The Starling resistor: A model for explaining and treating obstructive sleep apnea

1. The incidence of obstructive sleep apnea in the general population is estimated at:
   1. 2%-4%
   2. 10%
   ➤ 3. 16%
   4. 29%

2. Select the correct statement regarding the Starling resistor and its application to obstructive sleep apnea (OSA).
   ➤ 1. the Starling resistor model is a theoretical model that has application in explaining upper airway dynamics in OSA
   2. the Starling resistor model is a theoretical model that has application in explaining the chemical control of breathing
   3. the Starling resistor model is a theoretical model that has application in explaining a central nervous system reflex that fails in OSA
   4. all of the above

3. Obstructive sleep apnea is defined as:
   1. cessation of airflow with no ventilatory effort for 10 seconds occurring 10 or more times per hour of sleep
   ➤ 2. cessation of airflow for more than 10 seconds despite continuing ventilatory effort occurring 5 or more times per hour of sleep
   3. cessation of airflow for 1 minute despite continuing ventilatory effort
   4. cessation of airflow with no ventilatory effort

4. Obstructive sleep apnea patients who use nasal continuous positive airway pressure (n-CPAP) postoperatively:
   1. have a higher incidence of nausea and vomiting
   2. have a higher pain score rating
   ➤ 3. have a lower incidence of serious complications and a shorter length of stay in the hospital
   4. have a lower pain score rating

5. All of the following are potential life-threatening complications of obstructive sleep apnea in the postoperative period EXCEPT:
   1. myocardial infarction
   2. hypoxemia
   3. hypercapnia
   ➤ 4. hypocapnia

6. N-CPAP is effective in preventing upper airway collapse by:
   1. delivering a set negative airway pressure during inspiration
   2. delivering a set positive airway pressure during inspiration
   3. pneumatically splinting the upper airway during inspiration
   ➤ 4. answers 2 and 3

7. Which of the following are prudent measures to take in the postoperative period for obstructive sleep apnea patients?
   1. remote pulse oximetry monitoring
   2. continuous infusion of epidural opioids
   3. moderation of opioids
   ➤ 4. answers 1 and 3

8. Prior to extubating the patient with a significant history of obstructive sleep apnea, consideration should be given to:
   1. ensuring full recovery from any muscle relaxants used
   2. ensuring full recovery of reflexes and the ability to follow commands
   3. consideration of the use of an airway exchange catheter to facilitate reintubation if necessary
   ➤ 4. all of the above

9. Patients with significant obstructive sleep apnea in the postoperative period:
   1. might benefit from n-CPAP even if they do not use it at home
   2. are at risk for apnea on postoperative day 1 due to high pain scores and the need for increased pain medication
   3. are at risk for apnea after postoperative day 1 due to increased rapid eye movement sleep
   ➤ 4. all of the above
10. Which of the following is an alternative to using opioids in managing postoperative pain in the obstructive sleep apnea patient?
   1. amide and ester local anesthetics
   2. mixed agonist-antagonist drugs
   3. nonsteroidal anti-inflammatory drugs
   ➤ 4. all the above

Anticoagulation and spinal and epidural anesthesia

11. An epidural hematoma is more likely to cause neurologic impairment than a spinal hematoma due to the:
   ➤ 1. prominent epidural venous plexus
   2. dilutional effect of cerebrospinal fluid
   3. increased size of epidural needles
   4. prominent motor innervation

*12. Epidural hematoma must be at least considered if:
   1. sensory block persists beyond expected duration of the spinal or epidural anesthetic
   2. motor block persists beyond expected duration of the spinal or epidural anesthetic
   3. both sensory and motor block persists beyond expected duration of the spinal or epidural anesthetic
   4. none of the above

13. Which of the following laboratory tests should be assessed in the patient taking ibuprofen preoperatively to determine risk for epidural hematoma?
   1. international normalized ratio (INR)
   2. prothrombin time (PT)
   3. partial prothrombin time (PTT)
   ➤ 4. none

14. Recommendations regarding warfarin therapy include:
   1. warfarin should be stopped 7 to 10 days before surgery, and PT and INR should be measured
   ➤ 2. warfarin should be stopped 4 to 5 days before surgery, and PT and INR should be measured
   3. warfarin should be stopped 4 to 5 days before surgery, and no laboratory tests are indicated
   4. if the first dose of warfarin has been administered less than 24 hours earlier, obtain a PT and INR

15. Intraoperative heparinization should be delayed for how long after spinal or epidural anesthesia?
   ➤ 1. 30 minutes
   2. 1 hour
   3. 2 hours
   4. no delay necessary

16. For a patient presenting on preoperative intravenous heparin therapy, regional anesthesia should be administered after the following:
   1. heparin has been discontinued for 3 to 4 hours, and PTT is normal
   2. heparin therapy can be continued when atraumatic needle placement is possible
   3. heparin has been discontinued 1 to 2 hours
   4. none of the above

17. The half-life of low-molecular-weight heparin (LMWH) compared to standard heparin is:
   1. the same
   ➤ 2. 2 to 4 times longer
   3. 3 times shorter
   4. dose dependent

18. Guidelines for maintenance of an indwelling epidural catheter in patients receiving daily postoperative LMWH include:
   1. administer initial dose 6 to 8 hours postoperatively
   2. remove epidural catheter 10 to 12 hours after initial dose
   3. administer subsequent doses of LMWH 2 hours after removal of epidural catheter
   ➤ 4. all of the above

19. Indwelling epidural catheters should be avoided in patients receiving which of the following drugs?
   1. ardeparin (Normiflo)
   ➤ 2. warfarin (Coumadin)
   3. fondaparinux (Arixtra)
   4. bivalirudin (Angiomax)

20. Herbal medications that are associated with bleeding include:
   1. ephedra
   2. licorice
   ➤ 3. flaxseed
   4. ginger

*Corrections*

Questions 12 and 16 have been eliminated from AANA Journal Course Examination No. 24 and have not been included in the test taker's score. For Question 12, the correct answer should have been “all of the above” instead of answer 4 that stated “none of the above.” For Question 16, the answer is number 1; however, an author of that course reports that it was incorrectly stated in the text on page 228. In the second column, last sentence of the second full paragraph, the term “prothrombin time” should be changed to “activated partial thromboplastin time” as follows: “Other sources recommend that for the patient receiving preoperative intravenous heparin, regional anesthesia should be administered only after heparin has been discontinued for 3 to 4 hours and the activated partial thromboplastin time or international normalized ratio has returned to normal.” Also in the table on page 227, the suggested laboratory tests for intravenous heparin should be changed from “Measure PT” to “Measure activated partial thromboplastin time.”
Eliminating surgical fires: A team approach

21. What are the 3 components of the fire triangle?
   1. oxygen, breathing circuits, and soda lime
   2. electrocautery, lasers, and prep solutions
   ➤ 3. oxidizers, fuels, and ignition sources
   4. prep solutions, staff vigilance, facility procedures

22. Operating room fires most often occur in:
   1. patient drapes
   2. waste baskets
   ➤ 3. the airway
   4. the head and neck

23. What can the anesthesia provider do to minimize the risk of fires during head and neck procedures?
   1. use laser-resistant endotracheal tubes and fill the cuff with air
   ➤ 2. establish a good seal of the airway with a correctly sized tube to minimize oxygen leak
   3. use pulse oximetry and increase oxygen above 30%
   4. when a closed breathing circuit is used, insure that tenting of drape allows air circulation

24. What are specific actions the surgical team can take to reduce the incidence of surgical fires?
   1. repair electrical equipment when defective, rather than doing preventive and routine maintenance
   ➤ 2. prevent pooling of prep solutions and allow time for complete drying of any flammable prep solution
   3. maximize oxygen concentrations for all head and neck procedures
   4. reduce irrigation when using a laser-resistant endotracheal tube

25. How can the anesthesia provider reduce the incidence of surgical fires?
   ➤ 1. use pulse oximetry to safely minimize the percentage of oxygen necessary for adequate oxygenation
   2. eliminate the use of surgical prep solutions in the operating room
   3. maximize the oxygen enriched environment of the surgical field
   4. abstain from the use of inhalational gases

26. Why does reaction planning reduce the severity of patient injury from fire?
   1. securing the airway prior to extinguishing the fire should always be the first action of the plan
   ➤ 2. practicing a plan decreases the time it takes to initiate action
   3. allowing the junior staff to direct the process ensures their education and development
   4. reaction planning allows for improved oxygenation prior to ignition of the fire

27. Which is NOT a reliable method to educate the operating room team about surgical fires?
   1. hands-on training using fire extinguishers
   2. scavenger hunts for equipment
   3. videos
   ➤ 4. assuming staff knowledge is excellent

28. What does the anesthesia provider control that could reduce the frequency of surgical fires?
   1. choice of surgical prep solutions
   2. choice of laser settings
   ➤ 3. oxygen-enriched environment percentages
   4. use of nonflammable drapes

29. Which of the following actions decreases the risk of fire?
   1. maximize the wattage of lasers to decrease time of surgery
   2. use dry sponges to protect the endotracheal tube during laser procedures
   ➤ 3. clean the tip of the electrocautery to minimize sparking or burning of tissue debris
   4. place electrosurgery electrodes on the patient when not in use

30. Subsequent to an airway fire, which is NOT an appropriate intervention?
   1. an immediate direct laryngoscopy and bronchoscopy
   ➤ 2. immediate extubation and ventilation with 100% oxygen while extinguishing the fire
   3. copious irrigation to extinguish the blaze, evacuation of smoke, and removal of any burning materials
   4. aggressive pulmonary toilet

Preoperative cardiac evaluation

31. Each of the following statements regarding the American College of Cardiology/American Heart Association (ACC/AHA) guideline on perioperative cardiovascular evaluation for noncardiac surgery are true EXCEPT:
   ➤ 1. they are ineffective in stratifying cardiac risk by using clinical predictors
   2. they delineate methods to objectively categorize cardiovascular risk
   3. they use data from the cardiology consultation to refine anesthetic management
   4. they can lead to more efficient approaches to perioperative evaluation of the noncardiac patient with cardiac disease

32. The prevalence of cardiac disease:
   ➤ 1. increases with age
   2. decreases with age
   3. is greater in middle-aged women than middle-aged men
   4. is greater in middle-aged men than middle-aged women
33. Important risk factors for postoperative cardiac morbidity include which of the following?
   1. history of cigarette smoking
   2. congestive heart failure (CHF)
   3. diabetes mellitus
   ➤ 4. all of the above

34. In comparison to the ACC/AHA guideline on perioperative cardiovascular evaluation for noncardiac surgery, the Goldman cardiac risk index has been found to be predictive in patients undergoing which of the following surgical procedures?
   1. vascular
   2. orthopedic
   3. thoracic
   ➤ 4. none of the above

35. The guideline provides the basis for a cardiac consultation after completion of step:
   1. 3
   2. 5
   ➤ 3. 7
   4. 9

36. According to the ACC/AHA guideline, which of the following is an intermediate predictor of clinical cardiac risk?
   1. decompensated CHF
   2. advanced age
   ➤ 3. history of myocardial infarction or CHF
   4. abnormal electrocardiogram

37. According to the ACC/AHA guideline, intermediate risk surgical procedures, such as orthopedic surgical procedures or carotid endarterectomy, carry what percentage risk for perioperative cardiac events?
   ➤1. 1%-5%
   2. 6%-10%
   3. 11%-15%
   4. 16%-20%

38. Functional capacity is defined in the guidelines as?
   1. minute estimation equivalents
   ➤ 2. metabolic equivalent (MET) levels
   3. myocardial function equivalents
   4. myocardial equivalent levels

39. The ACC/AHA guideline classifies poor functional cardiac capacity as an inability to perform activities requiring:
   ➤ 1. greater than 4 METs
   2. 5-7 METs
   3. 7-10 METs
   4. greater than 10 METs

40. The ideal time interval that should elapse prior to elective noncardiac surgery following a percutaneous transluminal coronary angioplasty and stent placement is:
   1. 1 week
   2. 2 weeks
   3. 3 weeks
   ➤ 4. 4 weeks

41. Using the AVPU system (A, Alert; V, responds to Voice; P, responds only to Pain; U, Unresponsive), a “P” or “U” assessment corresponds to a Glasgow Coma Scale score of:
   1. 9 or more
   ➤ 2. 9 or less
   3. 8 or more
   4. 8 or less

42. The inherent accuracy of a pulse oximeter is:
   1. ± 10%
   2. ± 5%
   ➤ 3. ± 2%
   4. ± 1%

43. Which is true concerning the SLAM Emergency Airway Flowchart?
   ➤1. the 5 pathways include primary ventilation, rapid sequence induction, difficult intubation, rescue ventilation, and cricothyotomy
   2. concerning the crash airway, it is acceptable to attempt orotracheal intubation 1 time if a rapid, uncomplicated intubation is anticipated
   3. concerning the difficult intubation pathway, it is acceptable to undertake more than 3 intubation attempts provided that SpO₂ is 93% or greater
   4. answers 1 and 2

44. Which of the following are critical airway events?
   1. any “cannot ventilate–cannot intubate” (CVCI) situation
   2. three or more failed intubation attempts or attempting intubation for more than 10 minutes
   3. sustained hypoxemia that is refractory to positive pressure ventilation with 100% oxygen
   ➤ 4. all of the above

45. Leading mechanisms of morbidity and mortality in airway management include:
   1. inadequate ventilation
   2. unrecognized esophageal intubation
   3. difficult intubation
   ➤ 4. all of the above

46. In regard to confirmation of tracheal intubation, which statement is true?
   ➤ 1. only an evidence-based method (eg, esophageal detector device and/or carbon dioxide detection) is recommended for confirmation of tracheal intubation or monitoring of lung ventilation, regardless of the location of care
2. A carbon dioxide detector should always be used to confirm tracheal intubation in patients with a non-perfusing cardiac rhythm.
3. A self-inflating bulb should be used to confirm tracheal intubation only in patients with a perfusing cardiac rhythm.
4. All of the above.

47. Which of the following statements is true?
   1. The Combitube is a class IIb device.
   2. The best way to treat a "crash airway" patient is to attempt intubation 3 times prior to proceeding with rescue ventilation.
   3. The Combitube and laryngeal mask airway can treat airway obstruction, including supraglottic, glottic, and infraglottic obstruction.
   4. Class IIa status is reserved for a therapeutic option for which the weight of evidence is in favor of its usefulness and efficacy.

48. Which of the following is true concerning the "crash airway"?
   1. Crash airway patients are usually close to death and require either rapid tracheal intubation or immediate rescue ventilation.
   2. A "no" answer to the question PU = 92 indicates that a crash airway exists.
   3. Crash airway patients exhibit reduced responsiveness or are unresponsive and have severely depleted oxygen levels.
   4. Answers 1 and 3.

49. Which of the following is correct in regard to airway assessment?
   1. Airway assessment should be undertaken rapidly as the situation permits, employing the “4-D” (disproportion, distortion, decreased range of motion, and dental overbite) method of airway assessment.
   2. A patient who is predicted to have a difficult airway should be intubated using rapid sequence intubation.
   3. When no airway difficulty is predicted, unexpected difficulty managing the airway may still arise.
   4. Answers 1 and 3.

50. Simple techniques that facilitate tracheal intubation and rescue failed intubation in the patient with a difficult airway include:
   1. External laryngeal manipulation; head-elevated laryngoscopy position; use of bougie-assisted intubation.
   2. Change in blade length or type; assessment of the degree of muscle paralysis.
   3. Combined use of a lever-tip laryngoscope (eg, McCoy) and bougie for intubation of cervical spine injured patients.
   4. All of the above.

51. Opiates have been used to treat pain and a variety of other conditions for at least:
   1. 100 years.
   2. 500 years.
   3. 1,000 years.
   4. 6,000 years.

52. An intervention that should precede the use of opiates, or at least occur concurrently with their use is:
   1. Behavioral modification.
   2. Counseling and stress management.
   3. Physical therapy.
   4. All of the above.

53. A universal complication of opiate use that appears to persist regardless of duration of therapy is:
   1. Constipation.
   2. Bradycardia.
   3. Hallucinations.
   4. Thrombocytopenia.

54. Neuropathic pain refers to what type of chronic pain?
   1. Pain that is only associated with surgical procedures.
   2. Pain associated with direct nerve injury or disease of a neurological origin.
   3. Pain that is exclusively centered in a psychological component.
   4. Pain that is only eliminated with a local anesthetic.

55. Functionality of the patient during the course of chronic analgesic use can be assessed by:
   1. Asking the patient to maintain a daily diary.
   2. Talking to family members.
   3. Encouraging well-timed patient follow-up.
   4. All of the above.

56. The first systematic observations leading to empiric evidence that demonstrated the presence of specific brain regions and chemical modulators responsible for analgesia occurred:
   1. During the Middle Ages.
   2. During the Renaissance.
   3. During the Spanish American War.
   4. During World War II.

57. Codeine, as a prodrug, is metabolized by the P450 isoenzyme system to produce what clinically active substance?
   1. Methadone.
   2. Meperidine.
   3. Morphine.
   4. Acetaminophen.
58. **N-methyl-D-aspartate, or NMDA, is:**
   1. the receptor for glutamate and is an excitatory neurotransmitter
   2. produced in the pancreas
   3. an inhibitory neurotransmitter found only in the hypothalamus
   4. has no effect in humans

59. **Mu, kappa, and delta receptor activity can variably produce:**
   1. nausea, vomiting, bradycardia
   2. pruritus, urinary retention, miosis
   3. sedation, memory impairment, constipation
   4. all of the above

60. “Drug rotation” refers to:
   1. using non-analgesics concurrently with opioid-analgesics
   2. using successively higher doses of a drug to achieve a desired endpoint
   3. substituting an inhalational anesthetic for an oral analgesic
   4. using agents with slightly different receptor affinities to minimize tolerance