Hypokalemia and Hyperkalemia

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KEYWORDS

• Potassium • Hypokalemia • Hyperkalemia • Electrolyte disorders

HOSPITAL MEDICINE CLINICS CHECKLIST

1. Serum potassium concentration is used to diagnose hypokalemia and hyperkalemia. In the setting of low clinical suspicion of hypokalemia or hyperkalemia, abnormal serum potassium results need to be confirmed.
2. In individuals with hypokalemia or hyperkalemia, evaluate a 12-lead electrocardiogram for evidence of conduction abnormalities or arrhythmias. Telemetry is indicated in individuals with severe potassium derangement, with electrocardiographic abnormalities, or who are at risk of developing arrhythmias.
3. Attempt to identify the cause of hypokalemia or hyperkalemia based on history, medication review, examination, and other laboratory results.
4. In hypokalemia and hyperkalemia, evaluate medications and discontinue or dose reduce any causal or contributing medications.
5. In hypokalemia, determine if the individual needs potassium deficit replacement. In the case of a reversible redistribution of potassium into the intracellular compartment, be careful to avoid rebound hyperkalemia.
6. When potassium deficit replacement is indicated, use oral potassium replacement, unless there is a severe deficit, signs or symptoms of hypokalemia, or the individual cannot tolerate oral intake.
7. In individuals with hypokalemia from ongoing urinary potassium losses, consider use of potassium-sparing diuretics.
8. In severe hyperkalemia with electrocardiographic features of hyperkalemia, administer calcium salt to stabilize the cardiac membrane.

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9. In severe hyperkalemia, administer therapy to redistribute serum potassium into the intracellular space and concomitantly give therapy to remove potassium from the body.
10. After treatment of severe hypokalemia or hyperkalemia, close monitoring of serum potassium is indicated. In addition, repeat electrocardiogram, blood glucose monitoring, or other laboratory studies may be indicated.

DEFINITION

What is a normal potassium level?

Most potassium is intracellular and has a normal concentration of approximately 150 mmol (mEq)/L. Serum potassium has a normal concentration of 3.5 to 5.0 mmol/L. Hypokalemia is defined as a serum potassium concentration less than 3.5 mmol/L, and hyperkalemia is defined as a serum potassium concentration of higher than 5.0 mmol/L.[1] There are no agreed definitions of severe hypokalemia or hyperkalemia. However, most experts define severe hypokalemia as less than 2.5 to 3.0 mmol/L.[2,3] and severe hyperkalemia as higher than 6.0 to 6.5 mmol/L[4–8] However, others argue that hyperkalemia should not be considered severe until higher than 8.0 mmol/L.[9]

EPIDEMIOLOGY

How common are hypokalemia and hyperkalemia in hospitalized patients?

Hypokalemia and hyperkalemia are common clinical problems in hospitalized patients. Hypokalemia is present in up to 21% of hospitalized patients. Most of those patients have serum potassium levels between 3.0 and 3.5 mmol/L. However, around 2.5% to 5% of patients have serum potassium levels less than 3.0 mmol/L.[10,11] Hyperkalemia occurs in 1.1% to 10% of hospitalized patients.[12,13]

PHYSIOLOGY OF POTASSIUM REGULATION

What is the physiology of potassium regulation?

Serum potassium concentrations are highly regulated, because they are essential for normal neuromuscular function.[1] When potassium is ingested in the diet, approximately 90% is absorbed in the gastrointestinal tract. This process leads to an increase in the serum potassium concentration. In response to an increased serum potassium concentration, insulin, catecholamines, and aldosterone are secreted. Insulin and catecholamines serve to acutely decrease serum potassium levels by activating the sodium-potassium-adenosine triphosphatase pumps, which transport potassium into muscle and liver cells.[1,14] Aldosterone, in addition to increased serum potassium levels and increased delivery of sodium and water to the distal nephron, causes urinary potassium excretion.[1,14,15] This process leads to a near complete excretion of the potassium load within 6 to 8 hours of ingestion.[14,15] Normally, the kidney is responsible for 90% to 95% of potassium excretion, with the remaining 5% to 10% lost in stool and sweat.[15]