Knowledge Assessment Booklet

NBCRNA
National Board of Certification & Recertification for Nurse Anesthetists

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Test Your Knowledge

NBCRNA
National Board of Certification & Recertification for Nurse Anesthetists

Promoting Patient Safety By Enhancing Provider Quality

The NBCRNA Knowledge Assessment booklet is comprised of questions developed separately from the Continued Professional Certification Assessment (CPCA) by the CPCA Practice panel.

NBCRNA does not recommend using this booklet as a study guide for the CPCA because it does not provide a comprehensive or all-encompassing representation of CPCA content.

1. Following surgery, a patient taking sertraline (Zoloft) becomes febrile with spontaneous myoclonus and diaphoresis following a dose of metoclopramide (Reglan). What is the BEST treatment option?

A. Cyproheptadine (Periactin)
B. Dantrolene (Dantrium)
C. Diphenhydramine (Benadryl)
D. Ondansetron (Zofran)

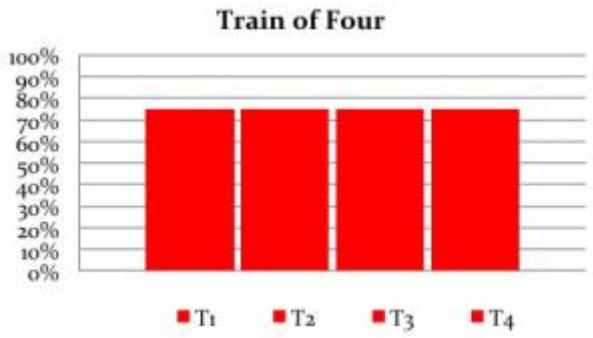
2. An E-cylinder PSIG reads 475 and the patient requires 3 L/min of oxygen per nasal cannula. About how much time, in minutes, remains presuming that the E-cylinder was full at 1,900 PSI and 660 L?

A. 30
B. 60
C. 120
D. 220

Click here for the answers

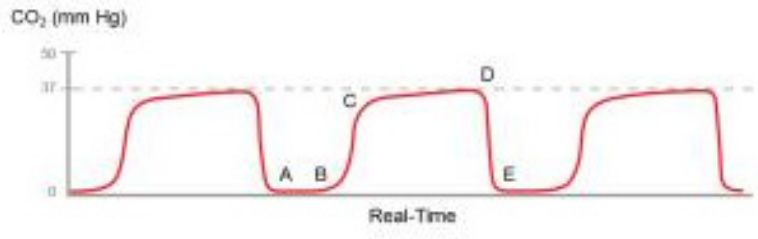
3. The train-of-four response depicted in the figure would be expected after the administration of which neuromuscular blocking agent?

A. Cisatracurium (Nimbex)
B. Pancuronium (Pavulon)
C. Rocuronium (Zemuron)
D. Succinylcholine (Anectine)



4. In the figure below, where is the peak alveolar $ETCO_2$ BEST reflected?

A. A
B. B
C. C
D. D



Click here for the answers

5. After an epidural catheter dose, the patient begins to feel numbness and tingling in the fifth digit of her hand. What dermatome level would this indicate?

A. C6
B. C8
C. T4
D. T10

6. A patient presents to the operating room for emergent exploratory laparotomy with an arterial pH of 7.28, base deficit of 8.2, heart rate of 128/min, lactic acid level of ⁻8 mmol/L, and skin temperature of of 39°C. Which is a priority intervention?

A. Beta$_2$-adrenergic blocker
B. Deep vein thrombosis prophylaxis
C. Fluid resuscitation
D. Milrinone (Primacor) infusion

Click here for the answers

7. A patient receives a second dose of succinylcholine (Anectine) on induction. At the end of the case, some muscle tone returns but is notably weak; the patient's train-of-four response is 2 out of 4 with fade. What is the MOST appropriate next action?

A. Extubate, knowing that the train-of-four will return in a few minutes
B. Keep the patient intubated and admit to the ICU on a ventilator
C. Use a full dose of neostigmine (Prostigmin) and glycopyrrolate for reversal
D. Wait until the train-of-four response is stronger and then give a reversal agent

8. As volatile anesthesia minimum alveolar concentration increases, what is the LAST effect noted?

A. Amnesia
B. Immobility
C. Sedation
D. Unconsciousness

Click here for the answers

9. An adult patient is having a general endotracheal anesthetic for an open appendectomy. The patient's alarms are fully functioning, incision was made 30 minutes ago, the patient has been stable and the anesthesia machine has been functioning normally. Now the peak inspiratory pressure becomes zero, the $ETCO_2$ waveform is nonexistent, and the ventilator bellows have deflated. The MOST likely reason for this scenario is:

A. air embolus.
B. circuit disconnect.
C. pneumothorax.
D. pulmonary edema.

10. After a head lift of 5 seconds and strong hand grip, the anesthesia provider extubates the patient and reapplies the face mask. The abdomen is moving, but the bag is not. No breath sounds are auscultated, and the oxygen saturation begins declining. Attempts at ventilation generate high peak-pressure readings with no breath sounds or chest movement. The MOST likely reason for this scenario is:

A. air embolus.
B. circuit disconnect.
C. inadequate reversal.
D. laryngospasm.

Click here for the answers

11. Which electrolyte imbalance can lead to spasm of laryngeal muscles?

A. Hyperchloremia
B. Hyperkalemia
C. Hypocalcemia
D. Hypomagnesemia

12. Which condition would CONTRAINDICATE the use of a supraglottic airway device as the initial means of securing an airway for a routine general anesthetic?

A. COPD
B. Coronary artery disease
C. Essential hypertension
D. Hiatal hernia

Click here for the answers

13. Accurate interpretation of somatosensory evoked potentials is MOST disrupted by the administration of:

A. propofol (Diprivan).
B. remifentanil (Ultiva).
C. rocuronium (Zemuron).
D. sevoflurane (Ultane).

14. Strategies to avoid ventilator-induced lung injury and atelectasis in volume-controlled ventilation include:

A. CPAP of 10 cm H_20.
B. pressure support of 5 mm Hg.
C. tidal volume of 6 mL/kg ideal body weight, with PEEP.
D. tidal volume of 12 mL/kg actual body weight, with PEEP.

Click here for the answers

15. Which is the MOST sensitive monitor for malignant hyperthermia?

A. Capnometry
B. Electrocardiography
C. Esophageal temperature monitoring
D. Pulse oximetry

16. The rise in alveolar (FA) anesthetic concentration toward the inspired (FI) concentration is MOST rapid with which anesthetic?

A. Desflurane (Suprane)
B. Isoflurane (Forane)
C. Nitrous oxide
D. Sevoflurane (Ultane)

Click here for the answers

17. During general anesthesia with a laryngeal mask airway in place, an alarm signals an $FiCO_2$ of 3 mm Hg. The anesthesia provider should: (Select 2)

A. change the carbon dioxide absorbent at the end of the case.
B. increase fresh gas flows.
C. replace the breathing circuit.
D. replace the laryngeal mask airway.

18. Patients with scleroderma have which physiologic derangements? (Select 2)

A. Hypotension
B. Metabolic acidosis
C. Pulmonary hypertension
D. Spastic quadriparesis

Click here for the answers

19. Which acid-base disturbance would be MOST common in patients on long-term thiazide diuretic therapy?

A. Respiratory acidosis
B. Metabolic acidosis
C. Respiratory alkalosis
D. Metabolic alkalosis

20. Which classes of medications are MOST likely to have an adverse effect in the patient with a history of myasthenia gravis? (Select 2)

A. Cholinesterase inhibitors
B. Corticosteroids
C. Muscle relaxants
D. Opioids

Click here for the answers

21. Which opioids would be MOST appropriate to order in the recovery room for postoperative pain after an exploratory laparotomy in a patient with chronic renal failure on dialysis? (Select 2)

A. Fentanyl (Sublimaze)
B. Hydromorphone (Dilaudid)
C. Meperidine (Demerol)
D. Morphine

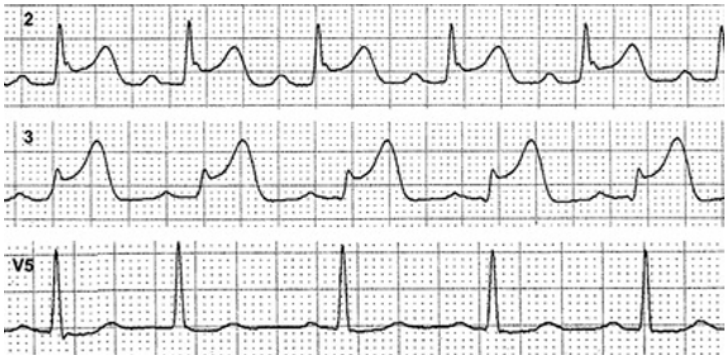
22. What age-related decreases occur in the geriatric population that contribute to variations in anesthetic drug responses? (Select 2)

A. Fat content
B. Nerve pathways
C. Protein binding
D. Renal function

Click here for the answers

23. Which treatments should be administered for the patient displaying the following ECG during a general anesthetic? (Select 2)

A. 100% oxygen
B. 500-mL bolus of lactated Ringer solution
C. Ephedrine
D. Nitroglycerin (Nitrol)



24. Airway management of a patient with a large goiter and audible stridor should include: (Select 2)

A. a standard anesthesia induction with a GlideScope.
B. awake fiberoptic induction/intubation with an armored tube.
C. biopsy of the goiter prior to the day of surgery.
D. examination of a CT for anatomic abnormalities.

Click here for the answers

25. Which conditions INCREASE risk for prerenal acute kidney injury during the perioperative period? (Select 2)

A. Hypervolemia
B. Ischemia
C. Sepsis
D. Ureteral calculi

Click here for the answers

Answer Key

1. A

Rationale: Metoclopramide given to a patient taking sertraline can cause a drug interaction leading to serotonin syndrome. Ondansetron may contribute to serotonin syndrome. Dantrolene is used in treating malignant hyperthermia. Diphenhydramine is an H_2-antagonist, which may worsen the symptoms. Cyproheptadine is the first-line treatment for recognized serotonin syndrome.

2. B

Rationale: A full E-cylinder tank of oxygen contains 1,900 PSIG and holds 660 L of oxygen. Using Boyle's law, therefore, an E-cylinder tank reading a PSIG of 475 would hold 165 L of oxygen and 3-L/min flow that would last 55 minutes.

3. D

Rationale: This train-of-four response demonstrates a lack of fade and thus is a response seen after blockade with succinylcholine.

4. D

Rationale: Segment C to D reflects exhalation, with point D being the peak $ETCO_2$.

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5. B

Rationale: The sensory dermatome of C8 is indicated by the fourth and fifth digit of the hand. C6 would be the first digit or thumb, T4 would be the midchest or nipple line, and T10 would represent mid-abdomen or umbilicus.

6. C

Rationale: Increased lactic acid levels, falling base deficit, and acidosis are all signs of tissue hypoperfusion seen in severe sepsis, a form of hyperdynamic shock. Management of sepsis initially includes goal-directed therapy with fluid resuscitation, hemodynamic monitoring, and blood-pressure support.

7. B

Rationale: A desensitizing succinylcholine neuromuscular blockade or phase II block can occur after large doses of succinylcholine administration over a prolonged period of time. Muscle cell membrane gradually repolarizes, but transmission of the neuromuscular membrane remains blocked. Clinical symptoms are apparent weakness on emergence.

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8. B

Rationale: Volatile anesthesia effects move from amnesia in low doses to sedation, loss of consciousness, and finally immobility.

9. B

Rationale: Disconnection can occur during an anesthetic between the endotracheal tube and the circuit. Indications of the disconnect include failure of the bellows to fill, failure to reach normal inspiratory peak pressure, and lack of end-tidal carbon dioxide. With air embolus, pneumothorax, and pulmonary edema, peak inspiratory pressures would be abnormally elevated.

10. D

Rationale: Laryngospasm must be recognized quickly so that interventions can be applied. This patient is extubated, has absent breath sounds, but demonstrates a head lift for 5 seconds and hand grips. The elevated peak pressure results from the inability to move inspiratory gas past the closed laryngeal cords. In a circuit disconnect, peak pressure would not be able to be generated at all because the circuit is no longer intact. An air embolus is unlikely. This was not a laparospopic procedure, and the patient had demonstrated adequate spontaneous ventilation prior to extubation.

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11. C

Rationale: A nerve that is exposed to low calcium levels will have lower threshold for excitation. This can lead to spasms in the muscles of the face and extremities. It can also cause problems with the laryngeal muscles by causing spasm at the vocal cords that can lead to stridor and hypoxia.

12. D

Rationale: One of the keys to determining whether a patient is at an acceptable risk for a supraglottic airway device is aspiration risk. A patient with a known hiatal hernia is an aspiration risk. None of the other conditions would contraindicate a supraglottic airway device.

13. D

Rationale: Somatosensory evoked potentials (SSEPs) are used to monitor the somatosensory pathways of the brain and spinal cord. The administration of opiates and/or muscle relaxants does not affect the reading of SSEPs. Both inhalational and IV agents have a dose-dependent effect on SSEPs; however, inhalational agents have a greater effect when compared to IV agents. Monitoring conditions for SSEPs are commonly achieved with TIVA, narcotic-based anesthetics, or less than 0.5 minimum alveolar concentration end-tidal i nhalational agent administration.

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14. C

Rationale: The landmark ARDSNET study (2000) described a lower incidence of acute-lung injury with tidal volumes of 5–7 mL/kg of ideal body weight. This is recommended in the presence of PEEP and occasional recruitment maneuvers. CPAP and pressure support is monitored, not controlled under volume-controlled ventilation settings and that is why those two are wrong answers.

15. A

Rationale: Capnometry is the most sensitive monitor for detection of malignant hyperthermia (MH) as the earliest sign of an MH crisis is the rapid and unexplained rise in $ETCO_2$ out of proportion to minute ventilation. Other early signs of MH crisis include tachycardia, skin mottling, cyanosis, drop in SaO_2, and total body or jaw muscle rigidity.

16. C

Rationale: The FA/FI ratio does not exceed 1. The rise in alveolar anesthetic concentration (FA) toward the inspired concentration (FI) is most rapid with least soluble anesthetic in comparison to most soluble anesthetic. Nitrous oxide has a more rapid rise due to low solubility in the blood and tissue and influence of the concentration effect.

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17. A & B

Rationale: Absorbent canisters should not be changed in the middle of the case because of the risk that improper placement may lead to the inability to ventilate. Increasing fresh gas flows should decrease the amount of inspired carbon dioxide during the case, so the provider can wait until the end of the case to change the canister. It is not necessary to replace the breathing circuit or laryngeal mask airway.

18. B & C

Rationale: In patients with scleroderma, physiologic derangements include pulmonary hypertension, esophageal dysmotility, and myocardial fibrosis. Scleroderma is an autoimmune disease that involves multiple organs. It is characterized by excessive deposits of collagen and subsequent fibrosis of the internal organs and skin. Pulmonary, cardiac, vascular and renal involvement may be present, although manifestations are most evident in the skin. Patients with scleroderma are often difficult to intubate and have a high risk of aspiration. Renal disease-related systemic hypertension is very common. Exocrine gland involvement causes decreased lacrimation and xerostomia.

19. D

Rationale: Thiazide-induced hypochloremic metabolic alkalosis is a common side effect when used chronically for the treatment of hypertension.

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20. A & C

Rationale: Cholinesterase inhibitors may potentiate vagal responses and, when combined with muscle relaxants, can obscure the differential diagnosis and treatment of postoperative muscle weakness. Responses to succinylcholine (Anectine) may be unpredictable, and untreated patients with myasthenia gravis appear to be 2-3 times more resistant to succinylcholine. These patients treated with cholinesterase inhibitors exhibit a normal or prolonged response to succinylcholine. Myasthenia gravis patients are also extraordinarily sensitive to nondepolarizing muscle relaxants.

21. A & B

Rationale: The 2 most appropriate opioids are hydromorphone and fentanyl. Morphine has an active metabolite, morphine-6-glucuronide, which is eliminated via the kidneys, and can accumulate and contribute to respiratory depression. Meperidine has a metabolite, normeperidine, which can accumulate and lead to central nervous system toxicity in patients with renal failure. Fentanyl clearance is not altered in renal failure. Hydromorphone does not significantly accumulate in renal failure patients.

22. C & D

Rationale: Variations in anesthetic drug responses among the geriatric population most likely reflect a decreased cardiac output, an increased fat content, decreased protein binding, and decreased renal function.

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23. A & D

Rationale: In the patient that presents with a ST-elevation myocardial infarction, the immediate treatment is oxygen, aspirin, nitroglycerin, and beta-blockers.

24. B & D

Rationale: A CT of the neck will demonstrate anatomic abnormalities. Sedatives and narcotics should be avoided before and during endotracheal tube placement. Awake intubation with an armored tube using fiberoptic bronchoscopy is the safest method to assess the degree of obstruction and establish the airway.

25. B & C

Rationale: Prerenal azotemia is caused by renal hypoperfusion or ischemia that has not yet caused injury to the kidneys. When debris from necrosis is released into the tubules, causing obstruction, which increases tubular back pressure and leak of tubular fluid, acute kidney injury begins. In patients with already existing renal vasocontriction (eg, hypovolemia, heart failure, nephrotoxin exposure, or sepsis) prerenal acute kidney injury is more likely. Calculi are a cause of post-renal acute kidney injury.

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