

HYPERKALEMIA

(Last updated 07/24/2019; Last reviewed 03/17/2017; Reviewers: Abhay Vakil, MD; John M. Litell, DO)

IMMEDIATE CONSIDERATIONS

FINDINGS

- **Signs & Symptoms**
 - ECG changes
 - Arrhythmias
 - Severe muscle weakness
 - Often asymptomatic
- **Diagnostic Findings**
 - ECG changes
 - Early changes include:
 - Tall peaked T waves in multiple leads
 - Shortened QT interval
 - More severe changes include:
 - Progressive lengthening of PR interval and QRS duration
 - Disappearance of P wave
 - QRS widening to sine wave pattern
- **Predisposing Conditions**
 - Reduced urinary excretion of potassium
 - Can be:
 - Secondary acute or chronic renal failure
 - Reduced aldosterone secretion
 - Aldosterone resistance

- Reduced distal sodium and water delivery
- Increased production of potassium:
 - Tissue catabolism
 - Necrosis
 - Medications
 - Beta-blockers
 - ACE inhibitors
 - Digoxin
 - Potassium-sparing diuretics
 - Metabolic acidosis
 - Exercise
 - Insulin deficiency
 - Hyperkalemic periodic paralysis
 - Massive red blood cell transfusion with hemolysis
- **Differential Diagnoses**
 - Pseudohyperkalemia
 - Commonly due to hemolysis of red blood cells during or after specimen collection
 - Repeat the test if hyperkalemia does not fit the clinical picture
 - Elevation in measured serum potassium is due to potassium movement out of the cells during or after the specimen is drawn (hemolysis)

DIAGNOSTIC INTERVENTIONS

- **First priorities**
 - Immediate ECG to assess for dangerous manifestations of hyperkalemia
 - Any ECG changes should prompt immediate empiric treatment

- Repeat electrolyte panel to confirm hyperkalemia if it does not fit the overall clinical picture
 - May be pseudohyperkalemia
- **Second priorities**
 - Perform additional testing to assess for cause of renal failure, including:
 - Blood urea nitrogen
 - Creatinine
 - Serum electrolytes
 - Sodium
 - Bicarbonate
 - Chloride
 - Calcium
 - pH
 - Glucose levels
 - Creatinine kinase
 - Also consider adding urine microscopy and urine electrolytes to assist in the differential diagnosis of renal failure
 - Consider renal ultrasound with doppler to evaluation for renal perfusion abnormalities
- **Ongoing priorities**
 - Continuous cardiac monitoring
 - Serial serum potassium measurements until the level normalizes
 - Monitor urine output

THERAPEUTIC INTERVENTIONS

- **Medications**
 - **In presence of ECG abnormalities and/or cardiac arrhythmias:**

- Intravenous calcium
 - Antagonizes membrane action of hyperkalemia to prevent lethal cardiac arrhythmias
 - Calcium gluconate or calcium chloride can be used, but gluconate is safer
 - The temporizing effect of calcium therapy is very short-lasting and **does not correct the problem**
- Intravenous insulin and dextrose, inhaled beta-2 adrenergic agonists, and intravenous sodium bicarbonate will temporarily shift potassium into the intracellular space
 - **These therapies also do not correct the problem** but temporize until potassium removal
- Diuretic therapy and hemodialysis
 - In the case of severe oligoanuric renal failure
 - Will actually remove potassium from the body
- Cation exchange resins may aid in removing potassium from the body via the gastrointestinal tract, but this approach is unpredictable
 - Ex. sodium polystyrene sulfonate
- Identify and treat reversible underlying causes for hyperkalemia
 - Stop any potassium supplementation or associated medications

MANAGEMENT AFTER STABILIZATION

- **Follow-Up**
 - Follow potassium levels every 4-6 hours until stable and/or underlying cause is reversed
- Persistent hyperkalemia despite diuresis may suggest tissue necrosis

CAUTIONS

- Lethal cardiac arrhythmia can result from delayed empiric intervention
 - These arrhythmias can occur unpredictably with relatively mild hyperkalemia
- Cation exchange resins have been implicated in intestinal necrosis

REFERENCES & ACKNOWLEDGEMENT

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