

Electrolyte Imbalances

Electrolytes are charged ions dissolved in body fluids. Cations are positively charged, and anions are negatively charged. Electrolytes are distributed between intracellular (ICF) and extracellular (ECF) fluid compartments. The distributions of ions differs in ICF and ECF. The difference in the concentration of electrolytes in the ICF and ECF maintains cell excitability and allows for the transmission of nerve impulses.

Body fluids should be electrically neutral; the negative and positive ions in the body fluids are equal in number. When dissolved in water or another solvent, electrolytes separate into ions and conduct either a positive (cations: magnesium, potassium, sodium, calcium, and hydrogen ions) or negative (anions: phosphate, sulfate, chloride, bicarbonate, and proteinate ions) electrical current.

Healthy people can develop an imbalance of electrolytes from an imbalance of intake and output. Ill and older adult clients are at higher risk of electrolyte imbalance. Although laboratory tests can accurately reflect the electrolyte concentrations in plasma, it is not possible to directly measure electrolyte concentrations within cells.

EXPECTED REFERENCE RANGES

Sodium: 136 to 145 mEq/L

Calcium: 9.0 to 10.5 mg/dL

Potassium: 3.5 to 5.0 mEq/L

Magnesium: 1.3 to 2.1 mEq/L

Chloride: 98 to 106 mEq/L

Phosphorus: 3.0 to 4.5 mg/dL

Sodium imbalances

- Sodium (Na^+) is the major electrolyte (cation) found in ECF, and maintains ECF osmolarity.
- Sodium within ICF is low (14 mEq/L). The difference in ICF and ECF sodium levels is very important in maintaining skeletal muscle contraction, cardiac contraction, and nerve impulse transmission.
- Water flows in the direction of sodium concentration. The ECF sodium level influences fluid retention, excretion, and movement of fluid from one body space to another.
- The kidneys regulate sodium levels with the assistance of aldosterone, antidiuretic hormone (ADH), and natriuretic peptide.
- Decreased sodium levels are known as hyponatremia.
- Elevated sodium levels are known as hypernatremia.

Hyponatremia

Hyponatremia is a net gain of water or loss of sodium-rich fluids that results in sodium levels less than 136 mEq/L.

- Hyponatremia delays and slows the depolarization of membranes.
- Water moves from the ECF into the ICF, causing cells to swell (cellular edema).
- Urine sodium levels helps to differentiate between non-kidney fluid loss (vomiting, diarrhea, and sweating) and kidney salt wasting, which can occur with diuretic use.
- Hyponatremia generally is caused by fluid imbalance, which results in sodium loss.
- Compensatory mechanisms include the kidney excretion of sodium-free water.

ASSESSMENT

RISK FACTORS

Actual sodium deficits

- Excessive sweating
- Diuretics
- Wound drainage (especially gastrointestinal)
- Nasogastric tube suction of isotonic gastric contents
- Decreased secretion of aldosterone
- Hyperlipidemia
- Kidney disease
- Inadequate sodium intake (nothing by mouth [NPO] status)
- Hyperglycemia
- Low-sodium diet
- Cerebral salt wasting syndrome

Relative sodium deficits due to dilution

- Hypotonic fluid excess (PO ingestion)
- Psychogenic polydipsia
- Freshwater submersion accident
- Kidney failure (nephrotic syndrome)
- Heart failure
- Irrigation with hypotonic fluids
- Syndrome of inappropriate ADH secretion
- Anticonvulsant medications, SSRIs, or desmopressin
- Older adult clients are at a greater risk due to increased incidence of chronic illnesses, use of diuretic medications, and risk for insufficient sodium intake. ⑥

EXPECTED FINDINGS

- Clinical indicators depend on whether it is associated with a normal (euvolemic), decreased (hypovolemic), or increased (hypervolemic) ECF volume.
- If the client is hypervolemic with hyponatremia, palpate the bounding pulse. The client can have normal to high blood pressure.
- Muscle weakness can lead to respiratory compromise.

VITAL SIGNS: Can vary based on state of ECF volume. All due to hypovolemia: Hypothermia, tachycardia, rapid thready pulse, hypotension, orthostatic hypotension, diminished peripheral pulses.

NEUROMUSCULOSKELETAL: Headache, confusion, lethargy, muscle weakness to the point of possible respiratory compromise, fatigue, decreased deep-tendon reflexes (DTRs), seizures, lightheadedness, dizziness.

GASTROINTESTINAL: Increased motility, hyperactive bowel sounds, abdominal cramping, nausea.

LABORATORY TESTS

Serum sodium: Decreased, less than 136 mEq/L

Serum osmolality: Decreased, less than 270 mOsm/L

PATIENT-CENTERED CARE

NURSING CARE

- Replacement of sodium should not exceed 12 mEq/L in a 24-hr period because rapid rise in sodium level risks development of neurological damage due to demyelination.
- If the client can tolerate PO fluids, sodium can be easily replaced by intake of foods and fluids.
- Administer IV fluids (lactated Ringer's or 0.9% isotonic saline).
- Report abnormal laboratory findings to the provider.
- Fluid overload: Restrict water intake as prescribed by the provider.
- Hypertonic sodium solution may be used to decreased cerebral edema.

Acute hyponatremia

- Administer hypertonic oral and IV fluids as prescribed.
- Administer 3% sodium chloride slowly, and monitor sodium levels frequently. When using hypertonic solutions, the serum sodium level should not be greater than 125 mEq/L.
- The goal is to elevate the serum sodium level enough to decrease neurological manifestations associated with hyponatremia such as lethargy, confusion, and seizures.
- Encourage foods and fluids high in sodium (beef broth, tomato juice).
- Monitor I&O and daily weight.
- Monitor vital signs and level of consciousness. Report abnormal findings to the provider.
- Administer medications as prescribed (such as conivaptan or tolvaptan, which promote excretion of excess fluid).

INTERPROFESSIONAL CARE

- Nephrology may be consulted for electrolyte and fluid replacement.
- Respiratory services may be consulted for oxygen management.
- Nutritional services may be consulted for high-sodium food choices and restricting fluid intake.

CLIENT EDUCATION

- Encourage the client to weigh daily and to notify the provider of a 1- to 2-lb gain in 24 hr, or 3-lb (1.4 kg) gain in 1 week.
- Instruct the client to consume a high-sodium diet, including reading food labels to check sodium content, and keeping a daily record of sodium intake.

COMPLICATIONS

Acute hyponatremia

Complications (coma, seizures, respiratory arrest) can result from acute hyponatremia if not treated immediately.

NURSING ACTIONS

- Maintain an open airway, and monitor vital signs.
- Implement seizure precautions, and take appropriate action if seizures occur.
- Monitor level of consciousness.

Hypernatremia

Increased sodium causes hypertonicity of the serum. This causes a shift of water out of the cells, resulting in dehydrated cells.

- Hypernatremia is a serum sodium level greater than 145 mEq/L.
- Hypernatremia is a serious electrolyte imbalance. It can cause significant neurological, endocrine, and cardiac disturbances.

ASSESSMENT

RISK FACTORS

- Water deprivation (NPO)
- Hypertonic enteral feedings without adequate water supplement
- Diabetes insipidus
- Heatstroke
- Hyperventilation
- Watery stools
- Burns
- Excessive sweating
- Excessive sodium retention: kidney failure, Cushing's syndrome, aldosteronism, some medications (e.g., glucocorticosteroids)
- Excessive intake of oral sodium
- Age-related changes, specifically decreased total body water content and inadequate fluid intake related to an altered thirst mechanism ☹
- Compensatory mechanisms, including increased thirst and production of ADH

EXPECTED FINDINGS

Thirst

VITAL SIGNS: Hyperthermia, tachycardia, orthostatic hypotension

NEUROMUSCULOSKELETAL: Restlessness; irritability; muscle twitching to the point of muscle weakness, including respiratory compromise; decreased or absent DTRs; seizures; coma

GASTROINTESTINAL: Thirst, dry mucous membranes, nausea, vomiting, anorexia, occasional diarrhea

LABORATORY TESTS

Serum sodium: Increased to greater than 145 mEq/L

Serum osmolarity: Increased to greater than 300 mOsm/L

Urine sodium: Decreased urine

Urine specific gravity and osmolarity: Increased

PATIENT-CENTERED CARE

NURSING CARE

- Report abnormal laboratory findings to the provider.
- Monitor level of consciousness, and ensure safety.
- Monitor vital signs and heart rhythm.
- Auscultate lung sounds.
- Provide oral hygiene and other comfort measures to decrease thirst.
- Monitor I&O, and alert the provider of inadequate urinary output.

Fluid loss

Based on serum osmolarity and hemodynamic stability

- Administer 5% dextrose and 0.45% sodium chloride solution. It is a hypertonic solution prior to infusion, but once infused the glucose rapidly metabolizes and it becomes a hypotonic solution.
- Administer isotonic nonsaline IV fluids (5% dextrose in water).

Excess sodium

- Encourage water intake, and discourage sodium intake.
- Administer diuretics (loop diuretics) for clients who have poor kidney excretion.

INTERPROFESSIONAL CARE

Nutritional services may be consulted for low-sodium food choices and to restrict fluid intake.

CLIENT EDUCATION

- Encourage the client to weigh daily. Notify the provider of a 1- to 2-lb gain in 24 hr, or 3-lb (1.4 kg) gain in 1 week.
- Encourage the client to consume a low-sodium diet, read food labels for sodium content, and keep a record of daily sodium intake.
- Encourage fluids as prescribed.

COMPLICATIONS

Acute hypernatremia

Complications (seizures, convulsion, death) can result from acute hypernatremia if not treated immediately.

NURSING ACTIONS

- Maintain open airway, and monitor vital signs.
- Implement seizure precautions, and take appropriate action if seizures occur.
- Monitor level of consciousness.

Potassium imbalances

- Potassium (K⁺) is the major cation in ICF. 98% of the body's potassium within the cells.
- Potassium plays a vital role in cell metabolism; transmission of nerve impulses; functioning of cardiac, lung, and muscle tissues; and acid-base balance.
- Potassium has a reciprocal action with sodium.
- Minor variations in the level of potassium in the body is a significant finding.
- Decreased potassium levels are known as hypokalemia.
- Elevated potassium levels are known as hyperkalemia.

Hypokalemia

Hypokalemia is the result of an increased loss of potassium from the body or movement of potassium into the cells, resulting in a serum potassium less than 3.5 mEq/L.

ASSESSMENT

RISK FACTORS

Actual potassium deficits

- Overuse of diuretics, digitalis, corticosteroids
- Increased secretion of aldosterone
- Cushing's syndrome
- Loss via GI tract—vomiting diarrhea, prolonged nasogastric suctioning, NPO status, and excessive use of laxatives or tap water enema administered repeatedly because tap water is hypotonic, and gastrointestinal losses are isotonic
- Kidney disease, which impairs the reabsorption of potassium

Relative potassium deficit

- Alkalosis
- Hyperinsulinism
- Hyperalimentation
- Total parental nutrition
- Water intoxication
- Older adult clients due to increased use of diuretics and laxatives ☹

EXPECTED FINDINGS

VITAL SIGNS: Decreased blood pressure, thready weak pulse, orthostatic hypotension

NEUROLOGIC: Altered mental status, anxiety, and lethargy that progresses to acute confusion and coma

ECG: Flattened T wave, prominent U waves, ST depression, prolonged PR interval

GASTROINTESTINAL: Hypoactive bowel sounds, nausea, vomiting, constipation, abdominal distention. Paralytic ileus can develop.

MUSCULAR: Weakness. Deep-tendon reflexes can be reduced.

RESPIRATORY: Shallow breathing

LABORATORY TESTS

Serum potassium: Decreased to less than 3.5 mEq/L

DIAGNOSTIC PROCEDURES

Electrocardiogram (ECG): Show findings of dysrhythmias: premature ventricular contractions, ventricular tachycardia, inverted T waves, ST depression.

PATIENT-CENTERED CARE

NURSING CARE

- Report abnormal findings to the provider.
- Assess for phlebitis (tissue irritant).
- Never give potassium via IM or subcutaneous route, which can cause necrosis of the tissues.
- Monitor and maintain adequate urine output.
- Observe for shallow ineffective respirations and diminished breath sounds.
- Monitor cardiac rhythm, and intervene promptly as needed.
- Monitor clients receiving digoxin. Hypokalemia increases the risk for digoxin toxicity.
- Monitor level of consciousness, and maintain client safety.
- Monitor bowel sounds and abdominal distention, and intervene as needed.
- Monitor oxygen saturation levels, which should remain greater than 95%.
- Assess hand grasps for muscle weakness.
- Assess DTRs.

Replacement of potassium

- Encourage foods high in potassium: avocados, broccoli, dairy products, dried fruit, cantaloupe, bananas, juices, melon, lean meats, milk, whole grains, and citrus fruits.
- Provide oral potassium supplementation.

IV potassium supplementation

- Never administer by IV push (high risk of cardiac arrest).
- The maximum recommended rate is 10 mEq/hr.

INTERPROFESSIONAL CARE

- Nephrology may be consulted for electrolyte and fluid management.
- Respiratory services may be consulted for oxygen management.
- Nutritional services may be consulted for food choices and potassium-rich foods.
- Cardiology may be consulted for dysrhythmias.

CLIENT EDUCATION

- Educate the client regarding potassium-rich foods to consume.
- Teach the client ways to prevent a decrease in potassium by excessive use of diuretics and laxatives.

COMPLICATIONS

Respiratory failure

NURSING ACTIONS

- Maintain an open airway, and monitor vital signs.
- Monitor level of consciousness.
- Monitor for hypoxemia and hypercapnia.
- Assist with intubation and mechanical ventilation if indicated.

Cardiac arrest

NURSING ACTIONS

- Perform continuous cardiac monitoring.
- Treat dysrhythmias.

Hyperkalemia

Hyperkalemia is the result of an increased intake of potassium, movement of potassium out of the cells, or inadequate kidney excretion resulting in a serum potassium level greater than 5.0 mEq/L.

- Increased risk of cardiac arrest
- Rare in clients who have normal kidney function

ASSESSMENT

RISK FACTORS

Clients who are chronically ill

Actual potassium excess

- Older adult clients due to decreases in renin and aldosterone, and increased use of salt substitutes, ACE inhibitors, and potassium-sparing diuretics ☹

Relative potassium excess

- Extracellular shift caused from decreased insulin production, acidosis (diabetic ketoacidosis), tissue damage (sepsis, trauma, surgery, fever, myocardial infarction), hyperuricemia

EXPECTED FINDINGS

Vital signs: Slow irregular pulse, hypotension

Neuromusculoskeletal: Restlessness, irritability, weakness to the point of ascending flaccid paralysis, paresthesia

ECG: Premature ventricular contractions, ventricular fibrillation, peaked T waves, widened QRS

Gastrointestinal: Increased motility, diarrhea, hyperactive bowel sounds

Other signs: Oliguria

LABORATORY TESTS

Serum potassium: Increased to greater than 5.0 mEq/L

Hemoglobin and hematocrit

- Increased with dehydration
- Decreased with kidney failure

BUN and creatinine: Increased with kidney failure

Arterial blood gases: Metabolic acidosis (pH less than 7.35) with kidney failure

DIAGNOSTIC PROCEDURES

Electrocardiogram: Will show dysrhythmias (ventricular fibrillation, peaked T waves, widened QRS)

PATIENT-CENTERED CARE

NURSING CARE

Priority nursing care is to prevent falls, assessing for cardiac complications, and health teaching.

- Avoid administering “aged” blood in clients who have impaired kidney function because the deterioration of red blood cells releases potassium into the stored blood.
- Report abnormal findings to the provider.
- Monitor I&O.
- Assess for muscle weakness.
- Observe for GI manifestations, such as nausea and intestinal colic.
- Report abnormal findings in lab work, such as BUN, creatinine, glucose, and arterial blood gases.
- Encourage the client to avoid foods high in potassium, such as citrus fruits, legumes, whole-grain foods, lean meat, milk, eggs, coffee, tea, cocoa, and some cola beverages high in potassium. Encourage the client to read food labels for potassium content.
- Foods with less potassium include, butter, margarine, cranberry juice, ginger ale, hard candy, root beer, sugar, and honey.
- Clients who have impaired kidney function and are taking potassium-conserving diuretics should not receive potassium replacement or salt substitutes.
- For clients who have elevated potassium levels, report and stop IV infusion of potassium, maintain IV access, stop all potassium supplements, and promote a potassium-restricted diet.
- The client may receive furosemide to promote potassium excretion.
- A combination of glucose and insulin administration may be prescribed to promote reduction of potassium levels. This promotes uptake of potassium by the cells, which in turn decreases the extracellular content of potassium.
- Kayexalate (oral or rectal) may be prescribed to promote intestinal potassium excretion.
- Promote movement of potassium from ECF to ICF.
 - Administer IV fluids with dextrose and regular insulin.
 - Administer sodium bicarbonate to reverse acidosis.
- Monitor cardiac rhythm, and intervene promptly as needed.

MEDICATIONS

To increase potassium excretion

Loop diuretics (furosemide)

- Administer if kidney function is adequate.
- Loop diuretics increase the depletion of potassium from the renal system.

NURSING CONSIDERATIONS: Maintain IV access.

CLIENT EDUCATION

- Educate the client on a potassium-restricted diet.
- Instruct the client to withhold oral potassium supplements until further advised by the provider.

Cation exchange resins

Sodium polystyrene sulfonate works as a laxative and excretes excess potassium from the body.

NURSING CONSIDERATIONS: If potassium levels are extremely high, dialysis can be required.

CLIENT EDUCATION

- Educate the client on a potassium-restricted diet.
- Instruct the client to hold oral potassium supplements until advised by the provider.

INTERPROFESSIONAL CARE

- Nephrology may be consulted if dialysis is needed and for electrolyte and fluid management.
- Nutritional services may be consulted for food choices containing potassium-restricted foods.
- Cardiology may be consulted for dysrhythmias.

CLIENT EDUCATION

- Educate the client about potassium-restricted foods to consume.
- Teach the client ways to prevent an increase in potassium by reading food labels and avoiding salt substitutes containing potassium.

COMPLICATIONS

Cardiac arrest

NURSING ACTIONS

- Treat dysrhythmias.
- Perform continuous cardiac monitoring.

Other electrolyte imbalances

CALCIUM: Hypocalcemia, hypercalcemia

CHLORIDE: Hypochloremia, hyperchloremia

MAGNESIUM: Hypomagnesemia, hypermagnesemia

PHOSPHORUS: Hypophosphatemia, hyperphosphatemia

In particular, nurses should be aware of the implications of hypocalcemia and hypomagnesemia.

Hypocalcemia

Hypocalcemia is a total serum calcium less than 9.0 mg/dL.

ASSESSMENT

RISK FACTORS

- Lactose intolerance
- Malabsorption syndromes (Crohn's disease)
- End-stage kidney disease (ESKD)
- Thyroidectomy
- Hypoparathyroidism
- Inadequate intake of calcium
- Vitamin D deficiency (increasingly common) or lack of 25-hydroxy vitamin D related to ESKD
- Pancreatitis
- Hyperphosphatemia
- Medications that can predispose clients to hypocalcemia include antacids that contain aluminum, caffeine, cisplatin, corticosteroids, mithramycin, phosphates, and loop diuretics.

EXPECTED FINDINGS

Tetany is the most common manifestation seen in clients in a hypocalcemic state. It is caused by neural excitability–spontaneous discharges from both the sensory and motor fibers (peripheral nerves).

- Paresthesia of the fingers and lips (early manifestation)
- Muscle twitches as hypocalcemia progresses
- Seizure due to irritability of the central nervous system
- Frequent, painful muscle spasms at rest in the foot or calf (Charley horses)
- Hyperactive DTRs
- Positive Chvostek's sign (tapping on the facial nerve triggering facial twitching)
- Positive Trousseau's sign (hand/finger spasms with sustained blood pressure cuff inflation)
- History of thyroid surgery or irradiation of the upper chest or neck, which places a client at risk for developing hypocalcemia

CARDIOVASCULAR: Prolonged QT interval as a result of a prolonged ST segment. Risk of torsades de pointes. Decreased myocardial contractility (decreased heart rate and hypotension when hypocalcemia is severe).

GASTROINTESTINAL: Hyperactive bowel sounds, diarrhea, and abdominal cramps

LABORATORY TESTS

Calcium level less than 9.0 mg/dL

DIAGNOSTIC PROCEDURES

Electrocardiogram changes: Prolonged QT and ST interval

PATIENT-CENTERED CARE

NURSING CARE

- Administer oral or IV calcium supplements. Vitamin D supplements enhance the absorption of calcium.
- Implement seizure precautions.
- Avoid overstimulation. Keep the client's room quiet, limit visitors, and use soft lighting in the room.
- Have emergency equipment on standby.
- Encourage foods high in calcium, including dairy products, canned salmon, sardines, fresh oysters, and dark leafy green vegetables.
- The client can require administration of calcium gluconate or calcium chloride (not used as often due to risk of tissue damage if infiltrated). IV administration should be diluted in dextrose 5% and water and given as a bolus infusion (using an infusion pump). If administered too quickly, cardiac arrest could occur.

INTERPROFESSIONAL CARE

- Endocrinology may be consulted for electrolyte and fluid management.
- Respiratory services may be consulted for oxygen management.
- Nutritional services may be consulted for food choices high in calcium.
- Cardiology may be consulted for dysrhythmias.

CLIENT EDUCATION

- Educate the client about consuming foods high in calcium (yogurt, milk).
- Teach the client ways to increase calcium in diet by reading food labels.

Hypomagnesemia

Hypomagnesemia is a serum magnesium level less than 1.3 mg/dL.

ASSESSMENT

RISK FACTORS

Can be seen in Celiac disease or Crohn's disease

- Malnutrition (insufficient magnesium intake)
- Ethanol ingestion (magnesium excretion)
- Diarrhea
- Citrate from blood products
- Steatorrhea

EXPECTED FINDINGS

Possible depressed mood, apathy, or agitation.

Neuromuscular: Increased nerve impulse transmission (hyperactive DTRs, paresthesias, muscle tetany, seizures), positive Chvostek's and Trousseau's signs

Gastrointestinal: Hypoactive bowel sounds, constipation, abdominal distention, paralytic ileus

PATIENT-CENTERED CARE

NURSING CARE

- Discontinue magnesium-depleting medications (e.g., loop diuretics, osmotic diuretics, aminoglycoside antibiotics, and medications that contain phosphorus).
- Administer oral or IV magnesium sulfate following safety protocols. IV route is used because IM can cause pain and tissue damage. Oral magnesium can cause diarrhea and increase magnesium depletion. Monitor DTRs hourly during administration of magnesium sulfate.
- IV magnesium sulfate is given via an infusion pump not to exceed 150 mg/min, or 67 mEq over an 8-hr period.
- Encourage foods high in magnesium, including dark green vegetables, nuts, whole grains, seafood, peanut butter, and cocoa. If there is mild hypomagnesemia, dietary changes may be used to correct it.
- Clients receiving digitalis should be monitored closely if magnesium is low because it predisposes the client to digitalis toxicity.

INTERPROFESSIONAL CARE

- Endocrinology may be consulted for electrolyte and fluid management.
- Respiratory services may be consulted for oxygen management.
- Nutritional services may be consulted for food choices high in magnesium.
- Cardiology may be consulted for dysrhythmias.

CLIENT EDUCATION

- Educate the client regarding foods that are high in magnesium.
- Teach the client ways to increase magnesium in diet by reading food labels.

Application Exercises

1. A nurse is caring for a client who has a serum sodium level 133 mEq/L and serum potassium level 3.4 mEq/L. The nurse should recognize that which of the following treatments can result in these laboratory findings?
 - A. Three tap water enemas
 - B. 0.9% sodium chloride solution IV at 50 mL/hr
 - C. 5% dextrose with 0.45% sodium chloride solution with 20 mEq of K⁺ IV at 80 mL/hr
 - D. Antibiotic therapy
2. A nurse is caring for a client who has a serum potassium 5.4 mEq/L. The nurse should assess for which of the following manifestations?
 - A. ECG changes
 - B. Constipation
 - C. Polyuria
 - D. Paresthesia
3. A nurse is caring for a client who has a nasogastric tube attached to low intermittent suctioning. The nurse should monitor for which of the following electrolyte imbalances?
 - A. Hypercalcemia
 - B. Hyponatremia
 - C. Hyperphosphatemia
 - D. Hyperkalemia
4. A nurse is assessing a client who has hyperkalemia. The nurse should identify which of the following conditions as being associated with this electrolyte imbalance?
 - A. Diabetic ketoacidosis
 - B. Heart failure
 - C. Cushing's syndrome
 - D. Thyroidectomy
5. A nurse is assessing a client for Chvostek's sign. Which of the following techniques should the nurse use to perform this test?
 - A. Apply a blood pressure cuff to the client's arm.
 - B. Place the stethoscope bell over the client's carotid artery.
 - C. Tap lightly on the client's cheek.
 - D. Ask the client to lower her chin to her chest.

PRACTICE Active Learning Scenario

A nurse is caring for a client who has hypokalemia. Use the ATI Active Learning Template: System Disorder to complete this item.

ALTERATION IN HEALTH (DIAGNOSIS)

NURSING CARE: Describe at least six actions.

INTERPROFESSIONAL CARE: Describe one action.

CLIENT EDUCATION: Describe one teaching point.

COMPLICATIONS: Describe one.

Application Exercises Key

1. A. **CORRECT:** Three tap water enemas can result in a decrease in serum sodium and potassium. Tap water is hypotonic, and gastrointestinal losses are isotonic. This creates an imbalance and solute dilution.
B. 0.9% sodium chloride is an isotonic solution and will not produce these results.
C. 5% dextrose with 0.45% sodium chloride is an isotonic solution with 20 mEq of K⁺ at 80 mL/hr and would not produce these results.
D. Antibiotic therapy would not produce these results.

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2. A. **CORRECT:** The nurse should assess for ECG changes. Potassium levels can affect the heart and result in arrhythmias.
B. Constipation is a manifestation of hypokalemia.
C. Polyuria is a manifestation of hypokalemia.
D. Paresthesia is a manifestation of hypokalemia.

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3. A. An increase in calcium is not indicated with nasogastric losses due to suctioning.
B. **CORRECT:** The nurse should monitor the client for hyponatremia. Nasogastric losses are isotonic and contain sodium.
C. An increase in phosphatemia is not indicated with nasogastric losses due to suctioning.
D. A decrease in potassium can occur from nasogastric losses due to suctioning.

N NCLEX® Connection: Physiological Adaptation, Fluid and Electrolyte Imbalances

4. A. **CORRECT:** Hyperkalemia, an increase in serum potassium, is a laboratory finding associated with diabetic ketoacidosis.
B. Hyponatremia, a decrease in serum sodium, is a laboratory finding associated with heart failure.
C. Hypernatremia, an increase in serum sodium, is a laboratory finding associated with Cushing's syndrome.
D. Hypocalcemia, a decrease in serum calcium, is a laboratory finding is found in clients following a thyroidectomy.

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5. A. Applying a blood pressure cuff to the client's arm is performed to assess for Trousseau's sign.
B. Placing the stethoscope bell over the client's carotid artery is performed to auscultate a carotid bruit.
C. **CORRECT:** The nurse taps the client's cheek over the facial nerve just below and anterior to the ear to elicit Chvostek's sign. A positive response is indicated when the client exhibits facial twitching on this side of her face.
D. Asking the client to lower her chin to her chest is performed to assess for range of motion of the neck.

N NCLEX® Connection: Reduction of Risk Potential, Diagnostic Tests

PRACTICE Answer

Using the ATI Active Learning Template: System Disorder

ALTERATION IN HEALTH (DIAGNOSIS): Hypokalemia is the result of an increased loss of potassium from the body or movement of potassium into the cells, resulting in a serum potassium less than 3.5 mEq/L.

NURSING CARE

- Report abnormal findings to the provider.
- Replacement of potassium
 - Encourage foods high in potassium (avocados, broccoli, dairy products, dried fruit, cantaloupe, bananas, juices, melon, lean meats, milk, whole grains, and citrus fruits).
 - Provide oral potassium supplementation.
- IV potassium supplementation
 - Never administer by IV push (high risk of cardiac arrest).
 - The maximum recommended rate is 10 mEq/hr.
 - Assess for phlebitis (tissue irritant).
- Potassium must never be given by IM or subcutaneous route, which can cause necrosis of the tissues.
- Monitor and maintain adequate urine output.
- Observe for shallow ineffective respirations and diminished breath sounds.
- Monitor cardiac rhythm, and intervene promptly as needed.
- Monitor clients receiving digoxin. Hypokalemia increases the risk for digoxin toxicity.
- Monitor level of consciousness, and maintain client safety.
- Monitor bowel sounds and abdominal distention, and intervene as needed.
- Monitor oxygen saturation levels, which should remain greater than 95%.
- Assess hand grasps for muscle weakness.
- Assess deep-tendon reflexes.

INTERPROFESSIONAL CARE

- Nephrology may be consulted for electrolyte and fluid management.
- Respiratory services may be consulted for oxygen management.
- Nutritional services may be consulted for food choices and potassium-rich foods.
- Cardiology may be consulted for dysrhythmias.

CLIENT EDUCATION

- Educate the client regarding potassium-rich foods to consume.
- Teach the client ways to prevent a decrease in potassium by excessive use of diuretics and laxatives.

COMPLICATIONS

- Respiratory failure
- Cardiac arrest

N NCLEX® Connection: Physiological Adaptation, Fluid and Electrolyte Imbalances