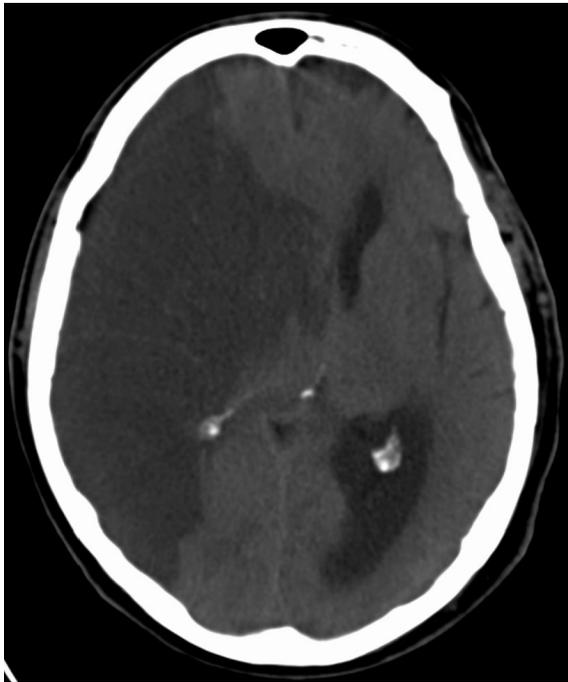


**4.** A 45-year-old man with a history of atrial fibrillation on warfarin presents after an acute ischemic stroke involving the right hemisphere with a high National Institutes of Health Stroke Scale Score of 21. His warfarin is stopped, but he is not a candidate for recombinant tissue plasminogen due to his anticoagulation. Two days after his admission to the ICU, he has a CT scan (Figure 4-A). His international normalized ratio (INR) of prothrombin time (PT) is 1.3. What intervention is most likely to restore him to some level of independence?

- A. Mannitol administered intravenously to lower intracranial pressure
- B. Coagulation factor IX complex (4-factor prothrombin complex concentrate) to reverse his INR
- C. Levetiracetam administered intravenously to prevent seizures
- D. Hemicraniectomy to allow swelling to proceed with less risk of herniation



**Figure 4-A** CT scan of the head 24 h after the onset of stroke symptoms.

**5.** A patient with fever and delirium has been admitted to the ICU. A number of drug toxicities and toxidromes are being considered as potential causes.

Which set of findings would most strongly support a diagnosis of serotonin syndrome?

- A. Mydriasis, dry skin, decreased bowel sounds, normal muscle tone, and normal reflexes
- B. Normal pupils, diaphoresis, normal bowel sounds, lead pipe muscle rigidity, delayed reflexes
- C. Mydriasis, diaphoresis, increased bowel sounds, increased muscle tone, hyperreflexia
- D. Normal pupils, mottled skin, decreased bowel sounds, extreme muscle rigidity, decreased reflexes

**6.** A 54-year-old man with medical history significant for obstructive sleep apnea with BMI of 35, coronary artery disease status post coronary artery stent placement 3 years ago, and significant alcohol use presents with increasing shortness of breath and foul smelling, purulent sputum. In the ED, he is febrile with temperature of 39.4°C. He is hemodynamically stable with BP 172/95 mm Hg; respirations, 35/min with oxygen saturation 91% on 100% FIO<sub>2</sub> nonrebreather mask. His head is atraumatic and normocephalic without craniofacial abnormalities. His laboratories are notable for serum sodium, 122 mmol/L; potassium, 4.9 mmol/L; chloride, 91 mmol/L; bicarbonate, 17 mmol/L; BUN, 9 mg/dL (3.22 mmol/L); creatinine, 0.8 mg/dL (70.8 mmol/L); glucose 93, mg/dL (5.16 mmol/L); and lactic acid, 4.6 (0.5–2.0) mEq/L (0.46 mmol/L). His chest radiograph demonstrates dense right lower lobe consolidation with hydropneumothorax. After resuscitation with 2 L of crystalloids, his pulse is decreased slightly to 120/min, but his tachypnea has worsened to 44/min, and his oxygen saturation is now 89% on high-flow nasal cannula with 100% FIO<sub>2</sub> and 40 L/min of flow.

The decision is made to place an endotracheal tube and support his breathing with mechanical ventilation. Which of the following is true about placing an endotracheal tube in him?

- A. Induction with ketamine will decrease his risk of mortality compared with using etomidate.
- B. Providing apneic oxygenation will reduce his chance of developing significant hypoxia during the intubation.
- C. Using video laryngoscopy will improve the view of the airway, but will not facilitate faster intubation compared with direct laryngoscopy.
- D. Rocuronium should be used for neuromuscular blockade as he is at considerable risk for clinically significant hyperkalemia from succinylcholine.

**7.** A 56-year-old male construction worker presents with multiple traumatic injuries after a building under construction collapses on him. Extrication took more than 6 h. On presentation, BP is 90/56 mm Hg; pulse rate, 112/min; and respirations, 24/min. He is alert and oriented, and he can respond and follow commands. He has lacerations with degloving injuries to the right upper and lower extremities and long bone fractures of the right upper and lower extremities. He does not have significant injuries to the thorax, abdomen, head and neck, or left upper or lower extremities. A CT scan of the head and neck reveals no abnormalities. Past medical history is significant for hypertension, COPD, and coronary artery disease (CAD). He receives surgical stabilizing treatment and is admitted to the ICU for care.

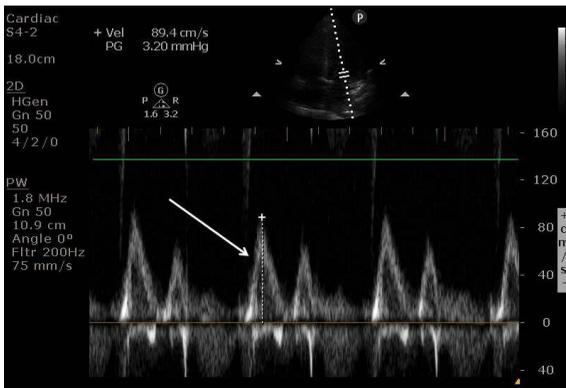
Which of the following is true concerning this patient's outcome from traumatic injury?

- A. The patient's COPD and CAD are not implicated in his outcome from acute trauma.
- B. Blunt and penetrating trauma are equivalent mortality risk factors.
- C. An ionized calcium level <4 mg/dL (<1.0 mmol/L) has been associated with a 50% increase in mortality from trauma.
- D. The patient's elevated heart rate increases the Trauma and Injury Severity Score (TRISS).

**8.** Figure 8-A shows a cardiac apical 4-chamber view with the pulse wave Doppler sample volume placed at the tips of the mitral valve.

To which of the following cardiac events does the higher of the two flow peaks (white arrow) correspond?

- A. Ejection through the left ventricular outflow tract
- B. Left atrial systole
- C. Early (passive) mitral inflow
- D. Mitral regurgitation



**Figure 8-A** Pulse-wave Doppler from the apical 4-chamber view. By convention, flow toward the probe is displayed above the baseline.

**9.** An 85-year-old woman who resides in an assisted-living facility has been diagnosed with postural orthostatic tachycardia syndrome (POTS) for 5 years. Her presentation at that time was as recurrent episodes of fever and pulmonary infiltrates occurring in association with a pulse that would often exceed 160/min. Over the next 2 years, she had recurrent palpitations, which when evaluated with ambulatory cardiac monitoring, revealed atrial fibrillation with rates varying from 170/min to 30/min. She also had two episodes of micturition syncope as well as alternating patterns of diarrhea and constipation. Three months before presentation, she began having difficulty rising from a chair, and her ambulation became shuffling and slow to the point that she had difficulty walking the 100-foot hallway from her room to the dining hall for meals. Four weeks after the ambulation problems began, the patient started having difficulty writing checks to pay her bills; 4 weeks later she began demonstrating episodes of confusion in association with agitated patterns of behavior. In association with these complaints, the nursing staff noted that she was having fluctuations in BP ranging from 180/110 mm Hg to 70/40 mm Hg over the course of a day; these occurred concomitantly with temperatures that ranged from 34°C to 38°C at multiple times during the same day. On the morning of admission, the patient became acutely ill and had the sensation that she was going to die. Temperature at the time was 35.4°C; BP, 78/42 mm Hg; and pulse, 38/min. Upon arrival to the ED, temperature was 38.2°C; BP, 152/92 mm Hg; and pulse, 124/min. On the basis of this constellation of clinical problems, a unifying diagnosis for the entire illness script with which this patient presents would occur on the basis of which mediator?

- A. Thyroxine (T4)
- B. Norepinephrine
- C.  $\alpha$ -Synuclein
- D. Tumor necrosis factor

**10.** A 74-year-old patient with type 2 diabetes, hypertension, and chronic atrial fibrillation on dabigatran (CHADS<sub>2</sub> score 5) was admitted to the ICU yesterday for evaluation and management of abdominal sepsis. He presented to the ED with acute abdominal pain, and reported intermittent worsening epigastric discomfort over the past several weeks. On admission WBC count was 23,000/ $\mu$ L ( $23.0 \times 10^9$ /L) with left shift; creatinine, 2.1 mg/dL (185.6  $\mu$ mol/L); and lactate, 23.7 mg/dL (2.6 mmol/L). Liver function tests were normal. CT of the abdomen showed nonspecific thickening of the first portion of the duodenum and fat stranding, and the patient was scheduled for upper endoscopy the next morning.

The patient deteriorated overnight despite appropriate crystalloid resuscitation and piperacillin-tazobactam, requiring initiation of low-dose norepinephrine infusion. Abdominal exam now demonstrates worsening epigastric tenderness with involuntary guarding. Repeat WBC count is 31,400/ $\mu$ L ( $31.4 \times 10^9$ /L); hemoglobin, 8.5 g/dL (85 g/L); platelet count,  $145 \times 10^3$ / $\mu$ L ( $145 \times 10^9$ /L); creatinine, 2.5 mg/dL (221.0  $\mu$ mol/L); and lactate, 34.2 mg/dL (34.2 mg/dL). Prothrombin time is normal, and activated partial thromboplastin time (aPTT) and thrombin time are prolonged. A chest radiograph demonstrates new pneumoperitoneum, and general surgery is consulted for exploratory laparotomy to localize and treat a presumed intestinal perforation. It has now been 18 h since the patient's last dose of dabigatran.

What is the most appropriate treatment to reduce the risk of serious bleeding during surgery?

- A. Idarucizumab
- B. Andexanet
- C. Ciraparantag
- D. Prothrombin complex concentrate

**11.** A 28-year-old woman G1P0 presents to the ED with fever, palpitations, sweating, and confusion. She thinks she is approximately 14-weeks pregnant. The symptoms started several weeks ago but are now markedly increased. She missed her first prenatal appointment. Past medical history is notable for depression, and a remote history of hyperthyroidism that has not required medications for the past 5 years. Current medications include citalopram (at a stable dose) and a multivitamin. She has a remote history of recreational drug use, but denies this currently. Her boyfriend noted her becoming more anxious over the last few weeks and was attributing this to the pregnancy, but this morning she was confused, and warm and sweaty to the touch. He states that she has not gained any weight in the pregnancy, and has complained to him about feeling warm and that her "heart is racing."

On examination she appears anxious and tremulous, pulse is 150/min; respirations, 25/min; BP, 160/60 mm Hg; and temperature, 39.6°C. She is oriented to person only. She has subtle lid lag. Neck is supple with a prominent thyroid. Lungs are clear, cardiac exam is notable for tachycardia. Skin is warm and diaphoretic. She has 1+ edema. Deep-tendon reflexes are brisk without clonus or rigidity. Routine labs and urinalysis are unremarkable. Pancultures are pending. Toxicology screen is negative. ECG shows sinus tachycardia. She is admitted to the ICU.

What is the best initial therapy for the likely diagnosis in this case?

- A. Vancomycin, ceftriaxone, azithromycin, and metronidazole
- B. Propranolol and a thionamide
- C. Iodide and a thionamide
- D. Midazolam and cyproheptadine

**12.** A 46-year-old man with stage 1 chronic kidney disease secondary to polycystic kidney disease presents to the ED with increasing shortness of breath, chest pain, and purulent sputum. The patient is intubated for acute hypoxemic respiratory failure, and admission laboratories demonstrate WBC  $24.6 \times 10^3/\mu\text{L}$  ( $24.6 \times 10^9/\text{L}$ ) with 70% neutrophils and 14% bands; hemoglobin, 12.1 g/dL (121 g/L); and platelet count,  $138 \times 10^3/\mu\text{L}$  ( $138 \times 10^9/\text{L}$ ). He is noted to have acute renal failure with BUN 35 mg/dL (12.5 mmol/L) and creatinine 1.7 mg/dL (150.3 mmol/L), increased from his baseline creatinine of 1.1 mg/dL (97.24 mmol/L). Chest radiograph demonstrates bilateral lower lobe infiltrates with small effusions. He is started on cefepime 2 g IV every 12 h and vancomycin 1,000 mg IV with subsequent dosing to be determined by pharmacokinetics consult. Over the next 2 days, oxygenation improves and he is weaned to 40%  $\text{FiO}_2$  and PEEP of 5 cm  $\text{H}_2\text{O}$ . The patient is mildly agitated, delirious, and confused. He has had worsening acute renal failure (BUN and creatinine are 58 mg/dL [20.7 mmol/L] and 3.8 mg/dL [335.9 mmol/L], respectively), and he is producing approximately 200 mL of urine daily. The following morning, the nurse calls you urgently to bedside during his spontaneous breathing trial. On your arrival, he is nonresponsive with tonic-clonic activity in all extremities. His pulse appears to be a sinus rhythm on the bedside monitor with a rate of 143/min and a BP of 175/96 mm Hg. He has not previously been hypertensive throughout his ICU course. You order 10 mg of lorazepam but seizure activity stops prior to administration. An emergency head CT is performed (Figure 12-A, Figure 12-B, and Figure 12-C). On return to the ICU, pulse has improved to 106/min, although he remains hypertensive with BP 184/100 mm Hg and minimally responsive. His Glasgow coma scale score is 12 (3 eye, 4 verbal, 5 motor). Neurologic exam is nonfocal with cranial nerves intact. He does not follow commands but moves all four extremities well and has 2+ reflexes throughout.

What action should be taken?

- A. Change cefepime to levofloxacin.
- B. Initiate a code stroke and arrange for emergency MRI.
- C. Initiate nicardipine infusion targeting goal systolic BP of 140 to 160 mm Hg.
- D. Consult neurosurgery and start nimodipine 60 mg per nasogastric tube every 4 h.

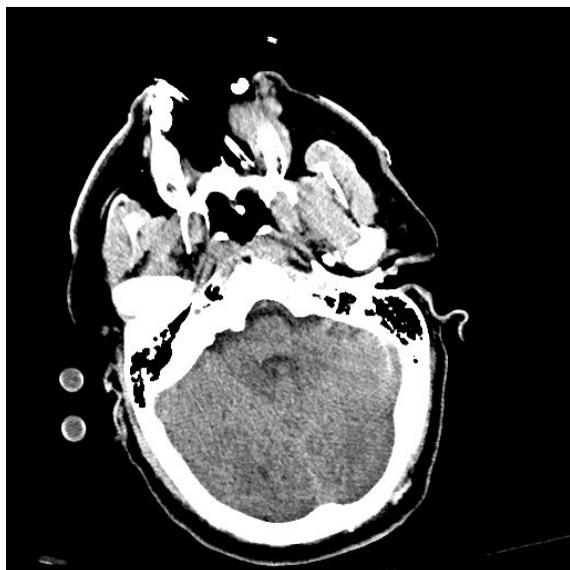


Figure 12-A



Figure 12-B



Figure 12-C Representative head CT images.

**13.** A 52-year-old man from Indiana, United States, recently diagnosed with HIV infection but not on antiretroviral therapy, presents to the ED with complaints of progressive fever, shortness of breath, and lymph node swelling for the past month. His CD4<sup>+</sup> count 1 month ago was 43/ $\mu$ L. There is no history of arthralgia, sore throat, or skin rash. The patient reports bright red blood per rectum that has been occurring over the past 3 days. On exam, he appears acutely ill and has the following measures: temperature, 38.8°C; BP, 88/64 mm Hg supine and 62/38 mm Hg sitting; pulse, 134/min; and respirations, 34/min. He has diffuse lymphadenopathy involving posterior cervical, axillary, and inguinal chains. Chest exam reveals scattered crackles in both lungs. Neurologic exam is normal. There are no skin rashes and no evidence of joint inflammation. Chest x-ray shows bilateral interstitial opacities. Laboratory data are noteworthy for sodium, 124 mEq/L (124 mmol/L); potassium, 5.9 mEq/L (5.9 mmol/L); chloride, 86 mEq/L (97 mmol/L); and bicarbonate, 21 mEq/L (21 mmol/L). Hemoglobin is 8 mg/dL (80 g/L), WBC count is 890/ $\mu$ L ( $0.89 \times 10^9/L$ ) with an absolute neutrophil count of 740/ $\mu$ L ( $0.74 \times 10^9/L$ ), and platelet count is 26,000/ $\mu$ L ( $26 \times 10^9/L$ ). Peripheral blood smear shows decreased cell counts but no schistocytes or abnormal cellular elements. Prothrombin time, 11.8 seconds; partial thromboplastin time, 30 seconds. Aspartate aminotransferase is 328 (5.48  $\mu$ kat/L), and alanine aminotransferase is 421 U/L (7.03  $\mu$ kat/L). Room air blood gases are pH 7.52, Pco<sub>2</sub>, 31 mm Hg (4.1 kPa), and Po<sub>2</sub>, 58 mm Hg (7.7 kPa). Serum ferritin was 38,238 ng/mL (85,921 pmol/L). Soluble IL-2 receptor alpha (CD25) was not elevated. On the basis of the available information, which of the following disorders should be treated now?

- A. Primary hemophagocytic lymphohistiocytosis (HLH)
- B. Adult-onset Still's disease
- C. Catastrophic antiphospholipid antibody (APLA) syndrome
- D. Sepsis due to *Histoplasma capsulatum*

**14.** The Model for End-Stage Liver Disease (MELD) score has recently been modified to include which of the following laboratory measurements?

- A. Platelet count
- B. Serum ammonia
- C. Serum sodium
- D. Serum lactate