

## Electrolyte Imbalance

### Patient Profile

E.G. is a 73-year-old woman whose daughter brings her to see the health care provider because she has had a case of the “stomach flu,” with vomiting and diarrhea for the past 3 to 4 days and is now experiencing occasional light-headedness and dizziness. Her medical history includes hypertension, hypercholesterolemia, and mild heart failure. She is taking:

- Digoxin 0.125 mg po daily
- Captopril 25 mg po twice daily
- Furosemide 40 mg po daily
- Potassium chloride 20 mEq po daily
- Atorvastatin 20 mg po at bedtime

### Subjective Data

- Has been following a low-sodium diet
- States her abdomen feels bloated and she has been constipated since the onset of the “flu”
- Has been taking her medications except for the potassium chloride pill because it upsets her stomach.
- Occasionally takes an extra “water pill” when her ankles are swollen

### Objective Data

#### Physical Examination

- Temperature 98.2°F, pulse 88, respirations 20, BP 138/86
- Lungs clear to auscultation, breathing regular and unlabored
- +1 edema bilaterally in ankles
- Muscle strength in upper extremities normal and equal and in lower extremities weak
- Sensation to all extremities normal
- Abdomen distended with hypoactive bowel sounds

#### Diagnostic Studies

- Lab values
  - Sodium 139.0mEq/L
  - Potassium 3.0mEq/L
  - HCO<sub>3</sub><sup>-</sup> 25.4mEq/L
  - Chloride 99.5 mEq/L

### Discussion Questions

1. What is a possible pathophysiologic cause of E.G.’s muscle weakness and dizziness? What other symptom does E.G. have that may be related to this problem?

**Answer: A possible pathophysiologic cause of E.G.’s muscle weakness would be the decrease in potassium. Other symptoms that could be related to this problem include edema in the ankles, vomiting, constipation, and abdominal distention.**

**Rationale: Potassium regulates muscle contraction, fluid balance, and nerve signals. In hypokalemia, the patient will experience constipation and abdominal distention/discomfort due to the muscles in the GI system not contracting as they should. This is the same case for the patient also experiencing weakness.**

2. What factors contributed to the development of this electrolyte imbalance?  
**Answer: The contributing factors for the electrolyte imbalance are vomiting and diarrhea for the last three to four days.**  
**Rationale: Excessive fluid loss leads to electrolyte imbalances.**
3. What should you be on an alert for in a patient who is on furosemide and digoxin and why?  
**Answer: You should be alert for signs and symptoms of hyperkalemia.**  
**Rationale: Digoxin toxicity can cause severe hyperkalemia. The sodium/potassium pump allows sodium to leave cells and potassium to enter the cells. Digoxin blocks this mechanism which causes an increase in serum potassium levels.**
4. What additional signs and symptoms should you assess E.G. for?  
**Answer: Other signs and symptoms you should assess E.G. for are her respiratory status, cardiac dysrhythmias, and assess for further deterioration of her mild heart failure.**  
**Rationale: Hyperkalemia can cause cardiac dysrhythmias and can lead to cardiac arrest. Her respiratory status needs to be reevaluated after the intervention of administering supplemental oxygen and ensuring that she is getting adequate oxygen and perfusion to her body.**
5. What diagnostic test is indicated and why?  
**Answer: ECG testing, digoxin level a serum electrolyte panel, kidney function test, and urine sampling are all indicated in this situation.**  
**Rationale: An ECG is necessary due to the potential of cardiac dysrhythmias from abnormal potassium levels. Digoxin levels are essential to monitor on a regular basis, especially when electrolyte imbalances associated with potassium are present. A complete serum electrolytes panel is indicated here due to abnormalities in potassium, constipation, and verbalized inappropriate use of diuretics. A urine sample would also be appropriate in this patient to assess for presence of electrolytes that could be a potential cause of imbalances in sodium, potassium and magnesium considering the medications she is taking.**
6. Write three nursing diagnoses that are appropriate for E.G.  
**Answer: Imbalanced fluid volume related to diarrhea and vomiting, risk for electrolyte imbalances related to diuretic use as evidenced by vomiting, constipation and decreased potassium levels, and impaired bowel movement related to hypokalemia as evidenced by hypoactive bowel sounds.**  
**Rationale: Vomiting and diarrhea cause fluid loss which puts the patient at risk for imbalanced fluid volume. Diuretics are used to rid the body of excess fluid, but they can spare too much which can cause electrolyte imbalances. Hypokalemia can cause the muscles in the GI tract to not contract as they should which can cause constipation.**
7. What interprofessional care would you anticipate for E.G.?  
**Answer: Team care would include nursing, dietician, pharmacist, gastroenterologist, cardiologist, and internal medicine specialist.**  
**Rationale: Nursing staff is important for the care of this patient to ensure that replacements are given for electrolyte imbalances and to ensure all of the patients questions are addressed to prevent further mismanagement of medication use at home. A dietician can be beneficial in offering solutions for gastrointestinal distress and for substitutions for foods that contain high sodium and potassium. A pharmacist should be included to educate the patient entirely on**

their medication regimen to ensure that they are taken as prescribed at home with reinforcement from physician and nursing team members. A gastroenterologist should be included to discuss symptoms of GI distress and ensure that there are no secondary causes to her constipation, nausea and vomiting. A cardiologist should see the patient to monitor her for signs of worsening heart failure and to adjust her medications accordingly (Digoxin, Captopril, Atorvastatin and Furosemide). Lastly, an internal medicine specialist should be consulted to ensure her overall medication and health needs are addressed to ensure the medication regimen and recommendations from specialists (cardiology and gastroenterology) are safe and effective for this patient when used together.

8. What instructions should you give E.G. regarding the signs and symptoms of this electrolyte imbalance and how to prevent it?

**Answer:** Education for electrolyte imbalances in this case include signs and symptoms of muscle cramps, weakness and palpitations; as well as, close monitoring of urine output and education about medication adherence.

**Rationale:** Hypokalemia from lack of medication adherence to prescribed potassium replacement can cause symptoms of muscle cramps, weakness and palpitations. Excess urine output from overuse of diuretics can lead to additional excretion of potassium in the urine and further extenuate the problem of low potassium levels that might lead to severe dysrhythmias. It is also important to educate the patient to adhere to diet and fluid instructions as prescribed by the physician to ensure electrolyte levels remain within a normal range. Inappropriate use of Furosemide can lead to electrolyte imbalances in sodium and potassium levels. This patient is already at risk of electrolyte imbalances due to their use of digoxin and should be cautioned to ensure an appropriate amount of water is consumed each day. Excessive amount of fluid intake can cause heart failure exacerbation and cause a shift in potassium, sodium, magnesium and chloride. Excessive use of furosemide can cause diarrhea and lead to electrolyte imbalances in sodium and potassium. The patient is not taking the prescribed potassium due to it upsetting her stomach, it is important to educate the patient to take her potassium with a full glass of water and to remain upright for ten minutes after taking the medication to relieve her indigestion.