Practice Exam Questions

CNRN

Certified Neuroscience Registered Nurse

EXAMAIDES

PASS YOUR EXAM AT FIRST TRY

1. Which is the most accurate statement concerning antibiotic therapy for bacterial meningitis?

a. Treatment should not commence until the causative organism has been identified
b. Bactericidal and bacteriostatic antibiotics are equally acceptable
c. Initial drug selection is based on the most likely organisms and should be reassessed within hours as CSF laboratory results return
d. Antibiotic therapy should be initiated before administering any dexamethasone

2. Which of the following is NOT an important nursing intervention in the care of a patient with viral meningitis?

a. Serial neurologic examinations to detect focal abnormalities or altered consciousness
b. Taking steps to prevent increased intracranial pressure, such as maintaining the neck in neutral position and instituting a good bowel program to prevent the need for Valsalva
c. Avoiding hyperthermia by keeping the room cool, applying moist cloths to the head, and administering antipyretic drugs as necessary
d. Maintaining isolation until the patient has been afebrile without antipyretic drugs for at least 24 hours

3. The MOST important part of nursing preparation for a patient about to undergo diagnostic lumbar puncture is to:

a. check platelet count and coagulation studies.
b. have the patient empty his bladder and move his bowel if possible.
c. maintain the patient NPO for six hours or more.
d. educate the patient about the purpose, method, and possible complications of the procedure.

4. Which is the MOST important element of patient education for the patient being discharged from hospital after diagnosis and early treatment of Lyme disease?

a. Emphasize the necessity to complete the entire course of oral antibiotics
b. Reassure the patient that his experience with Lyme disease has conferred immunity to *B. burgdorferi*
c. Instruct the patient to maintain isolation until he has completed the entire course of antibiotic therapy
d. Alert the patient to possible long-term joint damage from the disease

5. A patient with relapsing-remitting multiple sclerosis wishes to discontinue therapy with interferon beta-1b, because she has not noticed any neurologic improvement since starting the medication two years ago. The MOST appropriate nursing response is to:

a. evaluate her for depression, since depression is a known side effect of interferons, as well as a likely symptom of her multiple sclerosis.
b. help her to manage flu-like side effects by pretreating with acetaminophen or a nonsteroidal anti-inflammatory agent prior to injections.
c. remind her that the goals of therapy are to reduce the frequency and severity of exacerbations and delay the development of disability. Provide regular phone follow-up to support her in continuing treatment.
d. propose changing to interferon beta-1a or glatiramer acetate.

6. A college student is brought to the emergency room by a dormitory roommate because of severe headache, fever, and strange behavior over the last couple of hours. There are petechiae on the skin and conjunctivae. While the patient is being prepared for lumbar puncture, what supportive measure is MOST urgent?

a. Preparing for endotracheal intubation
b. Providing adequate intravenous access
c. Administering an antipyretic
d. Educating the patient and roommate about vaccination for meningitis

7. The MOST effective way for a patient with multiple sclerosis to cool core body temperature during exercise is to:

a. take antipyretics, such as acetaminophen, prior to exercising.
b. drink cool liquids.
c. wear a cooling vest.
d. dress lightly.

8. The MOST important element in the assessment of the patient hospitalized for care of worsening myasthenia gravis is:

a. comprehensive assessment of respiratory function.
b. evaluation of voice quality and volume.
c. evaluation of extraocular muscle function.
d. avoidance of neuromuscular-blocking drugs.

9. The best dietary advice for patients with myasthenia gravis is to:

a. follow a liquid diet on days when the muscles of mastication feel weak.
b. take anticholinergic medication well in advance of every meal.
c. never eat when fatigued.
d. eat a mechanical soft diet and take small meals.

10. Proactive decision making about life supports such as gastrostomy for feeding or tracheostomy for ventilation is essential for patients with amyotrophic lateral sclerosis (ALS) because:

a. death in ALS most commonly occurs because of aspiration or respiratory failure.
b. when terminal, an ALS patient may be unable to communicate.
c. ALS is a progressive disease, and 50% of the patients die within 3 years of diagnosis.
d. for ALS patients, feeding tubes and artificial ventilation are not temporary life-saving measures that can be instituted and then withdrawn when a crisis resolves.

11. The MOST essential element in respiratory monitoring of a patient hospitalized for management of Guillain-Barré syndrome is:

a. measuring respiratory rate at frequent intervals.
b. checking frequently for signs of hypoxia, such as dyspnea, cyanosis, or confusion.
c. measuring oxygenation by continuous pulse oximetry.
d. measuring vital capacity at frequent intervals, and knowing the value at which intubation will be performed electively.

12. Prevention of deep vein thrombosis in the patient hospitalized for management of Guillain-Barré syndrome is best accomplished by:

a. placing compression boots on the lower extremities.
b. oral warfarin.
c. mini-doses of heparin.
d. Aspirin.

13. A patient is sufficiently recovered from the acute phase of Guillain-Barré syndrome to have been successfully extubated, and is now ready for outpatient rehabilitation. His pain, however, is intense and unrelenting, and he has concerns about his prescription for a sustained-release opioid medication. The best approach to educating this patient about his pain medication is to:

a. explain that a sustained-release preparation taken time-contingently, rather than pain-contingently, actually allows him to minimize his total dose of opioid and reduce side effects associated with high serum levels.
b. warn him about the risks of respiratory suppression, since he has recently been ventilator-dependent and is still not fully recovered from Guillain-Barré syndrome.
c. explain to the patient and family that this medication carries a risk of addiction and make sure they know the signs of addiction and the importance of communicating their concerns to the prescribing physician.
d. encourage the patient to explore non-opioid drug options with the physician.

14. The MOST suitable nursing intervention to protect the eye of a patient with Bell's palsy is to:

a. apply a patch.
b. provide artificial tears for daytime instillation and protective ophthalmic ointment during sleep.
c. teach the patient facial exercises to promote return of strength to the orbicularis oculi.
d. recommend electrical stimulation of the involved nerve.

15. Which is the MOST fundamental part of patient education regarding bladder care for the patient newly diagnosed with multiple sclerosis?

a. Instructing the patient in self-catheterization
b. Recommending that the patient empty the bladder at regular, frequent intervals, regardless of subjective fullness
c. Setting up a schedule for regular urine cultures
d. Making a referral to a urologist

16. The MOST important role for nurses in the prevention of neurocysticercosis is:

a. educating patients, their families, and their other contacts about the importance of hand washing, proper handling and cooking of pork, and dietary precautions to take while traveling in endemic areas.
b. encouraging parents to have their children properly immunized against *Taenia solium*.
c. identifying asymptomatic patients for treatment by offering immunoserologic assays for *T. solium* antibodies.
d. identifying all close contacts of known patients for prophylactic treatment with antihelminthic drugs.

17. Nursing interventions in the care of patients with Creutzfeldt-Jakob disease include all of the following EXCEPT:

a. isolation precautions.
b. psychiatric interventions.
c. palliative care, including total care at the end of life.
d. support for patient and family in proactively addressing end-of-life concerns.

18. Once a patient has become HIV-positive, the MOST effective way to prevent AIDS-dementia complex (ADC) is which of the following?

a. Isolation precautions to prevent opportunistic CNS infections, such as tuberculosis
b. Prophylaxis with cholinergic medications such as donepezil
c. Aggressive cognitive stimulation
d. Early and sustained HAART (highly active antiretroviral therapy)

19. The MOST essential element in managing primary fatigue in multiple sclerosis is:

a. stimulant medication.
b. activity pacing.
c. occupational therapy.
d. treatment of any underlying sleep disorder.

20. The optimal position for the meningitis patient is:

a. neck extended.
b. neck flexed.
c. neck and head in neutral position.
d. fetal position.

21. For a patient anticoagulated with intravenous heparin, the MOST important laboratory parameter to follow in addition to the PTT (partial thromboplastin time) is:

a. the PT (prothrombin time).
b. the platelet count.
c. the hematocrit.
d. serum electrolytes.

22. The MOST important nursing intervention to prevent rebleeding in the patient with subarachnoid hemorrhage (SAH) due to cerebral aneurysm is:

a. instituting a bowel program promptly upon admission.
b. maintaining seizure precautions.
c. placing sequential compression boots or TED hose on the lower extremities.
d. limiting fluid intake.

23. The goal of blood pressure management in the patient with an aneurysmal subarachnoid hemorrhage (SAH) awaiting definitive treatment is:

a. keeping blood pressure as low as possible to prevent rebleeding.
b. keeping blood pressure as low as possible to prevent increased intracranial pressure.
c. keeping blood pressure high enough to avoid vasodilatation and low enough to avoid cerebral edema.
d. keeping blood pressure high enough to prevent vasospasm and low enough to avoid repeat aneurismal bleeding.

24. The best response to hyponatremia in the aftermath of an intracranial aneurysmal bleed is usually:

a. fluid restriction and sodium restriction.
b. fluid restriction and sodium replacement.
c. fluid replacement and sodium replacement.
d. sodium replacement alone.

25. The most accurate statement concerning patient age and treatment outcomes for cerebral aneurysm is:

a. for all accepted types of treatment, outcomes are not correlated with age.
b. above age 65, there is a higher incidence of negative treatment outcomes, even though the surgical complication rate is the same.
c. above age 65, the incidence of negative treatment outcomes and the incidence of surgical complications are both higher.
d. only ultra-soft coils have an acceptable success rate in patients over age 65.

26. Which of the following is among the eligibility criteria for treatment of acute stroke with thrombolytic therapy?

a. Symptom must be no more than 3 hours duration for all patients
b. The patient must also be receiving intravenous heparin
c. Blood glucose must be under 150
d. Symptoms must be of no more than 4.5 hours duration with exclusion criteria met

27. In the first 24 hours following carotid endarterectomy, the MOST important vital sign to monitor and stabilize is:

a. temperature.
b. heart rate and rhythm.
c. blood pressure.
d. respiratory rate and pulse oximetry.

28. In response to a patient's loss of self-control and social inhibitions following stroke, the MOST essential nursing intervention is to:

a. discuss with the patient and family the likely need for psychiatric care, including pharmacotherapy.
b. simply accept the new range of behavior and avoid judgment.
c. explain to the patient and family that these behaviors are involuntary, resulting from brain injury.
d. ignore the behavior.

29. What is the best nutritional advice to give a patient discharged on warfarin to prevent recurrence of embolic stroke?

a. Take a vitamin K supplement, because warfarin inhibits vitamin K
b. Eat leafy green vegetables regularly and in moderation
c. Do not drink more than 2 glasses of wine or 1 mixed drink per week
d. Take an iron supplement to counteract anemia associated with silent microscopic GI bleeding

30. Early definitive laboratory diagnosis of herpes simplex encephalitis is possible with:

a. CT scan of the brain.
b. a 4-fold rise in serum antibody titer.
c. viral DNA in the cerebrospinal fluid (CSF).
d. characteristic temporal sharp waves on electroencephalogram (EEG).

31. While carefully monitoring the neurologic examination in a patient receiving a continuous intravenous heparin for cerebral venous thrombosis (CVT), the nurse notes an acute neurologic deficit. The immediate response should be:

a. discontinue the heparin and notify the physician at once.
b. elevate the head of the bed and make sure the head remains positioned at 30 degrees.
c. assess the patient with PTT and CT scan of the brain.
d. obtain PTT and empirically increase the heparin infusion slightly pending the result.

32. Admission to the intensive care unit is standard care for which diagnostic group, independent of neurologic status?

a. Acute ischemic stroke
b. Transient ischemic attacks
c. Cerebral venous thrombosis
d. Acute hemorrhagic cerebral infarction

33. Which of the following statements is correct concerning management of neurologic disease and pregnancy?

a. Disease modifying therapy for multiple sclerosis should not be interrupted for pregnancy or lactation
b. In a woman with a known cerebral arteriovenous malformation (AVM), pregnancy should be delayed until the lesion can be definitively treated
c. A woman with a known cerebral arteriovenous malformation should not deliver her baby vaginally under any circumstances
d. Women with myasthenia gravis should not take anticholinesterase medications during pregnancy

34. What is the most accurate way to educate a patient contemplating surgery for an unruptured intracerebral arteriovenous malformation (AVM) about his risk of hemorrhage if the lesion is not treated?

a. The patient should be reassured, because the risk of hemorrhage is only 2-4% per year
b. Patients with particularly large AVMs should not be reassured, because they have a higher than average risk of bleeding
c. The patient should understand that even though there is a substantial lifetime risk of hemorrhage, the risk of death with hemorrhage is low
d. The patient should understand that although the risk of hemorrhage is low during any given year, the cumulative lifetime risk of hemorrhage is well over 50%

Answer Key and Explanations

1. C: Treatment for bacterial meningitis is urgent; the risk of mortality is too great to wait for a definitive bacteriologic diagnosis. Drug selection targets the organisms most likely to be present on clinical grounds and on the known antibiotic sensitivities of those organisms in the region and in the specific institution. These sensitivities vary geographically and evolve over time. Because of the seriousness of the infection, bactericidal antibiotics are preferable. If dexamethasone is included in the treatment regimen, it should be started before – or at least concomitant with – the first dose of antibiotic as the first phase of bacterial death can intensify the inflammatory response.

2. D: Unlike bacterial meningitis, viral meningitis cannot be transmitted from person to person via direct contact or airborne secretions. The viruses that cause aseptic meningitis in humans are called arboviruses and are transmitted by mosquitoes. Some of these viruses also cause encephalitis. Serial neurologic examination is important to detect focal neurologic abnormalities as soon as they develop, since viral meningitis is often accompanied by encephalitis. Some focal deficits can be life threatening, such as dysphagia. Any deterioration in level of consciousness should also be noted as promptly as possible so that the cause can be addressed, for example, by reversing increased intracranial pressure. Deteriorating level of consciousness is a poor prognostic sign. Hyperthermia in any setting can result in permanent brain damage.

3. A: The most important nursing precaution to take prior to lumbar puncture is to look for any evidence of a clotting disorder, because bleeding into the limited spinal subarachnoid space can produce a hematoma that entraps or compresses the cauda equina. The physician will already have assessed the risk of herniation due to increased intracranial pressure with or without a space-occupying lesion. It is advisable to have the patient attend to bathroom needs prior to the lumbar puncture so that he doesn't have to sit or stand following the procedure, but this is a lower priority than checking the coagulation studies. No restriction of food or liquid is necessary prior to lumbar puncture. Patient education is a part of preparation for any procedure, but again, the most pressing nursing intervention is to review the coagulation studies.

4. A: Lyme disease is caused by the spirochete *B. burgdorferi*, which is not quickly killed by antibiotics. If the diagnosis is made before neurologic, cardiac, or joint involvement, then antibiotic treatment can usually be completed orally at home. The patient needs to understand that treatment is not complete until the last prescribed dose has been taken. IV antibiotics may be required if the disease has progressed to involve the CNS, heart, or joints. In that case, the patient will remain in hospital or be discharged home with home nursing support. In either case, completing the entire course of treatment is essential. The patient should understand that especially if treatment has been started early in the course of the disease, he is very likely NOT immune to subsequent infection with *B. burgdorferi*, because his immune system may not have had sufficient time to mount an effective response. The patient should understand precautions against repeat infection. The infective agent is tick-borne, so the patient should avoid wooded environments and use insect repellents and wear protective clothing whenever he cannot avoid tick habitats. He should inspect himself and his pets regularly for ticks and understand the correct and incorrect methods for removing any ticks he may find. *B. burgdorferi* is not transmitted from human to human, so isolation is not required at any stage. The patient should be aware that Lyme disease is a chronic illness, and many individuals experience intermittent long-term symptoms such as arthralgias, headache and lethargy, but actual permanent joint damage is, in fact, unlikely.

5. C: The goal of disease-modifying treatment for multiple sclerosis is not cure or reversal of existing symptoms. Rather, the goal is to reduce the frequency and severity of exacerbations and to delay development of disability. For this reason, patients are easily frustrated even by successful therapy, because they cannot see concrete, positive improvement. Patients and their families often benefit by repeated reminders about the actual goals of treatment, even if they are not expressing frustration. Since depression can be a primary symptom of MS, a reaction to a particular loss associated with the disease, or a side effect of interferon treatment, the treatment team should always be alert to possible depression, but the first-line intervention in this case is education. If the patient is doing well neurologically and not experiencing unmanageable side effects, it is not appropriate to propose changing drugs.

6. B: Given her symptoms and signs, this patient likely has meningitis. She will certainly need IV antibiotics as soon as possible. Given her age and close living quarters, meningococcal meningitis (caused by *Neisseria meningitidis*) is the likely pathogen; her rapid course and the presence of petechiae suggest she is at risk for a fulminant presentation, which can include circulatory collapse. IV access may be needed not only for antibiotics, but also for fluids and pressors. Although she may ultimately require intubation, the IV is urgent immediately. Meningococcal meningitis is largely preventable by immunization, but immunization will not prevent disease in persons who have already been exposed. Close contacts should receive chemoprophylaxis with antibiotics. Vaccination is still appropriate for others in the environment beyond the immediate contacts, as vaccination may prevent a secondary outbreak.

7. B: Exercise is at least as important for individuals with multiple sclerosis as for others to maintain cardiovascular health, skeletal integrity, and bone strength and exercise confers psychological benefits as well. Because elevated core temperature can temporarily worsen MS symptoms, some people with MS are reluctant to exercise. The fastest way to lower core body temperature is by ingesting cool liquids. External cooling, as with vests, is costly and cumbersome. Dressing lightly throughout exercise is sensible, but to actually reduce core temperature, drinking cool liquids is the most effective approach.

8. A: In any patient whose myasthenia gravis is rapidly deteriorating, the most life-threatening development is respiratory failure. This is restrictive rather than obstructive respiratory failure, based on inability of the muscles of respiration to contract sufficiently to move air into the chest. Unlike obstructive failure, restrictive failure is not accompanied by overt respiratory symptoms, such as wheezing or gasping, and the patient may not be particularly hypoxic or even feel short of breath until complete respiratory failure is imminent. For this reason, the physical examination and arterial blood gases are inadequate measures of pulmonary function, and regular measurement of vital capacity is mandatory. The physician should determine in advance a value at which semi-elective intubation will be instituted in order to avoid a respiratory emergency. It is also important to evaluate other muscle groups, particularly the muscles of swallowing, as aspiration of secretions is also a very serious event. All patients should be carefully monitored for possible adverse events when they start a new medication. A wide range of drugs can worsen myasthenia, and while these are to be avoided, they may sometimes be watchfully given when the potential benefit is judged to outweigh the risk.

9. D: For myasthenic patients with difficulty swallowing, a liquid diet poses more risk of aspiration than does a mechanical soft diet. The mechanical soft diet includes foods that are easily chewed, such as scrambled eggs, pasta, and cooked vegetables. Foods to avoid include tough meats, nuts, crusty breads, and raw fruits. While anticholinergic medications should be timed for maximum effectiveness during essential activities such as eating, the use of sustained-release medications makes it unnecessary to medicate before every meal or snack. Small meals make fatigue of the

muscles of mastication less likely. It is best not to eat when at risk for aspiration, but it is usually not necessary to go hungry in the face of mild fatigue. Patients should be encouraged to know and honor their own body's signals.

10. D: The key issue is that once a patient loses the ability to swallow or breathe because of ALS, that ability will not return, and intervention is not temporary. Some ALS patients will want to take advantage of every life-saving measure and some will reject prolonged ventilatory support at the end of life. Many will be ambivalent and need consultation with family members, ethicists, clergy, or other advisors. There may be disagreement among family members. The discussion should be initiated early, respectfully, and supportively.

11. D: Respiratory failure is a common feature of Guillain-Barré syndrome and occurs because of neuromuscular weakness, not intrinsic lung pathology. When the cause of respiratory failure is neuromuscular, the patient may deteriorate very abruptly without having had symptoms or signs of hypoxia in advance. Relying on the clinical picture alone or supplemented by pulse oximetry or even arterial blood gases can be falsely reassuring. Once the vital capacity falls below 12-15 mL/kg, the patient is at risk for ventilatory failure, and intubation should proceed regardless of the patient's comfort level or other signs. Of course, measuring the respiratory rate and regularly auscultating the lungs are also important measures, but the most important element of respiratory monitoring is frequent vital capacity determination.

12. C: Patients with Guillain-Barré syndrome are at risk for deep vein thrombosis (DVT) because of prolonged immobility or reduced mobility. Compression boots can injure peripheral nerves already compromised by autoimmune inflammatory demyelination, so compression is not a good choice for these patients. Peroneal nerve palsy is a particular risk. Mini-doses of heparin are sufficient to prevent DVT. This approach carries fewer risks, is more immediately effective, and is more rapidly reversible than oral warfarin. Aspirin is not effective DVT prophylaxis, irreversibly damages platelets, and carries a risk of gastritis, especially in a critically ill patient. Because of the risk of peripheral nerve injury, positioning and turning are especially important considerations in the care of these immobilized patients.

13. A: Total opioid requirement is minimized with sustained-release medication taken time-contingently. The patient will likely have a prescription for a few tablets of an immediate-release medication for break-through pain. Tolerance to adverse side effects of the opioids, including respiratory suppression, develops very rapidly. If the patient has received opioid medication in the hospital before discharge, tolerance to respiratory suppression has already developed. The patient should, however, have pro-active bowel management while on opioids to prevent constipation, especially if there has been autonomic nervous system involvement.

In educating the patient and family about addiction, it is important to explain to them that tolerance (needing more medication to get the same level of pain relief) and dependence (experiencing unpleasant symptoms with abrupt withdrawal) are purely physiologic responses and can be managed in cooperation with the physician. Addiction is a completely different phenomenon from tolerance and dependence and is unlikely in the absence of pre-existing risk factors for addiction. While neuropathic pain often responds to a variety of non-opioid drugs, including anticonvulsants and tricyclic antidepressants, the pain of Guillain-Barré syndrome is often so severe as to require opioids.

14. B: The eye on the affected side in Bell's palsy does not close completely, so the eye has to be protected. Patches provide mechanical protection against foreign debris lodging in the eye and may be indicated in windy conditions or sometimes for sleep. The most important ongoing

consideration, however, is maintaining lubrication of the eye. The cornea is easily injured if it is not kept moist, and the eye may be dry, not only because of incomplete closure, but also because of reduced or absent tear production due to the cranial nerve VII dysfunction. Lubrication with tears and ointments is vital. Various devices such as eyelid weights can promote eye closure, but the first line of protection is lubrication. Facial exercises and nerve stimulation may be helpful in promoting recovery, but they will not protect the eye in the short term.

15. B: Most patients with multiple sclerosis do not have bladder symptoms at the time of diagnosis, but the majority of patients with MS will have bladder dysfunction of some kind at some point in their disease course. Bladder dysfunction in MS is often asymptomatic and usually consists of both detrusor hyperreflexia and incomplete emptying. This combination is known as detrusor external sphincter dyssynergia (DESD.) The patient may experience repeated bladder hyperdistention without any awareness of the problem, and this can lead, over time, to irreversible bladder flaccidity and incontinence and predisposes the patient to infection as well. Frequent timed voiding is a simple preventive measure that all patients with MS should learn and practice. Some neurologists feel that a urologist should be made a part of the patient's treatment team before there is any bladder disturbance, but this is optional. Self- catheterization is an easy skill to master and need not be taught unless there is an actual need for it.

16. A: Humans are the definitive hosts for *T. solium*. Infection can be passed from human to human via fecal contamination without an intermediate host, and infection can be acquired by ingesting undercooked pork that contains parasites. Good handwashing practice is the first line of defense against spread of cysticercosis. Proper precautions in handling and cooking pork are also important, and travelers from the United States should drink only bottled or boiled water when in endemic countries. There is no vaccine against *T. solium*. Immunoserologic assays may be positive in individuals who do not have active clinical disease and are not actively shedding parasites. Anti-helminthic treatment is not indicated in every patient with neurocysticercosis and is, in fact, contraindicated in some because of the risk of hydrocephalus if inflammation around degenerating cysticerci obstructs ventricular outflow.

17. A: Creutzfeldt-Jakob disease is caused by prions, abnormally folded proteins, which can be acquired by contact with contaminated tissues (e.g. corneal transplants or dural grafts before the mid-1980s) or biological products (e.g. human cadaver-derived growth hormone before 1985). An estimated 5-15% of cases are considered to be genetic in which case, a gene that causes abnormal folding of a protein is inherited; most cases are sporadic. Universal precautions apply, and certain instruments that come in contact with the patient's bodily fluids should not be reused, but isolation precautions are not required because ordinary human-to human transmission does not occur. Symptoms vary according to the parts of the central nervous system involved, and psychiatric manifestations often dominate early in the course. The disease follows an inexorable course of progressive dementia and is fatal within 13 months. Total care is required during the final months of life. The patient and family need support to address end-of-life issues as effectively as possible.

18. D: The pathophysiology of AIDS dementia complex is complex and includes entry of HIV into the brain within infected monocytes, widespread neuronal damage by cellular proteins and verotoxins, abnormal patterns of neurotransmitter release, and increased free intraneuronal calcium. HAART is thought to reduce entry of HIV into the central nervous system and to reduce neuronal damage by HIV once it has entered the CNS. HAART has significantly reduced the incidence of ADC in HIV-positive patients. In addition, HAART reduces severity and prolongs survival in cases of established ADC. Some patients with ADC also experience cognitive improvement with HAART treatment. There are no data to support the use of cholinesterase inhibitors.

19. B: Fatigue is a nearly universal complaint in multiple sclerosis. Primary MS fatigue is fatigue attributable directly to the disease process of the MS itself; secondary MS fatigue is fatigue due to other MS symptoms, such as urinary frequency that interferes with sleep or motor weakness that adds an energy toll to ordinary activities. Medications to manage symptoms of multiple sclerosis or other conditions can induce daytime drowsiness or contribute to daytime sleepiness by interfering with sleep at night. In addition, MS patients who report fatigue should be evaluated for causes of fatigue unrelated to their MS diagnosis, such as hypothyroidism, anemia, or sleep apnea, just like any other patient.

Many medications are tried empirically to treat primary MS fatigue, but only modafinil has been shown to be effective when compared with placebo and evaluated on the Fatigue Severity Scale. Pharmacologic management can be helpful, but in the absence of a patient-directed regimen of activity pacing, medications alone are of limited value. It is often difficult for patients to pace activities time-contingently and manage their energy pro-actively, and it is appropriate for the nurse to remind patients and their families of this strategy frequently. Many patients tend to overexert themselves on days when they feel energetic and then take the next day or days to rest and recover. Activity pacing allows the patient to conserve energy and avoid compensatory down time. Occupational therapy can also be helpful, particularly for patients with significant motor impairments who benefit from finding more ergonomically effective ways of accomplishing routine tasks.

20. C: Neutral position is ideal because allowing the head to turn to either side can cause jugular vein compression, which could contribute to increased intracranial pressure. Flexion causes traction on the meninges and can be painful; this is the basis of the Kernig's sign. Extension can also be uncomfortable. There is no advantage to fetal position, except during lumbar puncture.

21. B: In addition to monitoring the PTT to ensure adequate anticoagulation without undue risk of bleeding, it is essential to monitor the platelet count daily to look for early evidence of heparin-induced thrombocytopenia (HIT.) This is an immune reaction induced by heparin. Clinical manifestations range from innocuous petechiae on the skin to thrombotic and thromboembolic complications of the skin, extremities and internal organ systems. The reaction is potentially fatal. The earliest sign of HIT is an otherwise unexplained drop in the platelet count. HIT can also occur on a delayed basis, with onset a week or more after heparin treatment has been discontinued. Generalized hypersensitivity reactions may also occur, manifesting as urticaria, rhinitis, or asthma. The PT is useful in assessing adequacy of anticoagulation with warfarin.

22. A: Once the patient has had bleeding from an intracranial aneurysm, there remains a risk of rebleeding. The incidence of rebleeding following the initial presentation may be as high as 30%. Straining at stool raises intracranial pressure and poses a particular risk for rebleeding. The aneurysm patient is placed at bedrest and often has severe head pain requiring opioid medication, with the attendant side effect of reduced intestinal peristalsis. These factors combined predictably lead to constipation, so a good bowel regimen has to be instituted proactively. It is important to prevent straining at stool, because this increases intracranial pressure. Waiting for constipation to develop is waiting too long, because it is more difficult to treat established constipation than to just prevent it, and because by the time the patient becomes constipated, he will have entered the time of greatest risk for rebleeding.

Seizure precautions are important for the patient's safety, but seizure precautions only keep the patient safe in the event of seizures; only anticonvulsant medication can actually prevent seizures. Measures to prevent deep vein thrombophlebitis are important, but they do not protect the patient against aneurysmal bleeding.

At one time, it was common practice to limit fluid intake in patients with SAH as part of an over-all strategy of keeping blood pressure low. In fact, however, volume restriction and excessively low blood pressure both increase the risk of vasospasm and rebleeding.

23. D: Blood pressure is often elevated immediately following SAH due to increased anxiety and pain, in addition to a generalized sympathetic system response. Blood pressure management should aim to keep the systolic pressure between 120 and 150 mmHg without excessive vasodilatation, which can promote rupture of an untreated aneurysm. The pressure should be high enough to prevent vasospasm (which is induced by decreased blood flow) and low enough to prevent aneurismal rebleeding due to hypertension.

24. C: Although antidiuretic hormone (ADH) may be elevated in the immediate aftermath of subarachnoid hemorrhage (SAH), ADH levels decline spontaneously in the ensuing days, and urine and serum electrolytes are consistent with primary sodium wasting, not syndrome of inappropriate ADH (SIADH.) Although sodium restriction is appropriate for treatment of ADH, it is inappropriate for treating primary sodium wasting, which requires sodium replacement. In addition, the SAH patient requires volume expansion (via fluid replacement) to avoid cerebral vasospasm and the attendant risk of rebleeding.

25. A: Regardless of treatment for intracranial aneurysm, outcomes do not vary by age. Costs do increase in proportion to age and length of hospital stay. Early surgical repair can improve outcome and shorten hospital stay. Outcome data is a relevant and admissible factor in guiding treatment choices, but age is not a relevant or ethical criterion on which to base treatment choices for intracranial aneurysm.

26. D: Thrombolysis with recombinant intravenous tissue-type plasminogen activator (rt-PA) can restore perfusion to ischemic brain tissue. Early in the course of ischemic stroke, necrosis of ischemic tissue can be prevented with thrombolysis.

After four and half hours, the likelihood of saving the ischemic tissue declines and the risk of hemorrhagic transformation of the ischemic infarct increases. This time limit was recently increased (previously being a maximum of 3 hours from symptom onset) per American Heart Association and American Stroke Association guidelines, with specific exclusion criteria set. Exclusion criteria for tPA administration between 3 to 4.5 hours of symptom onset includes age over 80, severe stroke (NIHSS greater than 25), a history of stroke or diabetes, or currently taking any oral anticoagulation. Studies have established 4.5 hours as the longest duration of symptoms within which risk outweighs benefit for rt-PA. Studies have shown that outcome is not related to age or sex. Thrombolysis cannot be attempted in an anticoagulated patient. If the patient has been on heparin, he cannot undergo thrombolysis until the PTT is normal. If the patient has been on warfarin, the patient cannot undergo thrombolysis until the INR is > 1.7. Anticoagulants and anti-platelet drugs should not be given for the first 24 hours following rt-PA.

Serum glucose should be no less than 50 mg/dl. In the hours and days following thrombolysis, serum glucose should be managed to avoid hyperglycemia as well as hypoglycemia, as hyperglycemia can predispose to both hemorrhage and hypoperfusion.

27. C: Blood pressure monitoring and stabilization is critically important in the hours following carotid endarterectomy in order to avoid both hyperperfusion and hypoperfusion syndromes. Following carotid endarterectomy, abrupt restoration of arterial perfusion can lead to intracerebral hemorrhage. This is a particular risk until cerebral blood flow autoregulation normalizes. In addition to disrupted cerebral blood flow autoregulation, there is also disruption of the normal

systemic baroreceptor responses in patients immediately following surgical manipulation of the carotid artery, so systemic blood pressure may be difficult to regulate just when the brain is most vulnerable to alterations in flow. In this setting, hypertension poses a risk of hemorrhage, and hypotension poses a risk of cerebral ischemia. Blood pressure should be monitored continuously, and overcorrection is to be avoided. For most patients, a systolic pressure between 120 and 130 mmHg is optimal.

28. C: Especially with injury to the frontal and temporal lobes, stroke patients may lack self-monitoring and display socially inappropriate behaviors such as disregarding personal hygiene or making socially unacceptable sexual advances. Although these behaviors are involuntary and should not be judged, neither should they be ignored. It is important to make the patient aware of unacceptable behavior and reassure the patient and family that this behavior is a result of organic brain injury, is not a reflection upon the patient's character, and can be brought under control in time. It is helpful to state and repeat expectations clearly and to maintain a predictable routine help to minimize unwanted behaviors. Psychiatric care, including psychoactive medications, may be needed, but with or without psychiatric input, the patient and family absolutely need both explanation and reassurance about the origin of distressing behaviors.

29. B: Interference with vitamin K and the synthesis of clotting factors that depend upon vitamin K is the mechanism by which warfarin maintains anticoagulation. Taking vitamin K undermines anticoagulation with warfarin. Leafy green vegetables contain vitamin K. Patients should not avoid this class of foods, because they also provide fiber, folic acid, antioxidants, trace minerals, and other nutrients. While taking warfarin, however, they should keep their intake of leafy green vegetables as consistent as possible, avoiding unaccustomed excesses or unaccustomed abstinence from these foods. Plant-derived nutritional supplements should also be avoided. Patients should avoid cranberries and cranberry juice because they can augment the effects of warfarin as can ginseng, gingko, and certain botanicals such as St. John's wort. Alcohol is to be avoided altogether because of its inhibitory effect on the liver enzymes that break down warfarin. The therapeutic range for warfarin is narrow, and any factor that influences its actions or metabolism should be either strictly controlled or avoided altogether. The patient should not add or discontinue any prescription or over-the counter medication while on warfarin without consulting the physician who is prescribing and monitoring the warfarin. With proper management of the medication, occult GI bleeding is not to be anticipated, and iron supplementation is not required.

30. C: CT scan is often normal early in the course of herpes simplex encephalitis. MRI is more frequently abnormal, but the characteristic frontotemporal areas of hemorrhage are non-specific. A 4-fold rise in serum antibody titer is reliable but does not ensue until the convalescent stage – if the patient survives. The EEG changes are also non-specific. The only early laboratory indicator of herpes simplex encephalitis is the presence of viral DNA in the CSF. If this testing is not available, then the decision to treat must be made on clinical grounds supplemented by whatever imaging and laboratory data are available. Symptoms can be rapidly progressive, and if treatment is delayed until the onset of coma, mortality is over 30%.

31. A: Although anticoagulation with heparin is standard treatment in the acute phase of management of the patient with cerebral venous thrombosis, the risk of converting an ischemic infarct to a hemorrhagic infarct is substantial; as many as 40% of CVT patients actually have hemorrhagic infarcts even before starting IV heparin. Acute changes in neurologic status of patients with CVT should be treated as if for intracerebral hemorrhage pending further evaluation.

32. D: Patients with acute hemorrhagic cerebral infarction are at greatest risk for increased intracranial pressure and its attendant complications, including transtentorial herniation. Not only

do these patients need extremely close monitoring, but if increased intracranial pressure is not responsive to simple measures such as positioning and mannitol, then more invasive measures may be needed rapidly. These measures may include ventriculostomy and hyperventilation. Patients with hemorrhagic cerebral infraction are also at greater risk than patients in the other three categories for accelerated systemic hypertension.

33. B: The risk of bleeding from an arteriovenous malformation is probably slightly increased during pregnancy. Theoretically, the temporary increases in intracranial pressure associated with the transition stage of labor could contribute to bleeding from an AVM, but vaginal delivery is not absolutely contraindicated for a woman with an AVM.

None of the disease-modifying agents for MS is approved for use during pregnancy. When pregnancy can be planned, a patient should discontinue disease-modifying therapy several months before attempting to become pregnant. Pregnancy usually has a good effect on MS, and the incidence of exacerbations during pregnancy is lower than at any other time in the reproductive cycle. The post-partum period, however, is a time of increased incidence of exacerbations, and many neurologists advise patients to forgo breastfeeding in order to resume disease-modifying therapy immediately after delivery.

Pregnancy itself does not have a predictable effect on the course of myasthenia. About a third of women feel better symptomatically while pregnant while another third feel worse, and the remainder feel no different. Data concerning safety of anticholinergic medications during pregnancy are inconclusive regarding possible harm to the fetus. Most women who have been requiring anticholinergic medication prior to pregnancy will continue to need it while pregnant.

34. D: Although the annual risk of bleeding from an unruptured intracerebral AVM is low, the percentage cumulative lifetime risk can be estimated at 105 minus the patient's age in years at presentation. This risk is higher for aneurysms that have already bled once. Other factors also increase the risk of bleeding. Smaller AVMs have a higher risk, presumably because of higher pressures within the feeding artery. Hemorrhage risk is also greater for lesions that have only a single draining vein. Larger AVMs are less likely to bleed but are more likely to cause seizures, either because they are more likely to exert a mass effect on adjacent cerebral cortex or because of relative ischemia induced by shunting of larger volumes of blood away from parts of the cortex. Average mortality with the initial bleed from an AVM is between 6% and 30% and each hemorrhage increases the risk of subsequent hemorrhage.

35. A: Until autoregulation of cerebral blood flow is re-established, the risk of bleeding is significant, therefore mild systemic hypotension is permissible but must be closely monitored. The patients who are at risk of vasospasm are those who have had subarachnoid hemorrhage (SAH) due to a ruptured intracranial aneurysm, but vasospasm is not the main concern in the postoperative AVM patient. Cerebral venous hypertension is a concern preoperatively in patients who have high-flow AVMs, but it is not a major postoperative concern. SIADH is not a common complication in postsurgical AVM patients, and the patient should be kept well hydrated.

36. B: The single greatest risk factor for lacunar strokes is hypertension. To the extent that thrombosis is part of the pathophysiology of lacunar infarcts, it is secondary to microatheroma of small penetrating arteries, a condition promoted by sustained systemic arterial hypertension. Cigarette smoking and diabetes mellitus are lesser risk factors for lacunar infarction. Anticoagulation may be considered only in the minority of cases in which a cardiac embolic source appears to be the cause of lacunar infarcts.