Exam 2 Questions

One of the first duties of the physician is to educate the masses not to take medicine.

William Osler
(1849–1919)

1. A 54-year-old male presents to the emergency department with altered mental status and lethargy after being found down by his family. He is ultimately intubated for airway protection, and is now in the ICU. A non-contrast head CT is performed (see Image 1). Occlusion of which of the following vessels could explain this patient’s clinical presentation and CT findings?

A. Artery of Adamkiewicz
B. Artery of Drummond
C. Artery of Heubner
D. Artery of Percheron
E. Artery of Samson

2. A 62-year-old, 100 kg male is admitted to the ICU with multifocal pneumonia, acute respiratory distress syndrome (ARDS), and ventilator-dependent respiratory failure. Escalating ventilator support has been required to maintain an oxygen saturation > 88%, with current ventilator settings as follows: pressure control, FiO₂ 1.0, rate 14 breaths/min, positive inspiratory pressure 34 cm H₂O, positive end expiratory pressure (PEEP) 16 cm H₂O, inspiratory time 1.1 s. A recent arterial blood gas sample shows pH 7.29, PaCO₂ 44 mmHg, PaO₂ 66 mmHg. What additional interventions can be performed at this time that will confer an evidence-based mortality benefit?
A. Begin inhaled nitric oxide at 20 ppm
B. Place a gastric manometer to target positive transpulmonary pressures
C. Place a pulmonary artery catheter to measure the wedge pressure
D. Initiate prone positioning
E. All of the above can be expected to confer a mortality benefit

3. A large bore nasogastric tube may be indicated for which of the following?
   A. Refractory nausea and vomiting
   B. Providing enteral nutrition to a septic patient
   C. Decompressing a high grade bowel obstruction
   D. Prophylaxis against swallowing a large volume of blood with a posterior nosebleed
   E. All of the above

4. A 60-year-old male presents with weakness in right upper and lower extremities and worsening difficulty with walking for the last 48 h. Upon further questioning, he admits having similar symptoms 4 months ago that improved over few weeks with residual mild difficulty walking. He endorses intermittent urinary urgency. On exam, the patient demonstrates right hemiparesis (4/5 strength), a sensory level at T4 level bilaterally, and hyperreflexia in bilateral lower extremities. An MRI of the thoracic spine shows cord edema from T2 to T10 with T2/FLAIR hyperintensity and subtle gadolinium enhancement. There are multiple T2 flow voids on the dorsal surface of the spinal cord. What diagnostic test will most likely confirm diagnosis?
A. Lumbar puncture with CSF analysis  
B. Conventional spinal cord angiography  
C. MR spectroscopy of the spinal cord  
D. Laminectomy and operative intervention  
E. Paraspinal thoracic soft tissue ultrasound

5. A 51-year-old female with a recent subarachnoid hemorrhage (SAH) and recently removed external ventricular drain (EVD) is currently in the ICU with a cerebrospinal fluid (CSF) leak from her EVD site, fevers, and altered mental status. The patient is initiated on vancomycin and meropenem, and CSF cultures have been sent from a recently placed lumbar drain. Which of the following indicates the proper time to check a vancomycin trough along with an acceptable therapeutic level?

A. Before the second dose; 10–15 μm/mL  
B. Before the third dose; 10–15 μm/mL  
C. Before the third dose; 15–20 μm/mL  
D. Before the fourth dose; 15–20 μm/mL  
E. Before the fourth dose; 25–30 μm/mL

6. The bicaudate index is commonly used in the evaluation of which of the following disease states?

A. Hydrocephalus  
B. Herniation  
C. Hemorrhagic mass effect  
D. Intracranial hypertension  
E. Intracranial hypotension

7. A 55-year-old female is admitted to the ICU after having been rescued from a house fire. She was found unconscious in her bedroom by firefighters. On arrival to the ED, she had dermal burns to her forehead and cheeks, her mouth and nose were covered in soot, and she had singed nasal hairs. She was intubated for airway control. Her vital signs are as follows: blood pressure 110/40 mmHg, heart rate 110 beats/min, oxygen saturation 98% (on 100% oxygen). You bolus crystalloids, place a subclavian central line, and send blood work from the central line. Her serum lactate level is 9 mmol/L, with the following venous blood gas: pH 7.22, pCO₂ 32 mmHg, pO₂ 77 mmHg, ScvO₂ 90%. What is the most likely mechanism of her acid-base derangement?

A. Global tissue hypoperfusion  
B. Dysfunctional oxygen utilization  
C. Decreased metabolic demand  
D. Hemoconcentration  
E. All of the above

8. A 68-year-old male with a history of hypertension is being evaluated in the ED for right-sided weakness and slurred speech. A non-contrast head CT is performed, demonstrating a left-sided intracranial hemorrhage with the largest dimensions
measured at 1.5 cm × 2.0 cm. More than 50% of the hemorrhage is seen on ten cuts and less than 25% of the hemorrhage seen on two additional cuts, with a slice thickness of 0.5 cm. What is the approximate volume of this patient’s bleed?

A. 7.5 cc  
B. 15 cc  
C. 30 cc  
D. 60 cc  
E. 120 cc

9. Which of the following dietary alterations may be beneficial in the treatment of super refractory status epilepticus?

A. Low protein, high carbohydrate  
B. Low fat, high protein  
C. Low fat, low protein  
D. High fat, low carbohydrate  
E. High fat, high carbohydrate

10. An anxious appearing 45-year-old male with no past medical history presents complaining of 2 days of mild dyspnea. He has had approximately 10 days of rhinorrhea and nonproductive cough, which have improved but not resolved. Review of systems is positive for paresthesias in both of his hands and feet; he states these began yesterday and are worse today. He has not had any fevers. His oxygen saturation on room air is 97%. On exam, he is not tachypneic, and his lungs are clear. Sensation is grossly intact in all extremities, although he does note subjective paresthesias. His motor exam is unremarkable. An EKG, chest x-ray, and two sets of cardiac enzymes are negative. What is the most appropriate next step?

A. Admit for serial exams and further work-up  
B. Attempt a trial of intravenous benzodiazepines and reassess  
C. Reassurance and discharge with outpatient follow-up  
D. Observation in order to obtain a stress echocardiogram  
E. Discharge with a trial of antibiotics for atypical pneumonia

11. All of the following are part of the most recent guidelines from the Society of Critical Care Medicine regarding the definition and diagnosis of sepsis and septic shock except:

A. Elimination of the term “severe sepsis”  
B. Septic shock defined by serum lactate >2 mmol/L despite adequate resuscitation  
C. Septic shock defined by hypotension requiring vasopressors to maintain mean arterial pressure (MAP) ≥65 mmHg  
D. Use of the quick Sepsis-Related Organ Failure Assessment (qSOFA) score  
E. Use of the Acute Physiology and Chronic Health Evaluation (APACHE) IV score

12. Regarding spontaneous cerebellar hemorrhage, assuming rebleed does not occur, over what time period are patients most likely to experience clinical deterioration?
A. 1–2 h  
B. 12–24 h  
C. 3–5 days  
D. 1–2 weeks  
E. Patients with spontaneous cerebellar bleeding do not deteriorate in the absence of rebleeding

13. An 84-year-old female with a history of Parkinson’s dementia, chronic constipation, recurrent small bowel obstructions, peptic ulcer disease, and coronary artery disease is currently hospitalized for the treatment of community acquired pneumonia. She is receiving intravenous levofloxacin and has been tolerating a regular diet. On day 3, she begins complaining of severe abdominal pain, and a contrast-enhanced CT of the abdomen is obtained (see Image 2). Which of the following should be performed next?

A. Discontinue diet, place a nasogastric tube to low intermittent wall suction  
B. Surgical consultation for exploratory laparotomy  
C. Interventional radiology consultation for percutaneous drainage  
D. Discontinue levofloxacin, send stool sample for *Clostridium difficile* toxin assay  
E. Gastroenterology consult for emergent upper endoscopy

14. According to Brain Trauma Foundation guidelines, which of the following range of values would be reasonable jugular venous oxygen saturation (SjVO₂) targets?

A. 75–90%  
B. 50–75%  
C. 35–50%  
D. 20–35%  
E. 15–20%
15. A 62-year-old female with myasthenia gravis maintained on low-dose prednisone presents with dysuria and urgency. She is started on a 5-day course of ciprofloxacin by her primary care physician. She returns 3 days later complaining of generalized weakness, although her urinary symptoms have resolved. Physical exam reveals mild to moderate ptosis without bulbar weakness and a negative inspiratory force (NIF) of 41. She is afebrile, and has no flank or suprapubic tenderness. What is the most appropriate next step in this patient’s management?

A. Increase oral prednisone dose  
B. Discontinue ciprofloxacin  
C. Admit to the hospital for plasmapharesis  
D. Admit to the hospital for intravenous immunoglobulin  
E. Add azathioprine

16. A 35-year-old male with no past medical history presents with a thunderclap headache and vertigo in the absence of focal neurologic symptoms. He does not report a history of easy bruising or bleeding. On exam, his blood pressure is 126/85 mmHg and he is neurologically intact. Head CT demonstrates a 2 mm medullary hemorrhage; platelet count and coagulation studies are unremarkable. The patient is admitted for monitoring and further workup. Angiography is performed and no vascular malformation is identified. The patient’s exam remains nonfocal, and his vertigo improves. What is the most appropriate next step?

A. Reassurance and discharge home  
B. Discharge home with 6-week follow-up angiography  
C. Begin oral antihypertensive therapy and discharge home  
D. Obtain an MRI of the neuroaxis  
E. Consult hematology service for a coagulopathy work-up

17. Which of the following statements is true regarding posterior reversible encephalopathy syndrome (PRES) associated with immunosuppression therapy?

A. The severity of symptoms is directly correlated with supratherapeutic drug levels  
B. The risk is highest during the initial month of therapy  
C. Patients who develop PRES on calcineurin inhibitors (CNIs) have a contraindication to all CNI use in the future  
D. Discontinuation of immunosuppressive therapy is the first intervention to manage PRES  
E. None of the above

18. A 26-year-old male with no prior medical history presents with confusion, vomiting, and severe, diffuse myalgias approximately 1 day after starting a strenuous new workout routine. He is afebrile. A non-contrast head CT is performed, and is unremarkable. Which of the following findings would be expected on urinalysis?
A. Dipstick positive for blood and microscopic analysis with no red cells
B. Dipstick negative for blood and microscopic analysis with >50 red cells
C. Dipstick positive for blood and microscopic analysis with >50 red cells
D. Dipstick negative for blood and microscopic analysis with no red cells
E. The patient will not be able to provide a urine sample

19. Which of the following is the most common cause of intraventricular hemorrhage?
   A. Intraventricular tumor
   B. Intraventricular aneurysm
   C. Intraventricular vascular malformation
   D. Intraventricular trauma
   E. Extension of parenchymal hemorrhage

20. A 28-year-old man is brought to the ED via ambulance after sustaining multiple gun-shot wounds to the abdomen. The patient has two 18-guage IVs and has received 1 L of lactated Ringer’s (LR) solution en route. On arrival, his heart rate is 130 beats/min, blood pressure 74/40 mmHg, respiratory rate 30 breaths/min, and his oxygen saturation is 99% on 2 L via nasal cannula. His eyes are open, he is moaning in pain, and moving his arms spontaneously. A second liter of LR is bolused. His focused abdominal sonographic exam shows free intraperitoneal fluid in Morrison’s pouch. Which of the following should be performed next?
   A. Bolus an additional 2 L of LR
   B. Administer 4 units packed red cells (PRBC), 2 units fresh frozen plasma (FFP), and 1 unit of single-donor platelets
   C. Administer 4 units PRBC, FFP to a target international normalized ratio (INR) of <1.7, and platelets to target count >100 × 10^3/μL
   D. Administer 4 units PRBC, administer FFP to target INR <1.7, and platelets to target count >50 × 10^3/μL
   E. Allow permissive hypotension

21. A 74-year-old male is currently intubated in the ICU following the development of a spontaneous intracerebral hemorrhage. His hospital course has been complicated by the development of pyelonephritis and septic shock, and you are having trouble weaning him off the ventilator after nearly 2 weeks in the ICU. You decide to perform the peroneal nerve test in order to evaluate for the presence of critical illness polyneuropathy (CIP). Which of the following is true?
   A. The peroneal nerve test is a poorly sensitive screening test for the presence of CIP
   B. The test is considered positive if peroneal nerve testing is abnormal in both legs
   C. The test cannot be performed at the bedside
   D. Patients with an abnormal peroneal nerve test require a complete nerve conduction study in order to objectively diagnose CIP
   E. An abnormal peroneal nerve test should be repeated in 24 h, and if positive, confirms the diagnosis of CIP
22. A 58-year-old female is admitted to the ICU with a Hunt-Hess 3, modified Fisher 3 subarachnoid hemorrhage (SAH). She is intubated, and requiring 100% FiO2 to maintain a PaO2 of 100 mmHg. She is also hypertensive despite a continuous nicardipine infusion, and hyperglycemic at 277 mg/dL. Which scoring system will most succinctly identify this patient’s risk factors for early mortality beyond her acute neurologic injury?

A. The Hunt-Hess and modified Fisher scores are sufficient
B. The Acute Physiology and Chronic Health Evaluation (APACHE) score
C. The Medical Early Warning Signs (MEWS) score
D. The Therapeutic Intensity Score (TIS)
E. The Physiologic Derangement Score (PDS)

23. Which of the following is most commonly seen in patients with cerebral autosomal-dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL)?

A. Migraines by age 30
B. Temporal lobe epilepsy
C. Dementia by age 40
D. Severe mood disturbances
E. All of the above

24. All of the following are commonly affected in Toxoplasmosis except:

A. Pituitary gland
B. Brainstem
C. Basal ganglia
D. Meninges
E. Corticomedullary junction

25. Which of the following is not a known risk factor for nontraumatic subarachnoid hemorrhage (SAH)?

A. Hypertension
B. Cigarette smoking
C. Excessive alcohol consumption
D. History of peripheral vascular disease
E. All of the above are risk factors

26. A 76-year-old female was recently discharged from the hospital after suffering an ischemic right middle cerebral artery infarct. She is weak on her left side, but able to walk unassisted. She requires help completing her activities of daily life (ADLs), and has moderate dysarthria. What is this patient’s modified Rankin score?

A. 1
B. 2
C. 3
27. Which of the following medications is not a direct thrombin inhibitor (DTI)?
   A. Lepirudin
   B. Bivalirudin
   C. Argatroban
   D. Dabigatran
   E. Rivaroxaban

28. Steep increases in intracranial pressure lasting for 5–10 min are best described as:
   A. Lundberg A waves
   B. Lundberg B waves
   C. Lundberg C waves
   D. Lundberg D waves
   E. Lundberg E waves

29. Aerophobia is most commonly seen in which of the following disease states?
   A. Malignant hyperthermia
   B. Seratonin syndrome
   C. Leptomeningeal carcinomatosis
   D. Meningococcal meningitis
   E. Rabies encephalitis

30. A 61-year-old male with a history of degenerative disc disease and coronary artery disease is recovering postoperatively from a C3-C6 anterior cervical discectomy and fusion. Approximately 12 h after his procedure, he develops acute quadriparesis, and a stat CT of the cervical spine demonstrates a spinal epidural hematoma. He returns to the operating room for hematoma evacuation, and is transferred back to the ICU for further monitoring. The patient is now weakly antigravity in the proximal upper extremities and is 1/5 in the bilateral lower extremities. You perform a rapid bedside ultrasound of the lower extremities, and it is negative for deep vein thrombosis (DVT). Which of the following statements is correct?
   A. An inferior vena cava (IVC) filter should be placed at this time, but no systemic anticoagulation
   B. An IVC filter should be placed at this time, and the patient should be started on prophylactic enoxaparin this evening
   C. No IVC filter should be placed at this time, and no systemic anticoagulation should be initiated
   D. No IVC filter should be placed at this time, and the patient should be started on prophylactic enoxaparin this evening
   E. Any of the above are reasonable options
31. Regarding acute ischemic infarcts due to emboli in the setting of non-valvular atrial fibrillation, approximately what percentage of emboli originate in the left atrial appendage?
   A. 10%
   B. 25%
   C. 50%
   D. 75%
   E. 90%

32. Which of the following is the earliest sign of intra-abdominal hypertension (abdominal compartment syndrome)?
   A. Fever
   B. Rapidly expanding abdominal girth
   C. Oliguric kidney injury
   D. Altered mental status
   E. Complete bowel obstruction

33. Which of the following may indicate occult pelvic fracture in a 22-year-old male patient with multisystem trauma following a motor vehicle accident?
   A. Instability with downward pressure
   B. Scrotal swelling
   C. Blood at the meatus
   D. Contrast extravasation on CT scan
   E. All of the above

34. A 48-year-old female with hepatitis C and alcoholic cirrhosis is admitted to the ICU with worsening mental status. On admission, her renal function is normal; however, over the next several days, her creatinine increases fourfold despite daily albumin administration, foley catheter drainage, and no ultrasonographic evidence of obstructive uropathy or parenchymal renal disease. All potentially nephrotoxic agents have been avoided. Her vital signs are within normal limits and she is without obvious signs of infection. Serum potassium and bicarbonate levels are within normal limits. The next best step in management is:
   A. Administer dopamine
   B. Administer octreotide, midodrine and albumin
   C. Consult radiology for possible transjugular intrahepatic portosystemic shunt (TIPS) procedure
   D. Initiate hemodialysis
   E. Diurese the patient

35. Hollow viscous injury as a result of blunt abdominal trauma is most likely to occur at which of the following anatomic locations?
   A. Points of fixed bowel
   B. Freely mobile portions of bowel
C. More caudal portions of bowel
D. More rostral portions of bowel
E. Centrally located portions of bowel

36. Which of the following is true regarding acute disseminated encephalomyelitis (ADEM)?

A. Although it can affect patients of all ages, it is most commonly seen in the elderly population
B. Symptoms may develop several weeks after a bacterial infection
C. Unlike multiple sclerosis, patients with ADEM suffer a single symptomatic episode, followed by either death (approximately 50% of cases) or complete recovery
D. Unlike multiple sclerosis, ADEM rarely causes impairment in consciousness
E. First-line therapy consists of either intravenous immunoglobulin (IVIg) or plasmapheresis, with high-dose intravenous corticosteroids reserved for refractory cases

37. Approximately what percentage of brain abscesses arise via hematogenous spread from other sources?

A. 1%
B. 5%
C. 33%
D. 66%
E. 90%

38. A 31-year-old male with a history of HIV and recurrent Pneumocystis pneumonia on dapsone prophylaxis is brought to the ED after a generalized tonic-clonic seizure at home. The patient’s wife reports he has been fatigued for 1 week, followed by several hours of confusion that preceded his seizure. He is afebrile. A non-contrast head CT performed on admission does not show any overt lesions, and the results of a lumbar puncture are pending. Which of the following should be performed next?

A. Repeat the head CT with IV contrast administration
B. Empirically treat for both bacterial and viral meningitis
C. Arrange for 24-h video electroencephalography (vEEG)
D. Obtain an arterial blood gas
E. Place the patient on a continuous magnesium infusion

39. A 65-year-old male remains severely encephalopathic in the ICU 1 week after suffering a spontaneous intraparenchymal and intraventricular hemorrhage, likely related to chronic hypertensive microangiopathy. The nurse is reporting him as “stuporous”, with a Richmond Agitation Sedation Scale (RASS) score of −3, the neurosurgical resident scores him Glasgow Coma Scale (GCS) 7T, the physician assistant finds him “very drowsy”, while the neurology resident
prefers the term “lethargic”. Which score best helps you to succinctly reconcile these statements into a more unequivocal assessment of his current level of consciousness?

A. The GCS score reliably conveys this information; his score is less than 8, so he is comatose
B. The RASS suffices to assess his level consciousness
C. A combination of the FOUR score, his attention span, and which stimulus leads to arousal
D. Assessing his orientation to person, place, self, and recent events
E. All of the above provide equivalent information

40. Which of the following is the most common side effect of the anti-rejection medication tacrolimus?

A. Mood instability
B. Akinetic mutism
C. Fine hand tremor
D. Posterior reversible encephalopathy syndrome (PRES)
E. Chronic demyelinating sensorimotor neuropathy

41. A 39-year-old female presents to the ICU post-operatively following resection of a large right frontal mass. A preliminary pathology report indicates the presence of anaplastic cells, and no other masses or lesions have been identified elsewhere. Which of the following therapies would not be a reasonable future treatment option for this patient?

A. Bevacizumab
B. Temozolomide
C. Gemcitabine
D. Resection of recurrent lesions
E. Stereotactic radiosurgery

42. A 71-year-old female with a history of COPD requiring home oxygen use is admitted to the ICU after a mechanical fall that resulted in a subdural hematoma. The patient required intubation in the field for a Glasgow Coma Scale (GCS) score of 4. Three days after admission, the patient is sent for a computed tomography (CT) scan of the chest due to increasing secretions noted during endotracheal tube suctioning, as well as an increasing oxygen requirement. All of the following elements of the history are risk factors for the development of a ventilator-associated pneumonia (VAP) except:

A. Age >60
B. History of COPD
C. Transport out of the ICU for a diagnostic procedure
D. Need for reintubation
E. Female gender
43. A 36-year-old male presents to the emergency department with a first-time seizure, and has a second episode while being evaluated in the hospital. A non-contrast head CT demonstrates a suspicious hyperdensity, and the lesion takes on a “popcorn” appearance on follow-up MRI. Which of the following is a risk factor for developing the most likely pathology?

A. Cigarette smoking
B. Prior whole brain radiation for a pediatric brain tumor
C. Prior episode of Varicella zoster encephalitis
D. Prior severe closed head injury
E. Cocaine abuse

44. A 60-year-old female with a history of generalized anxiety disorder and severe alcohol abuse with multiple prior hospitalizations for delirium tremens has just been admitted to the ICU for confusion, tremor, and agitation. She normally consumes approximately 3 L of red wine per day. Her serum alcohol level is 181 mg/dL on arrival. A serum level above which of the following cutoffs should effectively prevent this patient from experiencing alcohol withdrawal seizures?

A. 50 mg/dL
B. 100 mg/dL
C. 175 mg/dL
D. 275 mg/dL
E. None of the above

45. Approximately what percentage of patients suffering from aneurysmal subarachnoid hemorrhage will go on to develop delayed (occurring weeks to months later) hydrocephalus?

A. 1%
B. 5%
C. 10%
D. 25%
E. 33%

46. A 49-year-old female who is HIV-positive is currently in the ICU following an aneurysmal subarachnoid hemorrhage complicated by stress-induced cardiomyopathy. The patient exhibits persist hypotension, and you decided to place a right internal jugular central venous catheter. During the procedure, you accidentally suffer a needlestick injury, and promptly report the incident to your supervisor. What is your approximate risk of contracting HIV as a result of this incident?

A. 0.3%
B. 3%
C. 33%
D. 66%
E. 99%
47. All of the following are true regarding primary angiitis of the central nervous system except:

A. The etiology is unknown  
B. It is more commonly seen in women  
C. It is an uncommon disease  
D. The most common presenting symptom is headache  
E. It affects the small and medium sized arteries of the brain

48. You are taking care of a patient with an aneurysmal subarachnoid hemorrhage complicated by septic shock secondary to multifocal pneumonia. She is recovering from her infection, but now appears to be fluid overloaded due to the saline boluses given at the time that she was hypotensive, and her serum creatinine has doubled in the last 24 h. Which of the following is true regarding furosemide use in this patient?

A. Furosemide may ameliorate ischemic damage in acute kidney injury by reducing the energy requirements of cells within the loop of Henle, and can be used as a prophylactic agent at the time of imaging procedures with contrast  
B. Randomized clinical trials have shown that furosemide can be used as a prophylactic agent for acute kidney injury perioperatively  
C. The use of furosemide may aid in the management of hypokalemia and hypocalcemia  
D. Furosemide facilitates diuresis and improves kidney recovery among patients requiring dialysis for acute kidney injury  
E. Furosemide can be used to facilitate mechanical ventilation in volume-overloaded patients

49. Which of the following regarding the treatment of pancreatitis is correct?

A. Aggressive fluid resuscitation is important in the early stages of acute pancreatitis  
B. Prophylactic antibiotics play an essential part in reducing complications in severe pancreatitis  
C. H2 blockers or proton pump inhibitors are recommended for reducing the course and severity of disease  
D. Nasogastric suction is recommended as part of routine management  
E. All of the above

50. A 71-year-old male is currently intubated in the ICU following an aneurysmal subarachnoid hemorrhage. His hospital course has been complicated by aspiration pneumonia and persistent fevers despite acetaminophen administration and appropriate antibiotic therapy. You decide to use a water-circulating surface cooling system to control the patient’s fever, but he begins to shiver uncontrollably. Which of the following is the next best step?

A. Discontinue water-circulating surface cooling  
B. Initiate surface counterwarming  
C. Administer buspar and magnesium
D. Administer magnesium and meperidine
E. Administer meperidine and propofol

51. A 59-year-old female with a history of diabetes, hypertension, and atrial fibrillation was recently hospitalized for an acute ischemic infarct, and was subsequently discharged to a rehabilitation facility. She presents to the emergency department 1 week later with fevers and cough productive of foul smelling sputum. There is no prior history of tuberculosis exposure, and she recently had a negative PPD screen. Computed tomography (CT) of the chest is performed (see Image 3). Which of the following should be performed next?

A. Administer clindamycin
B. Refer for urgent bronchoscopy
C. Place the patient on airborne isolation
D. Start systemic anticoagulation with a continuous heparin infusion
E. Refer for image-guided transthoracic biopsy

52. Which of the following may put patients at a greater risk of postoperative chemical (not bacterial) meningitis?

A. Surgical manipulation of the sinuses
B. Surgical manipulation of the spine
C. Presence of CSF rhinorrhea
D. Occurrence in the immediate postoperative period
E. New focal neurologic deficits

53. A 34-year-old female presents to the ED with headache, nausea and vomiting. A non-contrast head CT is performed, demonstrating thick, diffuse subarachnoid blood in the basilar cisterns with extension into the Sylvian fissures bilaterally. The patient is neurologically intact. Conventional angiography is
performed, and does not reveal the presence of any underlying vascular lesions. Magnetic resonance imaging of the neuroaxis is also unremarkable. Which of the following are the best next steps in this patient’s management?

A. Discharge home, repeat angiography in 1 year
B. Transfer out of the ICU, observe for 3 days, discharge home, repeat angiography in 3 months
C. Transfer out of the ICU, observe for 14 days, discharge home, repeat angiography in 6 months
D. Observe in the ICU, repeat angiography in 7 days, discharge home if negative
E. Observe in the ICU, discharge home in 7 days, repeat angiography in 9 months

54. A 45-year-old male is admitted to the ICU after a witnessed seizure. He was intubated in the field without complications. Head imaging on arrival showed a temporal lobe mass that was successfully resected. The patient passed a weaning trial, and was extubated on the fourth postoperative day. Thirty minutes after extubation, the patient became aphonic. He is also noted to be dyspneic, with a respiratory rate of 40 breaths/min and a heart rate of 108 beats/min. What is the next best step in alleviating the patient’s symptoms?

A. Reintubate the patient
B. Initiate noninvasive positive pressure ventilation with frequent reassessment
C. Administer supplemental oxygen via nasal cannula
D. Refer for urgent bronchoscopy
E. Administer racemic epinephrine and inhaled bronchodilators

55. A 65-year-old 100 kg female is currently intubated in the ICU following a left spontaneous intracerebral hemorrhage (ICH) complicated by convulsive status epilepticus. Continuous electroencephalography (EEG) at day 2 demonstrated gross seizure control. She is on a continuous propofol infusion and phenytoin 150 mg every 8 h, and is receiving continuous feeding for 18 h per day via nasogastric tube (NGT). The patient has had daily fevers for the past several days despite a negative bacteriological workup. On day 3, the patient has three consecutive 2-min convulsions in the right upper extremity with definite corroboration on EEG, followed by lateralizing epileptiform discharges spreading from the left parietal area. Which of the following should be performed next?

A. Discontinue tube feeds, taper off propofol, and assess for extubation readiness
B. Increase propofol infusion, and increase phenytoin to 200 mg every 8 h
C. Give 4 mg of lorazepam and replace phenytoin with valproate
D. Start midazolam infusion at 2 mg/kg/h until lateralizing epileptiform discharges abate
E. Rush the patient to the operating room for clot evacuation
56. Under which value should blood pressure be controlled in the first 24 h following tPA administration in the setting of an acute ischemic infarct?

A. 165/110  
B. 165/105  
C. 185/110  
D. 180/105  
E. 220/110

57. A 55-year-old male presents to the emergency department from his nursing home for increased lethargy. His past medical history is notable for hypothyroidism, atrial fibrillation, and recent hospitalization for traumatic brain injury sustained during a car accident. His medications include amantadine, levothyroxine and amiodarone. On examination, he has a blood pressure of 90/50 mmHg, heart rate of 52 beats/min, and a temperature of 95.5 °F. He has a healed tracheostomy scar, his gastrostomy site is erythematous, and there is a purulent collection around the tube. He does not open his eyes to deep noxious stimulation. At baseline, he is reported to be awake spontaneously and able to mouth words. Which of the following is least likely to be necessary at this time?

A. Insulin infusion  
B. Corticosteroids  
C. Rewarming  
D. Intravenous fluids  
E. Mechanical ventilation

58. Which of the following is true regarding the difference between SvO₂ and ScvO₂?

A. SvO₂ is measured from the superior vena cava, while ScvO₂ is measured from the pulmonary artery  
B. ScvO₂ is normally higher than SvO₂ because of brain oxygen extraction  
C. Obtaining ScvO₂ is more invasive than obtaining SvO₂  
D. Obtaining ScvO₂ poses more risk to the patient than obtaining SvO₂  
E. None of the above

59. You are caring for an 81-year-old female who has experienced a prolonged ICU course after experiencing a fall with resultant subdural hematoma and dens fracture. She remains in a hard collar and has been unable to tolerate weaning from the ventilator. She is now beginning to develop worsening infiltrates on her chest x-ray, intermittent fevers, and anasarca. In the course of your daily rounds, you begin to notice scleral icterus and gradual increases in bilirubin and transaminases; her albumin is currently 1.4 g/dL. The patient winces in pain when her upper abdomen is palpated. Bedside ultrasound demonstrates a distended gallbladder with a thickened wall and a large amount of surrounding pericholecystic fluid, but no gallstones. The common bile duct is unremarkable. What is the next best treatment option for this patient?
A. Expectant management with antibiotics
B. Percutaneous cholecystectomy
C. Laparoscopic cholecystectomy
D. Endoscopic retrograde cholangiopancreatography (ERCP)
E. Magnetic resonance cholangiopancreatography (MRCP)

60. Which of the following is true regarding CT perfusion (CTP) for the evaluation of delayed cerebral ischemia (DCI) and cerebral vasospasm in the setting of aneurysmal subarachnoid hemorrhage (aSAH)?

A. A mean transit time (MTT) >4.0 s is pathognomonic for cerebral vasospasm
B. The combination of CT angiography (CTA) and CTP is superior to conventional angiography for the diagnosis of cerebral vasospasm
C. CTP offers no added benefit when combined with CTA in the evaluation of DCI
D. CTP cannot be accurately interpreted without concurrent real-time transcranial doppler (TCD) ultrasonography
E. None of the above

61. Which of the following correctly lists the incidence of primary brain tumor in adults from most common to least common?

A. Meningiomas, gliomas, pituitary tumors, CNS lymphoma
B. Gliomas, meningiomas, pituitary tumors, CNS lymphoma
C. CNS lymphoma, meningiomas, gliomas, pituitary tumors
D. CNS lymphoma, gliomas, meningiomas, pituitary tumors
E. Pituitary tumors, gliomas, CNS lymphoma, meningiomas

62. You are taking care of a patient with hepatic encephalopathy who also needs renal replacement therapy for acute kidney injury. Continuous renal replacement therapy is unavailable in your institution, and intermittent hemodialysis is suggested by the nephrologist. Which of the following is not a reasonable dialysis prescription to decrease the risk of secondary brain injury?

A. Using a dialyzer membrane with larger surface area
B. Using a lower blood flow rate
C. Using a lower rate of ultrafiltration
D. Using a cooler dialysate temperature
E. Using a lower rate of urea removal

63. Which of the following therapies is least helpful in the treatment of status asthmaticus requiring mechanical ventilatory support?

A. Inhaled helium
B. Inhaled anesthetics
C. Inhaled nitric oxide
D. Bronchoscopy
E. Intravenous magnesium
64. A 60-year-old male with diabetes mellitus and no other significant medical history is currently intubated in the ICU secondary to status epilepticus and a left temporal lobe neoplasm. Overnight, the nurse notices the patient is experiencing a regular crescendo-decrescendo tidal volume pattern, interspersed with periods of apnea. His oxygen saturation remains normal during these episodes. Which of the following diagnostic tests should be performed next?

A. Magnetic resonance imaging (MRI) of the brain
B. Arterial blood gas
C. Venous blood gas
D. Bedside echocardiogram
E. Computed tomography (CT) of the chest

65. A 31-year-old female with a history of Lennox-Gastaut syndrome is currently intubated in the ICU for the treatment of status epilepticus. Her current antiepileptic regimen includes valproic acid (VPA), levetiracetam, and a continuous propofol infusion. The most recent serum ammonia level was 104 mcg/dL, and you decide to initiate levocarnitine therapy. Which of the following statements is correct?

A. Long-term therapy, but not acute VPA overdose, is associated with depleted carnitine levels
B. Levocarnitine should be co-administered with VPA in status epilepticus, even in the absence of hyperammonemia
C. The oral and intravenous forms have roughly equivalent bioavailability
D. There are no randomized trials evaluating the efficacy of levocarnitine in VPA-induced hyperammonemia
E. All of the above are correct

66. A 34-year-old obese male is currently in the ICU following a motor vehicle accident and multiple orthopedic injuries. He is currently on low molecular weight heparin for DVT prophylaxis, dosed at 30 mg every 12 h. Which of the following would be the appropriate range of anti-Xa serum values in order to ensure proper thromboprophylaxis?

A. <0.1 IU/mL
B. 0.1–0.2 IU/mL
C. 0.2–0.5 IU/mL
D. 0.5–1.2 IU/mL
E. 1.2–2.0 IU/mL

67. A 39-year-old female is currently intubated in the ICU following a motor vehicle accident with multiple long bone fractures and a small traumatic subarachnoid hemorrhage. A urine drug screen was performed on arrival which was positive for the presence of amphetamines, though the patient’s family is adamant that the patient has no history of substance abuse. Which of the following medical conditions would most likely explain this test result?
A. Hyperlipidemia
B. Restless leg syndrome
C. Depression
D. Hypothyroidism
E. Infertility

68. A 34-year-old female is currently in the ICU with an acute left superior cerebellar artery thrombus. She was attending a yoga class when she experienced profound, sudden onset vertigo. She has no past medical history and her only medication is an estrogen-containing oral contraceptive. A recent outpatient echocardiogram and lipid profile were unremarkable. Which of the following is most likely to be discovered on further work-up?

A. Elevated serum homocysteine
B. Abnormal factor V variant
C. Positive platelet serotonin release assay
D. History of recent international airline travel
E. All of the above are equally likely

69. A 23-year-old female is admitted to the ICU for treatment of suspected herpes simplex (HSV) encephalitis. She had been complaining of “flu-like” symptoms for the approximately 4 days, along with vomiting and severe headaches. She is initiated on empiric acyclovir treatment, 10 mg/kg three times a day. Her laboratory work on admission is unremarkable. What intervention can be done in order to reduce the risk of acyclovir induced nephrotoxicity?

A. No intervention needed, as the risk of nephrotoxicity at this dosage is minimal
B. Reduce the dose to 5 mg/kg IV three times a day
C. Administer crystalloids before and after each dose
D. Switch from intravenous to oral acyclovir
E. No intervention has been proven to decrease the risk of acyclovir nephrotoxicity

70. A 69-year-old female with a history of chronic kidney disease is currently being evaluated for a suspected intracranial mass seen on non-contrast head CT, and you are considering ordering a contrast-enhanced MRI. Below which of the following glomerular filtration rate (GFR) cutoffs, in general, would the administration of gadolinium be considered too dangerous to proceed?

A. 10 mL/min/1.73 m²
B. 15 mL/min/1.73 m²
C. 30 mL/min/1.73 m²
D. 45 mL/min/1.73 m²
E. 60 mL/min/1.73 m²

71. Which of the following is true regarding the use of statins to improve functional outcomes in the setting of aneurysmal subarachnoid hemorrhage? (aSAH)
A. Improved functional outcomes have been demonstrated in a dose-dependent fashion
B. Improved functional outcomes demonstrated with a fixed benefit across a range of doses from 10 mg to 40 mg daily
C. Improved functional outcomes have been demonstrated when used in conjunction with oral nimodipine
D. Improved functional outcomes have not been demonstrated
E. The efficacy of statins in aSAH has not been prospectively studied

72. All of the following elements help differentiate myoclonic status epilepticus from Lance-Adams syndrome except:

A. Presence of coma
B. Occurrence after cardiac arrest
C. Long term prognosis
D. Intention myoclonus
E. All of the above

73. A 40-year-old female with a history of tuberculosis and significant hemoptysis is currently being evaluated in the ICU for bronchial artery embolization. All of the following are potential complications of this procedure except:

A. Transverse myelitis
B. Bronchoesophageal fistula
C. Pulmonary embolism
D. Dysphagia
E. Chest pain

74. A 64-year-old female is currently in the ICU following a motor vehicle accident in which she suffered several broken ribs, a right-sided femur fracture, and a small right-sided subdural hemorrhage. She subsequently develops severe acute respiratory distress syndrome (ARDS) and requires mechanical ventilation. She is currently on airway pressure release ventilation (APRV) with the following settings: T\text{high} 5.4 s, T\text{low} 0.8 s, P\text{high} 30, P\text{low} 0, FiO\text{2} 70%. Her last arterial blood gas is as follows: pH 7.27, PaCO\text{2} 48, PaO\text{2} 67. Which of the following measures would not potentially improve this patient’s hypoxemia?

A. Increase the mean airway pressure
B. Increase T\text{low}
C. Increase the fraction of inspired oxygen
D. Initiate inhaled nitric oxide therapy at 10 parts per million
E. Prone the patient

75. A 45-year-old right-handed female who presented with headaches was found to have an unruptured arteriovenous malformation (AVM) on imaging. The AVM is located in the left frontal lobe and measures <3 cm. Subsequent cerebral angiography revealed no associated aneurysms, and the AVM drains into the superficial veins. Which of the following is the best treatment for this patient?
A. Craniotomy and surgical removal  
B. Medical management alone  
C. Endovascular treatment with complete obliteration of AVM by embolization  
D. Stereotactic radiotherapy alone  
E. Combination of craniotomy and stereotactic radiotherapy

76. A 45-year-old male with a history of HIV presents to the emergency department with headaches that have worsened over the past 2 weeks, and the patient is ultimately diagnosed with cryptococcal meningitis. His baseline serum creatinine is 1.1 mg/dL. The patient is initiated on amphotericin B and flucytosine for treatment. On day 2 of therapy, his serum creatinine increases to 1.5 mg/dL. Which of the following is the next best step in this patient’s management?

A. Reduce the dose of amphotericin B  
B. Discontinue flucytosine  
C. Administer normal saline boluses with each dose of amphotericin B  
D. Increase the administration rate of amphotericin B  
E. Decrease the administration rate of flucytosine

77. Which of the following lab abnormalities is most commonly seen in patients with aneurysmal subarachnoid hemorrhage?

A. Hyponatremia  
B. Hypercalcemia  
C. Hypophosphatemia  
D. Hyperglycemia  
E. Hypochloremia

78. Perflutren lipid microspheres may be used to aid in the diagnosis of which of the following disease processes?

A. Left ventricular thrombus  
B. Middle cerebral artery thrombus  
C. Basilar artery thrombus  
D. Popliteal deep venous thrombus  
E. Cerebral venous thrombus

79. A 67-year-old female presents to the emergency department for several months of worsening headaches and pulsatile tinnitus in her right ear. Her past medical history is remarkable only for mild osteoarthritis, and she does not report any history of trauma. She is neurologically intact. A vascular abnormality is found on further imaging. Which of the following statements is true regarding the most likely diagnosis?

A. Pulsatile tinnitus results from drainage into the transverse or sigmoid sinus  
B. The Barrow classification system divides lesions into Types A, B, C and D  
C. Lesions may be treated surgically or via stereotactic radiosurgery, but not endovascularly
D. Lesions do not recur after treatment
E. Common findings include vision loss and the presence of an orbital bruit

80. Approximately what percentage of patients suffering from spontaneous intracerebral hemorrhage (ICH) will go on to develop epilepsy over the subsequent 24 months?
   A. 1%
   B. 5%
   C. 10%
   D. 25%
   E. 50%

81. Which of the following is the drug of choice for empiric treatment of a suspected candida infection of a cerebrospinal fluid (CSF) shunt?
   A. Anidulafungin
   B. Amphotericin B
   C. Fluconazole
   D. Flucytocine
   E. All of the above are reasonable options

82. If all of the following patients arrived in the emergency department and were triaged simultaneously, which one should be treated first?
   A. 56-year-old male who took his apixaban this morning after awakening with left arm weakness
   B. 43-year-old female with back pain and worsening lower extremity weakness for 1 month
   C. 85-year-old male with known brain cancer and focal right leg seizure activity
   D. 64-year-old female with 30 min of facial droop and slurred speech
   E. 70-year-old female with 8 h of dizziness

83. A 60-year-old male with a history of metastatic lung cancer and recent gamma knife radiosurgery for an isolated cerebral metastatic lesion presents to the emergency department with several complaints, including a cough productive of rust-colored sputum, increased early morning headaches, urinary hesitancy, weakness in the bilateral lower extremities, and several days of subjective fever and chills. His vital signs are as follows: blood pressure 171/88 mmHg, heart rate 64 beats/min, respirations 14/min, saturation 93% on room air, and temperature of 99.9°F. He is awake, alert, and in no acute distress. His serum white blood cell count is $24.9 \times 10^9/L$. Obtaining which of the following is most urgent at this time?
   A. Non-contrast CT of the head
   B. Contrast enhanced CT of the chest, abdomen, and pelvis
   C. MRI of the lumbar spine
   D. Blood and sputum cultures
   E. A manual differential of the patient’s white blood cell count
84. A 55-year-old female is currently in the ICU following evacuation of a subdural hematoma suffered after a fall from standing. It is now day 7, and her hematoma has not reaccumulated. She has had a fluctuating mental status and transient aphasia for the last several days, which prompts continuous electroencephalography (EEG) monitoring, revealing left frontal and parietal periodic lateralized epileptiform discharges (PLEDs) that accelerate to 2.5 Hz, but never spread or vary in amplitude. Some of these rhythmic accelerations are prompted by noxious stimulation, but there is no superimposed fast activity. She is on levetiracetam at 1.5 g twice a day and valproate (VPA) 400 mg three times a day (last serum VPA level 80 μg/mL). You are considering her EEG pattern to be responsible for her fluctuating mental status, and have given the patient 1 mg of midazolam to see if this would improve her mental status, but her respiratory rate plummets and she nearly required intubation. Which of the following should be considered next?

A. Continue current regimen; her EEG pattern reflects fixed brain injury from her fall
B. Increase the dose of both her valproate and levetiracetam
C. Obtain single photon emission computerized tomography (SPECT) to assess if her PLEDs coincide with foci of hypermetabolism or hyperperfusion
D. Obtain CT perfusion imaging to assess if her PLEDs coincide with foci of hypermetabolism or hyperperfusion
E. Discontinue both VPA and levetiracetam, as guidelines do not recommend long term antiepileptic medications following subdural hemorrhage

85. A 19-year-old 70 kg male with a traumatic hemothorax secondary to a penetrating chest injury undergoes left-sided tube thoracostomy. 550 mL of blood is initially drained from the pleural space, and over the subsequent 2 h, his chest drain output is recorded as 500 mL (first hour) and 450 mL (second hour). What is the next appropriate step in management?

A. Continue chest tube drainage with close monitoring of vital signs and serial hemoglobin and hematocrit values
B. CT of the chest with IV contrast
C. Conventional angiography
D. Thoracotomy
E. Placement of a second left-sided thoracostomy tube

86. A 26-year-old female with a history of depression and schizoaffective disorder is brought to the hospital by her parents after noticing significant confusion and difficulty ambulating for the last few days. She has been maintained on sertraline for many years, with risperidone recently added for worsening depression. Her vital signs are as follows: blood pressure 166/80 mmHg, heart rate 117 beats/min, temperature 100.5 °F, respiratory rate 18 breaths/min, oxygen saturation 99% on room air. Physical exam is remarkable for lower and upper extremity rigidity and hyperreflexia. She is alert and oriented to person and place, but is unsure of the date or time. She cannot ambulate unassisted. Her blood work is
notable for a mild leukocytosis and a markedly elevated serum creatine kinase. A
non-contrast head CT is unremarkable, and lumbar puncture yields normal
cerebrospinal fluid. Which of the following should be administered next?

A. Vancomycin, ceftriaxone, and acyclovir
B. Dantrolene
C. Cyproheptidine
D. Urgent hemodialysis
E. Intravenous fluids and sedation with benzodiazepines as needed

87. According to guidelines from the American College of Surgeons, which of the
following criteria should be met when administering blood products as part of
a massive transfusion protocol (MTP)?

A. Administer 2 L of crystalloid after activating the MTP but prior to giving
   blood products
B. Administer 2 L of colloid after activating the MTP but prior to giving blood
   products
C. Transfuse one single donor apheresis or random donor platelet pool for
every 10 units of RBCs
D. Transfuse universal RBCs and plasma in either 1:1 or 1:2 ratio
E. Transfuse RBCs, plasma, platelets and cryoprecipitate in a 1:1:1:1 ratio

88. Patients admitted to the ICU with severe traumatic brain injury (TBI) and cere-
bral contusions who are comatose should routinely have which of the following
monitoring devices applied based on current guidelines?

A. Brain tissue oxygen monitor
B. Cerebral microdialysis catheter
C. Jugular venous oxygen saturation monitor
D. Pulmonary artery catheter
E. Continuous video electroencephalography

89. In a patient with bright red blood per rectum and hemodynamic compromise:

A. A lower GI bleed is always assumed to be the source, and colonoscopic
evaluation is the initial study of choice
B. Up to 10% may have may have an upper GI bleeding source, and upper
endoscopy may be the first endoscopic evaluation
C. Surgical intervention should be sought immediately
D. A transjugular intrahepatic portosystemic shunt (TIPS) procedure is the ini-
tial treatment of choice
E. Internal hemorrhoids remain an important diagnostic consideration

90. An 84-year-old male has been terminally extubated in the ICU following a
ruptured left middle cerebral artery aneurysm with a subsequent devastated
neurologic exam. Approximately 10 min after extubation, asystole is noted on
the monitor, and you are called to examine the patient. Which of the following
represents the official time of death?
A. The approximate time the aneurysm ruptured  
B. The time the patient was terminally extubated  
C. The time asystole was noted on the cardiac monitor  
D. The time the physician completes the death exam  
E. Any of the above may be used

91. According to current guidelines, patients who have sustained acute spinal cord injury should have all of the following interventions performed except:

A. Systolic blood pressure maintained above 90 mmHg  
B. Mean arterial pressure maintained between 85 and 90 mmHg for 7 days post-injury  
C. Targeted temperature management with core body temperature of 33 °C for 3 days post-injury  
D. Early surgical decompression for central cord syndrome  
E. Management in an intensive care unit

92. Which of the following intracranial vessels is most readily assessed via Transcranial Doppler (TCD) ultrasonography?

A. The anterior cerebral artery (ACA)  
B. The middle cerebral artery (MCA)  
C. The posterior cerebral artery (PCA)  
D. The posterior inferior cerebellar artery (PICA)  
E. The basilar artery

93. A 45-year-old male with an ASIA A classification injury at the C5 level remains vasopressor-dependent 5 days after injury and 3 days after operative decompression and fixation. Which of the following adjunctive therapies has been shown to increase the likelihood of successfully weaning this patient off of pressors?

A. Scheduled pseudoephedrine administered orally  
B. Administration of scheduled doses of 0.25 mg atropine IV every 6 h  
C. Volume loading to achieve a central venous pressure (CVP) of >14 cm H₂O  
D. Administration of oral nitrates to reduce left ventricular afterload and improve cardiac unloading  
E. Administration of amantadine 100 mg orally twice daily to antagonize NMDA receptors in the central nervous system

94. The American Heart Association recommends that an ambulance bypass the closest hospital in favor of a regional stroke center in which of the following situations?

A. The patients requests they be taken 45 min further, because their primary care doctor works at that location  
B. The regional stroke center is 15 min away, and the patient has a dense left hemiparesis that began 90 min ago  
C. The regional stroke center is 40 min away, and the patient has slurred speech and a facial droop that began 15 min ago
D. The patient is complaining of right arm weakness that has been ongoing for the last 3 days
E. The patient goes into cardiac arrest en route to the hospital

95. A 51-year-old male recently involved in a low-speed rear-end motor vehicle collision (MVC) is currently being evaluated for the presence of a cervical spine injury. The patient self-extricated and was ambulatory at the scene. He is neurologically intact. On exam, he complains of midline cervical tenderness, but is able to range his neck 45° to the left and right. According to the Canadian C-spine Rules, which of the following clinical features necessitates further imaging of the neck?

A. Age >50
B. MVC
C. Midline neck tenderness
D. Male gender
E. The patient does not require further imaging

96. Which of the following has the highest sensitivity for diagnosing myasthenia gravis?

A. Ice pack test
B. Tensilon test
C. AChR antibodies
D. MuSK antibodies
E. Electromyography

97. A 61-year-old female with a history of chronic alcoholism has recently been diagnosed with osmotic demyelination syndrome following overly aggressive correction of chronic hyponatremia. She is currently intubated and quadriparetic. Approximately what percentage of patients in this scenario will make a complete recovery from their illness?

A. 0%
B. 1%
C. 5%
D. 10%
E. 33%

98. You are evaluating a 52-year-old construction worker who fell 20 ft to the ground from scaffolding. En route to the hospital, the patient received 1 L of lactated Ringer’s (LR). Two 18-gauge IVs are in place and an additional 2 L LR are being bolused in the trauma bay. His vital signs are as follows: heart rate 120 beats/min, blood pressure 88/40 mmHg, respiratory rate 20 breaths/min, oxygen saturation 100% (room air). His Glasgow Coma Score (GCS) is 14 and he has bruising across his upper back and abdomen. The trauma resident performs a focused sonographic exam (see Image 4). Based on the clinical context, what is the diagnosis?
A. Ascites
B. Hemoperitoneum
C. Renal laceration
D. Hemothorax
E. Pneumothorax

99. Which of the following EEG patterns is uniquely associated with anti-N-Methyl-D-aspartate (NMDA) encephalitis?

A. Extreme delta brush
B. Frontal intermittent rhythmic delta activity (FIRDA)
C. Burst suppression
D. Generalized periodic epileptiform discharges (GPEDs)
E. Periodic sharp wave complexes (PSWCs)

100. Which of the following is associated with central diabetes insipidus?

A. Anorexia nervosa
B. Wolfram syndrome
C. Septo-optic dysplasia
D. Decreased thirst
E. All of the above
Exam 2 Answers

..so for me, the practice of medicine has become the pursuit of a rare element which may appear at any time, at any place, at a glance. It can be most embarrassing. Mutual recognition is likely to flare up at a moment’s notice. The relationship between physician and patient, if it were literally followed, would give us a world of extraordinary fertility of the imagination, which we can hardly afford. There’s no use trying to multiply cases; it is there, it is magnificent, it fills my thoughts, it reaches to the farthest limits of our lives.

William Carlos Williams
(1883–1963)

1. **The correct answer is D.** This patient’s CT scan demonstrates bilateral thalamic infarcts. The artery of Percheron is an anatomic variant in which a single vessel arises from the posterior cerebral artery to feed the bilateral thalamic and midbrain structures, and an occlusion of this vessel would explain this patient’s presentation. The artery of Adamkiewicz is a large anterior medullary artery that supplies blood to the thoracolumbar spinal cord, and an occlusion here can result in an anterior cord syndrome. The artery of Drummond is a colonic vessel that connects the superior and inferior mesenteric arteries, and provides collateral blood flow. The recurrent artery of Heubner is a branch of the anterior cerebral artery that supplies blood to the caudate and internal capsule, and an occlusion here may result in contralateral hemiparesis. Finally, the artery of Samson is a uterine vessel of little clinical significance.

2. **The correct answer is D.** The PROSEVA trial demonstrated that patients with ARDS and severe hypoxemia (PaO₂:FiO₂ ratio of <150 mmHg, with an FiO₂ >0.6 and PEEP >5 cm water) may benefit from prone positioning, with an unadjusted 28-day mortality of 16% vs. 32.8% in the standard care group. None of the other intervention listed has been shown to confer a mortality benefit in this setting [1].

3. **The correct answer is C.** Enteral nutrition can be accomplished with smaller, more comfortable tubes. Decompression is more likely to require a large bore tube to achieve appropriate and effective suction. Nasogastric tubes are not routinely placed in the management of epistaxis.

4. **The correct answer is B.** This patient has stepwise neurological decline with a lesion localized to thoracic spinal cord. Given the finding of spinal cord edema and flow voids in the thecal sac, a diagnosis of spinal AVM (aka Foix-Alajouanine syndrome) is likely, which has led to venous congestion and potentially a venous infarction of the thoracic spinal cord. Spinal angiography will likely confirm diagnosis, and will potentially be therapeutic with embolization of the feeding vessel [2].

5. **The correct answer is D.** Vancomycin trough levels should be checked approximately 30 min prior to the fourth dose. Therapeutic levels are generally in the 10–20 μg/mL range, with higher levels usually reserved for more severe infections. Levels exceeding 25 μg/mL are rarely (if ever) recommended, and may put patients at an increased risk of vancomycin toxicity.
6. **The correct answer is A.** The bicaudate index is defined as the diameter of the brain divided by the width of the frontal horns at the level of the caudate nuclei. It is usually used as a measure of hydrocephalus.

7. **The correct answer is B.** This patient’s history (prolonged downtime in the setting of a fire in a closed space) and physical findings (soot around mouth and nose) indicate inhalation injury. Patients with inhalational injury from structure fires are at high risk of carbon monoxide (CO) and cyanide exposure (CN), which is evident in this case. Both CO and CN impair cellular utilization of oxygen, resulting in end-organ dysfunction and lactic acidosis. Elevated venous oxygen content reflects decreased oxygen utilization, and is characteristic of these conditions.

8. **The correct answer is A.** Intracranial hemorrhage volume can be measured using the formula $A \times B \times C/2$ (approximating the volume of an ellipsoid), where $A$ and $B$ are the largest perpendicular dimensions of the hemorrhage, and $C$ is the number of slices on which the bleed is visible (assuming a slice thickness of 1.0 cm). $C$ is also modified by the percent of hemorrhage seen on each slice, with $>50\%$ counting as one full slice, $25\%$–$50\%$ counting as 0.5 slices, and $<25\%$ not counting at all. This patient has a bleed measuring approximately $1.5 \times 2.0$ cm, with ten slices that each count as a full slice and two slices that should not be factored in. Additionally, slice thickness here is 0.5 cm, making the calculation: $1.5 \times 2.0 \times (10/2)/2$, or 7.5 cc [3]. Note that often times, a simplified (and less accurate) version of this formula is utilized which equally counts all slices on which a hemorrhage is visible, in which case the measured volume would be 9 cc.

9. **The correct answer is D.** The ketogenic diet may be beneficial in cases of super-refractory status epilepticus, based on the observation that mimicking the fasting state has proven beneficial in certain cases of childhood epilepsy [4]. As such, the diet is high in fat, low in carbohydrates, and contains sufficient dietary protein.

10. **The correct answer is A.** This patient’s history of progressive paresthesias after a viral infection is suspicious for Guillain-Barre syndrome, and he should be admitted for close monitoring of his respiratory status. 80% of such patients have associated paresthesias which may portend significant muscular involvement. Given his absence of sputum production, fevers, or hypoxia, and his negative chest x-ray, pneumonia is unlikely. Benzodiazepines may be dangerous in this scenario; although anxiety-induced hyperventilation may cause similar paresthesias, he is not tachypneic on exam, and life-threatening causes of his presentation have not been adequately addressed. Likewise, reassurance and discharge is premature given the classic history for Guillain-Barre syndrome.

11. **The correct answer is E.** The most recent guidelines for the definition and diagnosis of sepsis and septic shock were released in 2016. These include several changes, most notably: elimination of the term “severe sepsis”, defining septic shock by either lactate $>2$ mmol/L despite resuscitation or use of vasopressure to
maintain a MAP ≥65 mmHg, and the use of the qSOFA score (requiring at least two of the three elements) as a measure of organ dysfunction [5].

12. **The correct answer is B.** In contrast to patients with supratentorial hemorrhage, the tight posterior fossa may lead to rapid deterioration secondary to brainstem compression or hydrocephalus. This usually occurs in the first 12–24 h.

13. **The correct answer is B.** This patient’s CT demonstrates pneumoperitoneum, concerning for ruptured viscus. Rapid surgical consultation for possible exploratory laparotomy is mandatory, along with broad spectrum antibiotic administration.

14. **The correct answer is B.** A normal SjVO₂ is in the 50–75% range. While there is no compelling data from randomized controlled trials to dictate saturation targets in traumatic brain injury, it is reasonable to avoid prolonged desaturation (<50%), as this may indicate imminent or ongoing ischemia. There is no evidence to support targeting supratherapeutic values (75–90%).

15. **The correct answer is B.** This patient’s infectious symptoms have resolved, and she is already beyond the recommended 3-day course of antibiotics for an uncomplicated UTI. Several antibiotics, most notably fluoroquinolones and aminoglycosides, have been implicated in myasthenic exacerbations. Injection anesthetics, IV magnesium, and rarely phenytoin and gabapentin have also been described as causes. Consequently, discontinuing this patient’s antibiotic would be prudent as it is no longer needed and likely the cause of her exacerbation.

16. **The correct answer is D.** Cavernous angiomas are a well-described cause of medullary hemorrhage. They are often not identified on angiography due to the absence of large feeding arteries and draining veins, but can be seen on gradient echo sequences. While hypertension may cause medullary hemorrhage, this patient is young, does not have known hypertension, and is not hypertensive at presentation, making hypertension an unlikely cause. Follow-up angiography may be performed after MRI, depending on institution and physician preference. There is nothing to suggest this patient has a rare platelet disorder or coagulopathy, and so this should not be performed before obtaining an MRI.

17. **The correct answer is B.** Most cases of PRES associated with immunosuppressive therapy present during the first month after initiation of therapy. PRES can occur at therapeutic and supratherapeutic levels of the immunosuppressant, and symptom severity is not associated with drug levels. However, if PRES occurs in the setting of a supratherapeutic drug level, reducing the dose may be a viable option for certain patient populations before considering discontinuing the medication. If needed, patients can be safely switched from mycophenolate to tacrolimus and vice versa [6].

18. **The correct answer is A.** This presentation is highly suggestive of rhabdomyolysis after a recent strenuous workout routine. Patients will classically produce a brown urine sample that is dipstick-positive for blood without red cells seen on microscopic analysis. This is due to the inability of the dipstick to
differentiate myoglobin from hemoglobin. Although rhabdomyolysis may progress to renal failure in severe cases, patients generally do not present with anuria.

19. **The correct answer is E.** Intraventricular hemorrhage without involvement of the parenchyma is relatively uncommon, and may be related to the presence of an aneurysm, vascular malformation, or tumor contiguous with the ventricles. Far more common is intraventricular hemorrhage as a result of extension of a parenchymal lesion [7].

20. **The correct answer is B.** This patient has penetrating abdominal trauma with evidence of intraperitoneal hemorrhage and signs/symptoms of shock. Based on the ABC score, a retrospectively-derived and prospectively validated prediction tool, he is likely to require massive transfusion [8]. While the optimal ratio of PRBC:FFP:platelets is still unclear, professional society guidelines advocate the achievement of a 2:1 PRBC to FFP ratio with 1 unit of platelets transfused for each 4–6 units of PRBC.

21. **The correct answer is D.** Peroneal nerve testing is a highly sensitive bedside screening assessment for the presence of CIP. The test is considered positive if there is an abnormal finding in either leg. Patients with a positive peroneal nerve test must still undergo a complete nerve conduction study in order to be objectively diagnosed with CIP [9].

22. **The correct answer is E.** The clinical elements most closely linked to early mortality after SAH are the A-a gradient, significant hyper- or hypotension, metabolic acidosis, and hyperglycemia. These elements, collectively, are known as the SAH Physiologic Derangement Score, which ranges from 0 to 8 points [10].

23. **The correct answer is A.** CADASIL most commonly presents as migraines between the third and fourth decade of life, followed by the onset of transient ischemic attacks and discrete infarcts in the fifth to sixth decade of life. Multi-infarct dementia of variable severity ensues. A smaller subset of patients may also present with epilepsy and mood disturbances [11].

24. **The correct answer is B.** *Toxoplasma gondii* commonly causes encephalitis in immunocompromised patients, but not meningitis. Therefore CSF cell count, protein, and glucose in toxoplasmosis may be unremarkable.

25. **The correct answer is D.** Hypertension, cigarette smoking, and excessive alcohol intake are all established risk factors for subarachnoid hemorrhage [12]. A history of peripheral vascular disease may intuitively seem like a risk factor, but it has not been established by epidemiological research.

26. **The correct answer is C.** The modified Rankin score is the most frequently used measure to describe the extent of a patient’s disability after suffering from a stroke. The scale is as follows: 0, asymptomatic; 1, symptomatic, but no disability; 2, slight disability preventing one from completely resuming all prior activities, but able to care for self; 3, can walk unassisted, but requires help with ADLs; 4, can neither walk unassisted nor care for ADLs; and 5, bedridden/incontinent/requiring constant nursing care.
27. **The correct answer is E.** Direct thrombin inhibitors (DTIs) include both the bivalent hirudin derivatives (bivalirudin, lepirudin) as well as the univalent DTIs (argatroban, dabigatran). Rivaroxaban, on the other hand, is a factor Xa inhibitor. Other medications in this class include apixaban and edoxaban.

28. **The correct answer is A.** Lundberg A waves represent steep increases in intracranial pressure lasting for 5–10 min. Lundberg B waves represent modest increases in intracranial pressure lasting 30 s to several minutes. Lundberg C waves represent small increases in intracranial pressure lasting 7–15 s. Lundberg D and E waves do not exist.

29. **The correct answer is E.** Aerophobia (and more notoriously, hydrophobia) are common symptoms of rabies encephalitis, along with myoclonic jerking, altered mental status, and coma. The disease is fatal in a majority of patients, though there are an increasing number of survivors reported in the literature [13].

30. **The correct answer is C.** According to guidelines from the American College of Chest Physicians, IVC filter placement is only recommended for patients with evidence of proximal DVT and contraindication to systemic anticoagulation [14]. This patient has no evidence of DVT, and so despite his higher risk of developing DVT secondary to an acute spinal cord injury, no IVC filter should be placed. Additionally, this patient has just returned from evacuation of a life threatening spinal epidural hematoma, and so it would not be appropriate to initiate DVT chemoprophylaxis at this time.

31. **The correct answer is E.** Approximately 90% of emboli in the setting of non-valvular atrial fibrillation originate in the left atrial appendage. This has led to a variety of methods to “seal off” the left atrial appendage, which may be particularly beneficial among patients who cannot tolerate or are not compliant with oral anticoagulation. The Food and Drug Administration (FDA) has recently approved percutaneous left atrial appendage filter placement for this purpose, based in part from data from the PROTECT AF trial [15].

32. **The correct answer is C.** Abdominal compartment syndrome is often an unrecognized cause of organ dysfunction in critically ill patients, due to the inaccuracy of the clinical examination in detecting intra-abdominal hypertension. Oliguric kidney injury may be the earliest sign, where compression of the renal veins leads to increasing venous resistance and lowering of the glomerular filtration rate [16].

33. **The correct answer is E.** Pelvic fractures may account for significant and often occult bleeding in patients following traumatic injuries. Scrotal swelling, blood at the meatus, and instability with “rocking” of the pelvis may indicate the presence of the fracture, and contrast extravasation on pelvis CT may represent ongoing bleeding.

34. **The correct answer is B.** This patient’s presentation is consistent with hepatorenal syndrome. In general, this syndrome is characterized as functional renal failure in the setting of liver failure, without obvious underlying renal disease. Ruling out overt shock, sepsis, underlying sources of infection, or use of nephrotoxic agents is vital to establishing the diagnosis. Once confirmed,
treatment is designed to promote splanchnic vasoconstriction and renal vaso-
dilation, and raise systemic arterial pressure to increase renal perfusion. Of the
options listed, octreotide, midodrine, and albumin are the best options to
achieve this goal [17].

35. **The correct answer is A.** Significant abdominal trauma and rapid deceler-
ation are thought to create shearing forces between the relatively fixed and
mobile portion of the GI tract. Natural points of fixation include the ligament
of Treitz, either end of the sigmoid colon, and the ileocecal junction, and these
are particularly vulnerable to injury [18].

36. **The correct answer is B.** Acute disseminated encephalomyelitis (ADEM) is
an autoimmune disease typically seen in younger patients. Although it often
follows a viral illness by 1–3 weeks, it may be seen following bacterial infec-
tions as well. Unlike multiple sclerosis, patients generally suffer a single epi-
sode, although recurrent forms exist as well. Mortality rates are low, with the
majority of patients experiencing complete recovery after several months.
Patients may present with fever, confusion, seizures, and coma. First-line ther-
apy consists of intravenous corticosteroids, with intravenous immunoglobulin
(IVIg) or plasmapharesis used for severe cases.

37. **The correct answer is C.** Approximately one third of brain abscesses arise
via hematogenous spread from remote sites. The most common cause,
however, is via contiguous spread of infected structures., accounting for one
half of all cases [19].

38. **The correct answer is D.** Fatigue, altered mental status, and seizure activity
in a patient on dapsone should immediately raise suspicion for methemoglo-
bininemia. Dapsone use may result in oxidation of the heme molecule, convert-
ing Fe$^{2+}$ to Fe$^{3+}$. Methemoglobin is less able to release oxygen at the tissue
level, resulting in functional hypoxia, and symptoms may range from lethargy
and confusion to coma and seizure activity. Arterial methemoglobin levels
should be obtained, and the sample should be examined for the characteristic
“chocolate” brown discoloration of the blood [20]. The possibility of methe-
moglobinemia can be rapidly assessed before exploring the possibility of a
CNS infection.

39. **The correct answer is C.** Communication is key in the ICU, especially with
multi-disciplinary care teams. The terms drowsy, lethargic, encephalopathic,
stuporous, and comatose are usually not precisely used, and can be equivocal.
Noting which stimulus (auditory, tactile, repeated vigorous tactile, noxious)
led arousal is more useful, in addition to eye tracking and attention span.
Aphasic or intubated patients with eye opening apraxia who are localizing to
painful stimuli score 7 on the GCS, but are definitely not comatose, as they
have cortically mediated responses.

40. **The correct answer is C.** Tacrolimus, a calcineurin inhibitor, is one of the
most widely used immunosuppressive medications in transplant recipients. A
wide array of neurologic side effects have been reported, including all of the
listed answer choices. The most common side effect, however, is fine tremor,
which may resolve on dose reduction or discontinuation of the medication.
41. **The correct answer is C.** A number of treatment options exist for patients with high grade gliomas (WHO class III or IV), including surgical resection, stereotactic radiosurgery, traditional chemotherapeutic agents (such as carmustine), and in particular the angiogenesis inhibitor bevacizumab and the alkylating agent temozolomide. Gemcitabine, on the other hand, is a nucleoside analog most commonly used for breast and lung cancer, and plays no role in the treatment of a high grade glioma.

42. **The correct answer is E.** Several risk factors have been identified for the development of ventilator-associated pneumonia. These include male gender, underlying lung disease, head trauma, need for reintubation, or need for transportation outside of the ICU for diagnostic procedure [21]. Female gender is not a risk factor.

43. **The correct answer is B.** This description of this patient’s lesion is consistent with a cavernous hemangioma, or cavernoma. A history of prior whole brain radiation is a risk factor for the development of cavernomas later in life [22].

44. **The correct answer is E.** There is no reliable serum alcohol cutoff that will ensure a patient will not experience alcohol withdrawal seizures. Furthermore, patients with a history of chronic and severe alcohol abuse may go into withdrawal at serum levels which would be otherwise incapacitating to average individuals.

45. **The correct answer is A.** Delayed hydrocephalus is an uncommon complication of subarachnoid hemorrhage, occurring in just over 1% of patients, the majority of whom will develop hydrocephalus within 1 year of hospital discharge. In one study, factors significantly associated with the development of delayed hydrocephalus included requiring a temporary ventriculostomy during initial hospitalization, microsurgical clipping, and discharge to a rehabilitation facility [23].

46. **The correct answer is A.** The overall risk of contracting HIV as a result of a needlestick injury in an HIV-positive patient is approximately 0.3%. A high plasma viral load in the source patient is associated with an increased risk of transmission [24].

47. **The correct answer is B.** The etiology of primary angiitis is unknown, and it is an uncommon disease overall, with an annual incidence of 2.4 cases per 1,000,000 person-years. A 2:1 male predominance is seen. Headache is the most common presenting symptom, seen in about 60% of cases [25].

48. **The correct answer is E.** The use of loop diuretics can exacerbate hypokalemia and hypocalcemia. It has been proposed that loop diuretics could ameliorate ischemic damage in acute kidney injury (AKI) by reducing energy requirements of cells within the loop of Henle. However, diuretics can also induce hypovolemia, which can lead to or worsen prerenal AKI. Some small trials have reported higher risks of AKI when used as a prophylactic agent at the time of imaging and surgical procedures. Overall, the use of furosemide to facilitate diuresis does not appear to improve kidney recovery among patients who require dialysis for AKI; however, it may facilitate mechanical ventilation in volume-overloaded patients.
49. The correct answer is A. Aggressive fluid resuscitation is essential in the treatment of acute pancreatitis, along with meticulous ongoing management of fluid and electrolyte needs. The routine use of antibiotics, acid reducers, or nasogastric suction is discouraged, as these therapies do not have any proven benefit [26].

50. The correct answer is B. Water-circulating surface cooling can be an effective therapy to combat central and persistent hyperthermia. Shivering is commonly encountered in this setting, and must be controlled. Surface counterwarming is a relatively simple non-pharmacologic approach that can be tried initially. Medications may be administered as well, including buspar, meperidine, magnesium, and sedative medications. However, it would be imprudent to institute multiple medical therapies without a trial of surface counterwarming first.

51. The correct answer is A. The CT scan shows a cavitary lung lesion in the left lower lobe. A cavity in the lung is a gas filled space within a consolidation, mass or nodule. The differential for a cavitary lesion is broad, and can be divided into infectious and non-infectious processes. The clinical history and presentation is of utmost importance in deciding the next best step. The most common organisms that can cause cavities or abscesses in the lung include anaerobes, mycobacteria, MRSA, fungi, Klebsiella, and Nocardia. Given the history of a recent stroke, fevers, and purulent sputum, this patient is most likely aspirating, resulting in an anaerobic infectious cause of the cavitary lung lesion. Therefore, antibiotics covering for aspiration organisms should be given, such as clindamycin or piperacillin-tazobactam. Tuberculosis must be strongly considered in anyone with an infectious cavitary lung lesion, but this patient has no risk factors, is PPD negative, and is acutely ill, which is more suggestive of an acute bacterial process. Bronchoscopy would not be needed if the patient improves on antibiotics. This patient’s finding is not consistent with a pulmonary infarct, and intravenous heparin is not needed. There is no role for image guided lung biopsy at this point, as the most likely cause is infectious. If the cavity does not improve after a sufficient period of time, further evaluation can be performed [27].

52. The correct answer is D. Chemical (sterile) meningitis is a postoperative complication that may be difficult to distinguish from bacterial meningitis. Operative and postoperative factors linked to bacterial meningitis include sinus or spine manipulation, CSF rhinorrhea or otorrhea, or the presence of new seizures or focal neurologic deficits. Chemical meningitis is more likely to be present in the immediate postoperative period [28].

53. The correct answer is D. The work-up for patients with subarachnoid hemorrhage without detectable aneurysm on conventional angiography varies, but generally includes repeat angiography at 1–2 weeks and magnetic resonance imaging of the neuroaxis if suspicion for a vascular cause is high. It is arguable that this may be unnecessary in patients with a classic perimesencephalic pattern of subarachnoid blood, and that those patients have an excellent prognosis without further imaging, but perimesencephalic bleeding should not, by definition, significantly extend into the bilateral Sylvian fissures (as it does in this
patient). Therefore, this patient likely requires repeat angiography, and waiting 3, 6 or 12 months to do so is too long; answers A, B, C, and E are incorrect [29].

54. **The correct answer is A.** The patient has an upper airway obstruction after extubation, most likely secondary to laryngeal edema. Aphonia indicates a complete obstruction with impending respiratory failure, and thus, the patient needs immediate re-intubation. Inhaled bronchodilators, racemic epinephrine, and helium-oxygen mixtures may provide some relief, but can only be used in patients who do not require immediate control of the airway. If there was prior clinical suspicion for laryngeal edema, the use of intravenous methylprednisolone 12 h prior to extubation has been shown to reduce failure rates [30].

55. **The correct answer is C.** While discontinuing feeds and tapering the propofol would indeed address the issue of phenytoin absorption and allow for a better neurologic assessment, the patient is still seizing, and still has a high risk of deterioration from hematoma expansion or increase in perihematomal edema. Increasing the phenytoin will still lead to erratic absorption given the continuous feeds; additionally, it may be the etiology of her fevers. It is likely more judicious to switch from phenytoin to a different agent, such as valproate. Recurrent seizure activity should always prompt a dose of benzodiazepine to prevent recurrence. Adding a midazolam infusion to her current regimen may result in prolonged mechanical ventilation, especially considering her LPDs may simply be markers of her ICH. Clot evacuation can be considered in extreme cases, but not before addressing her ongoing seizure activity.

56. **The correct answer is D.** There is evidence that excessive hypertension may contribute to the hemorrhagic complications of tPA administration. Prior to tPA administration, the blood pressure needs to be controlled <185/110 mmHg. Once tPA has been administered, the blood pressure needs to be maintained <180/105 for at least 24 h.

57. **The correct answer is A.** This patient presents with myxedema coma. These patients are usually hypoglycemic; therefore, an insulin infusion would likely be unnecessary. Corticosteroids may treat concurrent adrenal insufficiency, and hypothermia should be treated with rewarming. This patient is comatose, and may require mechanical intubation to protect his airway.

58. **The correct answer is E.** SvO2 is measured from the pulmonary artery, while ScvO2 is measured from the superior vena cava. As such, SvO2 measurements are more invasive, and inherently pose more risk to the patient. ScvO2 is usually (though not always) lower than SvO2 due to high oxygen extraction by the cerebral circulation.

59. **The correct answer is B.** The clinical presentation suggests acalculous cholecystitis. Critical illness and neurologic deficits are frequently associated with this diagnosis, and it confers considerably higher morbidity and mortality than its calculous counterpart. While surgical options may be considered, this patient’s overall critical illness and poor healing potential (i.e. very low serum albumin) make her a poor surgical candidate. Therefore, percutaneous cholecystostomy is the best treatment option for this patient.
60. **The correct answer is E.** There are a number of imaging studies that may be useful in the evaluation of DCI and cerebral vasospasm, including multimodality CT (non-contrast, angiography, and perfusion imaging). Mean transit times >6.4 are highly sensitive for predicting angiographic vasospasm, and may be used in conjunction with vessel appearance on CT angiography. However, conventional digital subtraction angiography (DSA) remains the gold standard [31].

61. **The correct answer is B.** In adult patients, gliomas account for the majority of primary brain tumors (approximately 50%). The next most common are meningiomas (30–40%), followed by pituitary tumors (10–20%) and primary CNS lymphoma (<5%).

62. **The correct answer is A.** In order to prevent rapid shifts in fluid and solute concentrations during intermittent hemodialysis, the dialysis prescription should include a dialyzer membrane with a small surface area, a low blood flow rate and dialysate flow rate, a high dialysate sodium concentrate, a low bicarbonate concentrate, a cooler dialysate temperature, a low rate of urea removal and a low rate of ultrafiltration.

63. **The correct answer is C.** The lower density of helium/oxygen mixtures reduces frictional resistance and promotes laminar gas flow, which reduces overall airway resistance. Isoflurane and sevoflurane both have bronchodilatory properties, and may help reduce auto-PEEP. In refractory cases of status asthmaticus with mucoid impaction, bronchoscopy and mucolytic therapy may lower airway pressures and improve gas exchange. Intravenous magnesium is a standard frontline therapy for status asthmaticus. Nitric oxide, on the other hand, is a pulmonary vasodilator, and is of little benefit in primary airway disease.

64. **The correct answer is D.** A regular crescendo-decrescendo tidal volume breathing pattern with alternating periods of apnea is typical of Cheyne-Stokes respiration. This is highly suggestive of low cardiac output and cardiac dysfunction, and is found in up to 33% of patients with heart failure and a reduced ejection fraction [32].

65. **The correct answer is D.** VPA-induced hyperammonemia is thought to be, in part, related to carnitine depletion, which is a co-factor in VPA metabolism. Depleted carnitine levels may be seen both in the setting of long-term use and acute overdose. Although there are no prospective randomized trials evaluating levocarnitine in VPA-induced hyperammonemia, numerous case reports have reported it to be both a safe and effective therapy. The oral bioavailability is poor compared to the intravenous route, and may not be tolerated due to its foul odor and tendency to cause gastrointestinal upset [33].

66. **The correct answer is C.** Anti-Xa assays may be used to monitor the activity of both unfractionated heparin (UH) and low molecular weight heparin (LMWH). Different therapeutic reference ranges have been established for each agent, depending on whether or not the intention is thromboprophylaxis or treatment. Anti-Xa levels for thromboprophylaxis should be 0.1–0.4 IU/mL and 0.2–0.5 IU/mL for UH and LMWH, respectively. Treatment levels for UH and LMWH should be 0.3–0.7 IU/mL and 0.5–1.2 IU/mL, respectively.
67. **The correct answer is C.** Both bupropion and trazodone have been known to result in false-positive drug screens for amphetamine. None of the other implied answer choices (including statins, dopamine agonists, levothyroxine, or hormone replacements) are known to cross-react with the amphetamine urine screen [34].

68. **The correct answer is A.** Of the choices listed, only hyperhomocysteinemia is likely to result in the formation of an arterial thrombus in this scenario. Oral contraceptive use may be a contributing factor in this case. The other answer choices refer to factor V Leiden, heparin induced thrombocytopenia (HIT), and deep venous thrombosis (DVT). DVT and factor V Leiden are conditions involving venous (not arterial) thrombosis. HIT does not occur in the outpatient setting in the absence of heparin exposure.

69. **The correct answer is C.** Administration of acyclovir is associated with nephrotoxicity due to intra-tubular precipitation of crystals, and may be prevented simply via administration of intravenous fluids. Since the patient has been complaining of vomiting for the past several days, she is likely dehydrated and at an increased risk of acute kidney injury. However, the acyclovir dose should only be reduced empirically in patients with known renal insufficiency, as reducing the dose may lead to therapeutic failure. Acyclovir should be administered intravenously during the initial treatment of HSV encephalitis, and therefore switching to oral therapy is not an option at this time.

70. **The correct answer is C.** Patients with impaired kidney function who receive gadolinium are at risk of nephrogenic systemic fibrosis (NSF), a severe and potentially life-threatening disorder involving fibrosis of both the skin and internal organs. Although NSF has been reported in patients with a GFR less than 60 mL/min/1.73 m², the risk is greatest when gadolinium is administered to patients with a GFR less than 30 mL/min/1.73 m².

71. **The correct answer is D.** The STASH trial was a randomized, double-blind, placebo-controlled, multicenter study evaluating the use of simvastatin to improve functional outcomes after aSAH. A favorable outcome was defined by a modified Rankin score of 0–2 at 6 months. There were no significant differences between the control and placebo groups in this study [35].

72. **The correct answer is B.** Lance-Adams syndrome is a rare form of intention myoclonus usually seen after resuscitated cardiac arrest. Myoclonic status epilepticus may also be seen after cardiac arrest; however, patients are comatose, and with poor long-term outcomes. On the other hand, patients with Lance-Adams are awake, and may regain much or all of their prior cognitive functioning [36].

73. **The correct answer is C.** Chest pain and dysphagia are common after bronchial artery embolization, and generally self limited. More serious complications often arise from unintentional, non-targeted embolization. For example, transverse myelitis may result from spinal cord ischemia secondary to anterior spinal artery infarction. Bronchoesophageal fistula, though rare, may develop after bronchial wall ischemia and proximity to the esophagus. Pulmonary embolism would not be an expected complication, as the catheter is not inserted in the venous system [37].
74. **The correct answer is B.** In airway pressure release ventilation, the primary determinants of oxygenation are the mean airway pressure and the fraction of inspired oxygen. Thus, increasing either of these parameters may improve this patient’s hypoxemia. Increasing $T_{low}$ would actually decrease the patient’s mean airway pressure by increasing the time spent at the lower set pressure. Both prone positioning and nitric oxide have been shown to improve hypoxemia in severe ARDS, though prone positioning has been linked to improved outcomes and nitric oxide has not.

75. **The correct answer is B.** The ARUBA trial evaluated the benefit of preventive eradication of unruptured brain AVMs. This trial compared the risk of death and symptomatic stroke in patients with unruptured brain AVMs who are allocated to medical management with interventional therapy (i.e. neurosurgery, embolization, or stereotactic radiotherapy, alone or in combination) or medical management alone. The trial found that medical management alone is superior to medical management with interventional therapy for the prevention of death and stroke [38].

76. **The correct answer is C.** Administration of crystalloid before and after amphotericin B reduces the risk of nephrotoxicity. Reducing the dose of amphotericin B and discontinuing flucytocine can have a detrimental effect on treatment of cryptococcal meningitis, and should not be tried before the much simpler addition of normal saline boluses. Changing the rate of administration of either drug is not expected to have any beneficial effect.

77. **The correct answer is A.** Hyponatremia is commonly encountered in patients with aneurysmal subarachnoid hemorrhage, with salt wasting often preceding the onset of cerebral vasospasm and delayed cerebral ischemia. For this reason, subarachnoid patients often require the careful initiation of hypertonic saline solutions, enteral salt supplementation, and medications such as fludrocortisone, to maintain a neutral-to-mildly hypernatremic salt balance.

78. **The correct answer is A.** Perflutren lipid microspheres are an ultrasound contrast agent. They are usually injected through a peripheral IV, with an echocardiogram probe placed on the heart. As the contrast material reaches the heart, the left ventricular chamber becomes opacified, the endocardium becomes easier to visualize, and the presence of a left ventricular thrombus may be detected (though transesophageal echocardiogram is more sensitive.) Perflutren lipid microspheres are not used in the diagnosis of cerebral venous thrombus, cerebral arterial thrombus, or deep venous thrombus.

79. **The correct answer is A.** Dural arteriovenous fistulae (AVF) may present with pulsatile tinnitus, particularly if they drain into the transverse or sigmoid sinus. The Barrow classification system is used to describe cavernous carotid fistulae (CCF), not dural AVF. CCF may present with vision loss and the presence of an orbital bruit. Dural AVF may be treated surgically, endovascularly, or via stereotactic radiosurgery. They may also recur after treatment.

80. **The correct answer is C.** The development of both early- and late-seizures has been described as a potential consequence of stroke, with the risk for developing epilepsy appearing to be higher among patients suffering from hemorrhagic infarcts. Although the incidence of late seizures varies based on
a number of factors, by 2 years, approximately 10% of ICH patients will develop epilepsy. Risk factors for the development of late seizures may include the development of early seizures, younger age at presentation, ICH volume, and cortical involvement [39].

81. **The correct answer is A.** Echinocandins, including anidulafungin, are the treatment of choice for empiric coverage of presumed candida infections, except for the central nervous system, eye, and urinary tract. Echinocandins do not penetrate the CSF. Amphotericin B formulations are currently considered treatment of choice for empiric coverage in this scenario; fluconazole is reserved for step-down therapy once the diagnosis has been confirmed and the patient is improving. Flucytocine may be added to amphotericin B therapy at clinician discretion [40].

82. **The correct answer is D.** The goal behind triage is to address the patients who are sickest first. When multiple patients are critically ill, one should evaluate and treat them in a way that does the most good for the most people. In this case, the patient who is most likely to require immediate intervention is the patient who may be having an acute ischemic stroke and is within the tPA window.

83. **The correct answer is C.** This patient is presenting with several symptoms that may be concerning for progression of his underlying disease (in addition to the potential for a superimposed infectious process). However, the possibility of spinal cord compression from a metastatic lesion is what most requires urgent investigation. These lesions may be rapidly progressive, and of the answer choices listed, the diagnosis of cord compression is the most time sensitive.

84. **The correct answer is D.** Even if EEG criteria are not met for seizures, this patient’s PLEDs seem to be on the ictal-interictal continuum, and are potentially responsible for her fluctuating mental status. When benzodiazepine trial is inconclusive or unable to be performed, metabolic imaging is the next best way to confirm that the ictal signature coincides with hypermetabolism. Both CT perfusion and SPECT imaging can be used for this purpose, although CT perfusion is faster and more easily obtained in a critically ill patient.

85. **The correct answer is D.** Once a chest tube is placed for traumatic hemothorax, the output should be monitored closely. Though individual trauma center thresholds may differ, per ATLS guidelines, initial chest tube blood output of ≥1.5 L (or 20 mL/kg) or continued blood drainage of ≥3 mL/kg/h are indications for urgent thoracotomy in order to rapidly identify and intervene on the source of hemorrhage [41].

86. **The correct answer is E.** The cornerstone in the management of both serotonin syndrome and neuroleptic malignant syndrome is adequate fluid resuscitation and control of psychomotor agitation with sedatives as needed. Differentiating neuroleptic malignant syndrome from serotonin syndrome can be difficult, and the administration of “antidotes” for either of these conditions should not precede standard conservative treatment.

87. **The correct answer is D.** The American College of Surgeons makes several recommendations regarding the development and implementation of MTPs. These include resuscitation with only blood products once the MTP has been activated, transfusion of RBCs and plasma in either a 1:1 or 1:2 ratio, giving one
single donor apheresis or random donor platelet pool for every 4 units of PRBCs administered, and having one cooler of blood products delivered every 15 min until the MTP is terminated. There are no recommendations given regarding fixed administration of cryoprecipitate in ratio with other blood products.

88. **The correct answer is E.** Of the monitoring choices listed, many hold promise for management of blunt TBI but have yet to be borne out in high-quality clinical trials. However, a significant percentage of comatose ICU patients may have non-convulsive status epilepticus (particularly those with severe neurologic injuries), which necessitates the use of continuous video EEG monitoring.

89. **The correct answer is B.** While hematochezia often implies a lower GI source of bleeding, a brisk upper GI bleed may be found up to 10% of the time as the source of bleeding. Therefore, especially in cases of hemodynamic instability, an upper endoscopy may be undertaken first in an effort to identify and control the bleeding. Surgical intervention is usually sought after more conservative medical and endoscopic therapies have failed. TIPS procedure may be appropriate in cases of established variceal bleeding [42].

90. **The correct answer is D.** The time of death is the time that a physician or licensed provider examines the patient and declares them to have expired. This may occur long after asystole and physical death have occurred, particularly if the provider is delayed in performing their exam.

91. **The correct answer is C.** Current recommendations do not include induced hypothermia; ongoing clinical trials aim to answer this clinical question. Maintenance of MAP between 85 and 90 mmHg, SBP targeted >90 mmHg, early decompression and admission to an ICU are all supported by Level III recommendations [43].

92. **The correct answer is B.** The MCA is the most readily accessible intracranial vessel, owing to the temporal window. Additionally, the MCA receives the majority of blood flow from the ipsilateral carotid artery, making it a useful surrogate of hemispheric blood flow. The PCA, PICA, and basilar are not assessed via TCD ultrasonography.

93. **The correct answer is A.** Pseudoephedrine has been shown to be an effective adjunctive therapy for the treatment of refractory hypotension secondary to spinal cord injury. Atropine at doses below 0.5 mg can cause worsening of bradycardia. Amantadine does not affect hemodynamics in spinal cord injury patients. Central venous pressures have fallen out of favor as measures of intravascular volume status [44].

94. **The correct answer is B.** The American Heart Association’s 2013 policy statement recommends that policies be developed to allow ambulances to bypass non-stroke centers when patients have stroke symptoms that started within 6–8 h, and when that diversion will take no more than 15–20 min [45].

95. **The correct answer is E.** Contrary to popular belief, the Canadian C-spine Rules do not recommend neck imaging simply for the presence of midline neck tenderness. No further imaging is recommended if the following criteria are met: Age <65, no extremity paresthesias, and no “dangerous” mechanism (defined as a fall >3 ft, axial load injury, high speed/rollover MVC/ejection,
bicycle collision or motorized recreational vehicle). Next, the patient must have at least one low risk feature (defined as sitting position in the ED, ambulatory at any time, delayed onset neck pain, lack of midline tenderness, or simple rear-end MVC). Finally, the patient must be able to rotate their neck at least 45° to the left and right [46].

96. **The correct answer is E.** Single-fiber EMG offers the best sensitivity at approximately 95%. The ice-pack test has limited sensitivity. The tensilon test is 80–90% sensitive, as is most helpful when there is clear ptosis or ophthalmoplegiasis. The AChR antibody is present in about 85% of those with generalized disease; of the remaining 15%, approximately 40–50% will be MuSK-positive. Of note, almost all patients with both myasthenia and a thymoma are AChR-Ab positive [47].

97. **The correct answer is E.** Although osmotic demyelination syndromes, such as pontine and extrapontine myelinolysis, are often thought to carry universally poor prognoses, this is a bit of a misconception. In one study of chronic alcoholics suffering from osmotic demyelination, nearly one third went on to make a complete recovery from their illness [48].

98. **The correct answer is B.** The focused assessment with sonography in trauma (FAST) is an integral component of the rapid assessment of the patient with thoraco-abdominal trauma. FAST provides the ability to rapidly identify hemothorax, hemoperitoneum, hemopericardium and pneumothorax. This ultrasound image of the right upper quadrant demonstrates fluid within the hepatorenal recess (Morrison’s pouch). While ascites and fresh blood are indistinguishable on ultrasound, in the setting of thoraco-abdominal trauma, one must assume that peritoneal free fluid represents blood.

99. **The correct answer is A.** Extreme delta brush is an unusual EEG waveform uniquely associated with anti-NMDA encephalitis, and resembles waveforms seen in premature infants. It is characterized by rhythmic delta activity with bursts of 20–30 Hz beta activity superimposed on each delta wave [49]. All of the other answer choices may be seen in a variety of conditions.

100. **The correct answer is E.** Anorexia nervosa is associated with subnormal or erratic vasopressin release. Wolfram syndrome is also known as DIDMOAD (diabetes insipidus, diabetes mellitus, optic atrophy and deafness). It is an autosomal recessive illness with incomplete penetrance, and is also associated with cognitive and psychiatric disorders. Septo-optic dysplasia and other congenital cerebral midline abnormalities have been associated with both anterior and posterior pituitary dysfunction.

References

Absolute Neurocritical Care Review
Levy, Z. (Ed.)
2017, XIV, 244 p. 23 illus., 1 illus. in color., Softcover
ISBN: 978-3-319-64631-2