Kaplan USMLE Step 2 prep: Managing a potassium abnormality

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Staff News Writer

If you’re preparing for the United States Medical Licensing Examination® (USMLE®) Step 2 exam, you might want to know which questions are most often missed by test-prep takers. Check out this example from Kaplan Medical, and read an expert explanation of the answer. Also check out all posts in this series.

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This month’s stumper

A 66-year-old man comes to the emergency department because of leg weakness and dyspnea. He has end-stage renal disease (ESRD) due to diabetic and hypertensive nephropathy and has been receiving chronic hemodialysis treatments for the past year. His medications include lisinopril and nifedipine. He has not adhered to prescribed dietary sodium and potassium restrictions and has missed his last two hemodialysis treatments.

His temperature is 37 °C (98.6 °F), pulse is 90 beats a minute, respiratory rate is 20 breaths per minute, and blood pressure is 186/82 mm Hg. The estimated jugular venous pressure is 12 cm H₂O. There are bibasilar lung crackles, an S3 cardiac gallop sound, 1+ pitting pretibial edema, and decreased strength in both legs.

Laboratory studies show:

- Hemoglobin: 8.8 g/dL.
- Leukocyte count: 8,000/mm³.
- Platelet count: 186,000/mm³.
Serum studies show:

- \( \text{Na}^+ \): 139 mEq/L.
- \( \text{Cl}^- \): 100 mEq/L.
- \( \text{K}^+ \): 7.9 mEq/L.
- \( \text{HCO}_3^- \): 14 mEq/L.
- Urea nitrogen (BUN): 156 mg/dL.
- Creatinine: 7.2 mg/dL.
- Glucose: 112 mg/dL.

ECG shows normal sinus rhythm with tall, tented/peaked T waves and a wide QRS complex. The patient receives one ampule of calcium gluconate, one ampule of 50% dextrose with 10 units of regular insulin, and an inhaled beta-2-adrenergic agonist.

Which of the following is the most appropriate next step in the management of the patient's potassium abnormality?

A. Administer 120 mg of furosemide IV.

B. Administer patiromer.

C. Emergent hemodialysis.

D. Send the patient home and arrange transportation for outpatient dialysis.

E. Stop lisinopril and monitor potassium levels.
The correct answer is C.

Kaplan Medical explains why

Severe hyperkalemia is defined by a serum potassium level above 6.5 mmol/L, ECG changes, or symptoms such as muscle cramping and needs to be addressed immediately.

Definitive potassium elimination with loop diuretics, sodium polystyrene or patiromer, or emergent hemodialysis, is required after protecting the cardiac membrane and temporarily redistributing potassium. Emergent hemodialysis is the best choice for this patient with ESRD and severe hyperkalemia.

Why the other answers are wrong

**Choice A:** Administering 120 mg of furosemide IV may increase urinary potassium along with sodium excretion in someone who has preserved renal function. In the presence of end-stage renal disease, this will be much less effective.

**Choice B:** Administering patiromer is not the right answer. Patiromer is a drug that binds potassium in the intestine, leading to a gradual reduction in serum potassium concentration. Patiromer and similar agents such as sodium polystyrene and sodium zirconium cyclosilicate are not indicated for the treatment of life-threatening hyperkalemia.

**Choice D:** Sending the patient home and arranging transportation for outpatient dialysis after the initial temporizing measures are complete is not appropriate. The potassium level will increase again once the effects of the insulin and sodium bicarbonate wear off.

**Choice E:** Stopping lisinopril and monitoring potassium levels will not have a significant effect on
urinary potassium excretion in the setting of end-stage renal disease, although this could be helpful in a patient with preserved renal function. Regardless, the reduction in serum potassium by the withdrawal of renin-angiotensin-aldosterone inhibition will not be rapid enough to treat life-threatening hyperkalemia.

**Tips to remember**

- Treatment of severe, life-threatening hyperkalemia includes calcium gluconate for stabilization of cardiac membranes; and insulin, bicarbonate (in the presence of metabolic acidosis), and beta-2-agonists to drive potassium intracellularly.
- The duration of these therapies’ effects is limited, however, and they must be paired with treatments that will remove excess potassium from the body. In the setting of end-stage renal disease, this requires dialysis.

For more prep questions on USMLE Steps 1, 2 and 3, view other posts in this series.