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ACADEMY OF ACUTE CARE PHYSICAL THERAPY

Competency:
Laboratory Values Interpretation Resource

Academy of Acute Care Physical Therapy – APTA Task Force on Lab Values

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Introduction to Competency

In 2017, the Academy of Acute Care Physical Therapy (AACPT) distributed an updated Laboratory Values Interpretation Resource to better reflect current trends in practice. In addition, a Point-of-Care Document was developed to improve usability in the busy acute care setting. These documents were established to assist clinicians with their clinical decision making, to provide excellent care, and to adhere to high standards.

Recognizing that each clinician's experience and education might vary, a competency was created to close the skill gaps and raise the bar on performance. This competency allows the clinician to utilize the AACPT Lab Value Resource Point-of-Care Document to clinically reason scenarios that physical therapists might encounter on the hospital floor. The competency is meant to demonstrate how the document can be applied during routine care to assist in clinical decision making, to improve collaboration with the healthcare team, and to provide excellent patient care.

The competency allows for acute care facilities to select questions that apply to the patient population and time constraints of their setting. Each question is supported by the references used in the Academy of Acute Care Physical Therapy Laboratory Values Resource document. Each correct answer has supporting rationale to allow further discussion among practitioners. Understanding lab values is a critical work function. The intent of the competency is to close the gap, as well as assess knowledge and skills to promote better patient care outcomes.

1. **According to the Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, therapists should:**

    A. Only review the most recent laboratory results, rather than the trend over time.

    B. Rely exclusively on a single laboratory finding when determining the plan of care.

    C. Immediately place the patient on hold when any lab value is out of normal range.

    D. Be aware of the time and trend when the laboratory specimen was drawn.

2. **According to the Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, African Americans commonly have _____ hemoglobin values when compared to Caucasian populations.**

    A. Lower

    B. Higher

    C. Similar

3. **According to the Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, a transgender woman, who is on estrogen replacement therapy, should have her lab values compared to normal values of females.**

    A. True

    B. False

4. **Your patient has a history of congestive heart failure. According to the Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, what is the normal range for Blood Urea Nitrogen (BUN) to determine the patient's tolerance for activity?**

    A. 3-15 mg/dl

    B. 10-20 mg/dl

    C. 18-23 mg/dl

    D. 6-25 mg/dl

5. **A patient with both increased Thyroid Stimulating Hormone (TSH) and decreased Thyroxine (T4) would MOST likely have:**

    A. Pituitary Disease

    B. Tachycardia

    C. Thyroid Disease

    D. Hepatitis

6. **An ultramarathon runner presents to the emergency department with dehydration after a long run. Which of the following lab values would most likely be elevated?**

    A. Hemoglobin (Hgb)

    B. White Blood Cells (WBC)

    C. Red Blood Cells (RBC)

    D. Platelets(Plt)

    E. All of the above

7. **A patient with a recent history of a myocardial infarction (MI) was admitted to the hospital within the past 24 hours. His electrolyte levels are as following: potassium (K) level of 2.2 mEq/L; sodium (Na) level is 136 mEq/L; and a calcium (Ca) level of 9.0 mg/dL. Which lab value is most concerning?**

    A. Potassium

    B. Sodium

    C. Calcium

    D. None, all are within safe range

8. **A patient was admitted with failure to thrive. Calcium (Ca) levels upon admission were 7.3 mg/dL and are trending down. What signs/symptoms would NOT be expected?**

    A. Fatigue

    B. Confusion

    C. Seizure

    D. Nausea/vomiting

9. **A patient with undiagnosed hypoglycemia may demonstrate which of the following symptoms during a physical therapy intervention?**

    A. Muscle cramping

    B. Ankle edema

    C. Nausea and vomiting

    D. Shaking and extremity weakness

10. Your patient has nausea, vomiting, abdominal pain, excessive thirst and severe fatigue. You suspect an abnormal glucose level. What is the most likely blood glucose level for this patient presentation?

A. 130-140 mg/dL

B. 300 mg/dL

C. 70-80 mg/dL

D. 90-130 mg/dL

11. A patient has a non-healing lower extremity wound. Which of the following lab values is most important to consider as a cause in delayed healing?

A. Hemoglobin A1c (Hgb A1c)

B. Calcium (Ca)

C. Hematocrit (Hct)

D. Sodium (Na)

12. A patient with a severe traumatic brain injury following a motor vehicle accident has documented downward trending glucose <80 mg/dL. Which is the best course of action?

A. Continue with physical therapy intervention.

B. Consult with the healthcare team prior to intervention.

C. Consult with MD regarding hyperglycemia.

D. Hold therapy for the day.

13. Which lab value shows the average level of blood glucose control for the past three months?

A. Fasting plasma glucose (FPG)

B. 2-hour plasma glucose

C. Hemoglobin A1C (Hgb A1c)

14. A therapist is treating a patient with a platelet (Plt) count of 150 K/uL. The BEST course of action is to:

A. Limit manual muscle testing to ≤ 3/5

B. Continue with plan of care

C. Cancel therapy session

15. A patient has a white blood cell count (WBC) of 6.0 10^9/L trending upward. Which of the following actions should be taken?

A. The patient should wear a mask when out of their room.

B. The therapist should use standard precautions.

C. The therapist should wear an isolation gown.

16. A 75-year-old female with a history of atrial fibrillation presents to the hospital after a fall. Lab work reveals a downward trend of hemoglobin (Hgb) at 9.2 g/dL. This is down from yesterday's baseline of 12.3 g/dL. Her current International Normalized Ratio (INR) is 5.1. The patient is referred for PT evaluation. Which of the following actions is most appropriate?

A. Proceed with the PT evaluation as planned.

B. Consult with the medical team to recommend PT evaluation.

C. Hold PT evaluation and discuss reason with the healthcare team.

D. Proceed with PT evaluation only after patient receives packed red blood cells.

17. A 27-year-old male presented to the emergency department after two days of generalized muscle pain, malaise and diaphoresis after recently competing in a CrossFit challenge. Laboratory findings include: urine dipstick positive for blood without hematuria; toxicology for illicit drugs negative; creatine kinase (CK) 39,362 IU/L; blood urea nitrogen (BUN) 22 mg/dL; creatinine (Crt) 1.4 mg/dL; hemoglobin (Hgb) 13.6 g/dL; and white blood cell count (WBC) 11.3 x 10^9/L. Which of the following diagnoses is most likely?

A. Influenza

B. Dehydration

C. Metabolic Acidosis

D. Rhabdomyolysis

18. A patient with a history of hepatitis and jaundice has a bilirubin level of 8.5 mg/dL that is continuing to trend upward to 10 mg/dL. How should this alter your planned session?

A. Expect improved performance on 6-minute walk test.

B. Anticipate need for a shorter session with rest breaks as needed.

C. Hold session due to increasing elevation of this laboratory value.

D. Decreased need for skin inspection and skin protection.

19. A patient with a history of cirrhosis has an ammonia level that started at 80 µg/dL and is now 90 µg/dL and is continuing to trend upwards. What would you expect to see during your therapy session?

A. No change in cognition from baseline.

B. Changes in fine motor control.

C. Patient report of improved nighttime sleeping patterns.

D. Improved safety awareness of patient resulting in decreased need for gait belt.

20. A patient had a troponin level of 0.03 ng/mL documented this morning. Upon re-check six hours later (just prior to physical therapy treatment), troponin is 6.13 ng/mL. What is the most appropriate interpretation of these results?

A. This value is an indicator of acute cardiac injury. Hold physical therapy.

B. This value is an indicator of acute cardiac injury. Proceed with physical therapy with caution.

C. This value indicates the presence of congestive heart failure (CHF). Hold physical therapy.

D. This value indicates the presence of congestive heart failure (CHF). Proceed with physical therapy with caution.

21. A patient with a history of chronic renal failure presents with down-trending troponin levels, with the most recent result being 0.50 ng/mL yesterday. The patient had a negative cardiac catheterization and is without acute cardiac symptoms. What is the appropriate course of action?

A. Defer evaluation due to elevation being contraindication for physical therapy.

B. Defer until redraw with down trending value.

C. Defer until following cardiology consult to rule out acute diagnosis.

D. Proceed with evaluation with standard monitoring of vital signs.

22. A patient who you evaluated yesterday with a history of coagulopathy is on Lovenox prophylactically following orthopedic surgery. The anti-factor Xa level is being closely monitored to assess coagulation state and is 0.30 U/mL. Today, prior to treating the patient, you were alerted of an acute deep vein thrombosis (DVT) diagnosis. The physician has just ordered an increased dose of Lovenox to be administered. What is the most appropriate course of action?

A. Proceed with treatment as usual, as the patient was already on Lovenox prophylactically.

B. Proceed with treatment only after increased dose of Lovenox given and anti-factor Xa level reaches 0.5 -1.0 U/mL.

C. Wait 24 hours following administration of increased dose of Lovenox.

D. Hold physical therapy until inferior vena cava (IVC) filter is placed.

23. A patient has been diagnosed with an acute right gastrocnemius deep vein thrombosis (DVT). The patient is unable to receive anticoagulation due to a concurrent gastrointestinal (GI) bleed. An inferior vena cava (IVC) filter was placed yesterday. Which of the following is the most appropriate course of action?

A. Proceed with physical therapy as planned.

B. Hold physical therapy until the gastrointestinal (GI) bleed has resolved and the patient can be anticoagulated.

C. Check with physician to see if physical therapy is indicated.

D. Proceed with physical therapy only after international normalized ratio (INR) is > 2.0.

24. A patient was admitted to the hospital with fatigue and weakness. Labs show hemoglobin (Hgb) of 5.2 g/dL, which was a decrease from a baseline of 10.0 g/dL, and platelets (Plt) of 6 k/uL. Which of the following actions is most appropriate?

A. Hold PT evaluation.

B. Evaluate the patient and assess all functional mobility.

C. Perform evaluation if vitals are stable.

D. Perform only bed level evaluation.

Use the following scenario to answer the questions below.

Patient is a 28-year-old male with a subtle onset of: puffiness of the face and periorbital swelling; sparse, dry hair; dry, scaly skin; lethargy; bradycardia; and lower extremity edema. The patient's B-type natriuretic peptide (BNP) is 86 pg/mL. A thyroid panel is now ordered.

25a. Based on the presentation above what would you expect the panel to reveal?

A. Increased Thyroid Stimulating Hormone (TSH)

B. Decreased Thyroid Stimulating Hormone (TSH)

C. Increased Triiodothyronine (T3)

D. Increased Thyroxine (T4)

25b. Based on this patient's presentation what movement system deficit would you expect?

A. Impaired coordination

B. Hyperreflexia

C. Proximal muscle weakness

D. Muscle hyperexcitability

Use the following scenarios to answer the questions below.

26a. A 24-year-old mixed martial artist, seen by the PT in the emergency room is now complaining of muscle weakness. Through questioning, he admits to taking magnesium citrate to lose water weight. Which of the following lab values would most likely be seen?

A. Hypomagnesemia

B. Hypermagnesemia

C. Hypernatremia

D. Hyperkalemia

26b. This same patient's lab values indicate elevated hemoglobin (Hgb) and hematocrit (Hct) levels from dehydration. Therefore, what values would be anticipated in his blood urea nitrogen (BUN)?

A. An increased BUN

B. A decreased BUN

C. No change in the BUN

26c. Due to the fluid loss, the patient has become hypernatremic. How would this affect his vital signs?

A. Tachycardia with hypertension

B. Tachycardia with hypotension

C. Bradycardia with hypotension

D. Bradycardia with hypertension

Reference

Tompkins, J, Norris T, Levenhagen K et al. Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017; http://c.ymcdn.com/sites/www.acutept.org/resource/resmgr/docs/2017-Lab-Values-Resource.pdf Accessed October 5, 2017.

Appendix I: Answer Key

1. Answer: D
2. Answer: A
3. Answer: A
4. Answer: D
5. Answer: C
6. Answer: E
7. Answer: A
8. Answer: D
9. Answer: D
10. Answer: B
11. Answer: A
12. Answer: B
13. Answer: C
14. Answer: B
15. Answer: B
16. Answer: C
17. Answer: D
18. Answer: B
19. Answer: B
20. Answer: A
21. Answer: D
22. Answer: B
23. Answer: A
24. Answer: A
25a. Answer: A
25b. Answer: C
26a. Answer: B
26b. Answer: A
26c. Answer: B

Appendix II: Answer Key with Reasoning

1. Answer: D

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 5.

2. Answer: A

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 6. “Physical therapists should be mindful of potential racial differences in laboratory values…African Americans tend to have lower hemoglobin (Hgb) values compared to Caucasians.”

3. Answer: A

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, pages 6-7. Transgender is an “overarching term for persons with various identities and expressions that are associated with assignment of incorrect sex.” (Table 1) “If the patient is on hormone replacement therapy, physical therapists should use the transitioned gender to determine the reference value.”

4. Answer: D

Patients with congestive heart failure might have trending upward values presenting with fatigue, decreased cognition, dyspnea and bone pain. Patients with trending upward values might have decreased tolerance to activity and, therefore, the physical therapist will want to use a symptom-based approach when determining appropriateness for activity. Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 15.

5. Answer: C

Increased TSH and decreased T4 are consistent with thyroid disease, specifically hypothyroidism. Patients with hypothyroidism might present with ataxia, proximal muscle weakness, paresthesia, and frequently accompanied by myalgia. Hyperthyroidism is an increased TSH and increased T3 and/or T4.

Pituitary disease would have a decrease in TSH levels. Pituitary glands excretes TSH; thyroid glands react to the TSH (gets stimulated). Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 17 – Thyroid Function Reference Value.

6. Answer: E

Measures of whole blood components (hemoglobin, hematocrit and platelets) as well as electrolytes are dependent upon plasma volume. If a patient is severely dehydrated, the Hgb, WBC, RBC and Plts will appear higher than if the patient were normovolemic. If the patient is fluid overloaded (too much fluid), these levels would appear lower than anticipated.

Physical therapists should use a symptoms-based approach for patients with severe dehydration when determining appropriateness for activity as well as monitoring symptoms and collaborating with the interprofessional team. Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 8-9,11.

7. Answer: A

Normal potassium (K) level ranges are from 3.7mEq/L to 5.1mEq/L. A level of 2.2 mEq/L suggests severe hypokalemia. All other electrolyte levels are within the normative range.

Trends are not yet able to be ascertained because only one set of levels is available. Great attention should be taken, especially due to this patient's history of a myocardial infarction, as hypokalemia can result in dysrhythmias that could lead to cardiac arrest. Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 12, 13.

8. Answer: D

Normal calcium (Ca) levels are 8.6-10.3 mg/dL. A measure of 7.3 mg/dL suggests hypocalcemia. Nausea/vomiting is associated with hypercalcemia, but all of the others are associated with hypocalcemia. Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 13.

9. Answer: D

Patients with hypoglycemia may experience lethargy, irritability, shaking, extremity weakness and loss of consciousness. Patients in acute care are often on sliding-scale insulin due to changes in medical condition, stress and inflammation. Prior to meals, patients are at risk for hypoglycemia, which can be exacerbated by activity such as gait. Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 16.

10. Answer: B

The patient is hyperglycemic (>200 mg/dL) and might be experiencing diabetic ketoacidosis. Treatment consists most simply of correcting the patient's blood sugar and insulin levels, which will halt ketone production. Assist the patient to return to supine and notify the healthcare team. Glucose will need to be tested and results provided before continuing treatment. Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 16.

11. Answer: A

High levels of blood glucose caused by diabetes can, over time, lead to neuropathy and peripheral vascular disease, resulting in poor wound repair. A poorly healing wound can be the first symptom of undiagnosed diabetes.

The American Diabetes Association (ADA) recommends an Hgb A1c of less than 5.7%. The ADA recommends measurement of Hgb A1c to determine whether a patient's metabolic control has remained continuously within the target range. Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 16.

12. Answer: B

Hypoglycemia is related to an increased stress response associated with more severe injuries, even in patients without a prior diagnosis of diabetes. Aggressive reduction of elevated blood glucose can result in hypoglycemia.

Physical therapy practitioners should consider all findings, including undocumented change in physical and cognitive status, lab value and consultation with the healthcare team. Patients often do not need to be on hold for the day. Treatment recommendations consist of correcting the patient’s blood sugar and insulin levels, and returning to therapeutic interventions. Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 16.

13. Answer: C

The most widely accepted glucose-based criteria for diagnosis are fasting plasma glucose (FPG) ≥ 126 mg/dL or a 2-h plasma glucose ≥ 200 mg/dL during an oral glucose tolerance test (OGTT) over several time points. Hemoglobin A1c (Hgb A1c) can assess blood glucose control due to the life span of erythrocytes, which is approximately120 days.

Hemoglobin A1c reflects long-term glycemic exposure, representing the average glucose concentration over the preceding 8-12 weeks.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 16.

14. Answer: B

Platelet (Plt) of 150 K/uL is within the normative range, therefore it is recommended to continue with plan of care.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 9.

15. Answer: B

6.0 10^9/L is within the normative reference range for WBC; therefore no special precautions are needed.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 16.

16. Answer: C

Most patients with atrial fibrillation are on anticoagulants. This patient has suffered a fall, which could result in an internal bleed. Most laboratories would determine an INR greater than 5 to be at a critical level with a risk for spontaneous bleeding. An INR level of 5.1 would warrant communication with the medical team prior to therapy intervention.

According to the Academy of Acute Care Physical Therapy Laboratory Values Interpretation Resource, page 24, patients with an elevated INR > 3.6, have an increased risk of bleeding.

17. Answer: D

Creatine kinase (CK) is considered mildly elevated at 2,000 U/L (2K) and severe at 10K, with the risk of renal dysfunction above 5K. The most sensitive laboratory finding of muscle injury is an elevated CK level. In the absence of myocardial or brain infarction, CK > 5,000 U/l indicates serious muscle injury.

Creatinine trending upward might indicate acute renal impairment. Weakness, myalgia and tea-colored urine are the main clinical manifestations of rhabdomyolysis. Collaborate with the healthcare team and use a symptom-based approach when determining appropriateness for activity.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 15.

18. Answer: B

Elevated bilirubin levels can be caused by a variety of factors, including breakdown of red blood cells, anemia, bile duct obstruction, or underlying liver disease. Patients with this condition might present with complaints of fatigue, nausea, fever or vomiting. Those patients might have increased yellowing pigmentation of the skin (jaundice) in association with increased levels of bilirubin.

In advanced disease, these patients are at risk for osteoporosis and bleeding due to deficiencies with fat soluble vitamins. Skin should be inspected and protected as needed. Vital signs for these patients should be monitored, and they should be given rest breaks as needed to help with symptoms of anemia.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 21.

19. Answer: B

Ammonia is a waste product of the body. Increased ammonia levels can be indicative of liver damage, as the organ is unable to convert ammonia to urea to remove from the body.

Patients with elevated ammonium levels can develop hepatic encephalopathy. Patients with this condition can present with confusion and delirium, and might be at a higher fall risk due to decreased safety awareness, impaired command following, and impaired higher-level thinking. Patients with elevated ammonia levels may also experience tremors and decline in fine motor control due to the excess ammonia in the body that circulates in the blood and can cross the blood brain barrier.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 21.

20. Answer: A

Troponin I (cTnI) and T (cTnT) are two biomarkers that are both sensitive and specific to the myocardium of the heart. They are released into the bloodstream when cardiac injury occurs (six hours after insult to three days), and they serve as the greatest use for diagnosing a myocardial infarction (> 0.10 ng/mL). Based on the increase to 6.13 ng/mL, acute cardiac injury can reasonably be suspected, and physical therapy should be held until further testing, such as a cardiac catheterization, is completed or until serial troponins begin to trend downward.

Patients with congestive heart failure might have elevated troponin levels due to stress on the heart, but not in the presence of a myocardial infarction.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 26.

21. Answer: D

Chronic renal failure is a known potential cause of elevated troponin levels. This in combination with the absence of cardiac symptoms and a negative cardiac catheterization suggest that there is not acute cardiac disease associated with the elevated troponin levels, and that the patient should be appropriate for evaluation.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 26.

22. Answer: B

From the venous thromboembolism (VTE) algorithm, mobilization is indicated five hours following administration of therapeutic dose of low molecular weight heparin (LMWH) such as Lovenox, and consultation with the physician between three and five hours. Anti-Xa levels can be used to monitor the effectiveness of LMWH anticoagulation pharmacokinetic studies on LMWH report that maximum anti-factor Xa and antithrombin IIa activities occur three to five hours after subcutaneous injection of LMWH.

The optimal therapeutic anti-Xa levels for treatment are 0.5 to 1.0 U/mL.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 24 and Hillegass E, Puthoff M, Frese EM, et al. Role of Physical Therapists in the Management of Individuals at Risk for or Diagnosed with Venous Thromboembolism: Evidence-Based Clinical Practice Guideline. *Phys Ther.* 2016; 96:143-166.

23. Answer: A

Based on the “Algorithm for Mobilizing Patients with Known Lower-Extremity Deep Vein Thrombosis” included in the lab values guideline, mobilization is indicated following placement of an IVC filter in the presence of an acute DVT.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 25.

24. Answer: A

Patients with a Plt count of <20 k/uL are at a risk of spontaneous bleeding.

In addition, this patient is anemic (low Hgb). It is recommended that the therapist communicate with the healthcare team regarding the risks vs. therapeutic benefits, and document this conversation prior to initiating the therapy evaluation.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 24.

25a. Answer: A

Based upon the subtle onset and the symptoms described, the panel is most consistent with hypothyroidism, which would have an increased TSH level. Patient's BNP level indicates no congestive heart failure.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 17, Thyroid Function Reference Value, and page 26, Cardiovascular Specific Labs.

25b. Answer: C

The only movement system deficit that is consistent with hypothyroidism from the list is proximal weakness. Hypereflexia is consistent with hyperthyroidism. Impaired coordination and muscle hyperexcitability are not consistent with hypothyroidism

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 17, Thyroid Function Reference Value.

26a. Answer: B

Patients who take magnesium citrate need to have their magnesium levels monitored. These patients will have increased magnesium intake while at the same time losing volume to further concentrate the level.

Muscle weakness is a clinical sign of hypermagnesemia. Based on the presentation, the patient's potassium levels would not be immediately affected, although all electrolytes could trend up with the loss of volume.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 14.

26b. Answer: A

A BUN level is reviewed to identify how well the kidneys are functioning. If the organs are unable to remove urea from blood, the BUN will rise.

This is commonly noted with heart failure, dehydration or when consuming a high protein diet. A lowered BUN is frequently noted with liver disease.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 15.

26c. Answer: B

The patient's symptoms are consistent with hypernatremia, which is brought on by the loss of volume. The body's physiologic response is to maintain cardiac output.

Hypernatremia is characterized by a deficit of total body water relative to the total sodium in the body. There may be many causes, including fluid consumption and impaired kidney function. Hypernatremia due to loss of water volume can lead to circulatory problems, including tachycardia and hypotension.

Refer to Academy of Acute Care Physical Therapy Laboratory Values Resource Guide 2017, page 12.