HYPOKALEMIA

(Last updated 07/25/2019; Reviewers: Abhay Vakil, MD)

IMMEDIATE CONSIDERATIONS

FINDINGS

• Signs & Symptoms
  o Severe muscle weakness
  o Cardiac arrhythmias
  o Renal abnormalities
  o Glucose intolerance

• Lab Findings
  o ECG changes
    ▪ PVCs
    ▪ ST segment depression
    ▪ Prolonged QTc
    ▪ T wave attenuation
    ▪ Appearance of U waves
  o Digoxin toxicity can lead to similar ECG findings

• Predisposing Conditions
  o GI loss of potassium
    ▪ Vomiting
    ▪ Diarrhea
    ▪ Gastric tube drainage
    ▪ Laxative overuse
  o Increased intracellular potassium shift
    ▪ Metabolic alkalosis
- Increased insulin levels
- Marked increase in blood cell production
- Hypothermia
- Chloroquine intoxication
  - Urinary loss
    - Diuretic use
    - Renal tubular acidosis
    - Hypomagnesemia
    - Polyuria
    - Use of amphotericin B
    - Bartter’s or Gitelman’s syndrome
    - Primary mineralocorticoid excess
  - Other causes
    - Sweating
    - Hemodialysis
    - Plasmapheresis

**DIAGNOSTIC INTERVENTIONS**

- Labs
  - BUN
  - Creatinine
  - Magnesium level
  - pH
  - Urinary potassium excretion
    - Spot vs 24 hour
- Urine protein to creatinine ratio

**Monitoring**
- ECG
- Serial serum potassium concentrations

**THERAPEUTIC INTERVENTIONS**

**Medications**
- Treatment for hypokalemia should be instituted at the earliest possible juncture, especially in the presence of ECG changes
  - Intravenous and/or oral potassium chloride administration should be instituted as soon as possible
  - Intravenous potassium replacement should be used in patients unable to tolerate oral medications potassium and/or as an adjunct to oral potassium in cases of severe hypokalemia
  - Identify and treat the underlying cause of hypokalemia

**MANAGEMENT AFTER STABILIZATION**

**Follow-Up**
- In patients with ECG changes, perform serial ECGs to monitor of correction

**Manage Complications**
- The most common complication after potassium replacement is hyperkalemia from overcorrection
  - Close monitoring of potassium levels is essential
    - Relatively rapid intravenous potassium replacement may be required in DKA and hyperosmolar hyperglycemic states
CAUTIONS

- Severe hypokalemia requires exponentially larger replacement needs
  - Use electrolyte replacement protocols
- IV potassium >10 meq per hour should be infused via central venous access

ALGORITHM TO DETERMINE CAUSE OF HYPOKALEMIA

1. Hypokalemia <3.5
   - Increase loss
     - Check urinary spot potassium
   - Distribution defect
     - Insulin excess, hyperglycemia, metabolic alkalosis, periodic paralysis
   - If Urinary Spot K <10
     - Non-renal loss
       - Diarrhea, vomiting, laxative abuse
   - If Urinary Spot K >20
     - Renal loss
       - Check BP
         - If BP High
           - Hyperaldosterone state
           - Check Plasma Renin
             - If Decreased
               - Primary hyperaldosteronism
             - If Increased
               - Secondary hyperaldosteronism
         - If Normal BP
           - Check bicarbonate level
             - If Decreased
               - RTA 1 / RTA 2
             - If Increased
               - Check urinary chloride
                 - If <10
                   - Vomiting with metabolic alkalosis
                   - Hyperaldosterone state
                 - If >10
                   - Bartters, diuretic use
                 - Distribution defect
                   - Insulin excess, hyperglycemia, metabolic alkalosis, periodic paralysis
REFERENCES & ACKNOWLEDGMENTS

Acknowledgement: John M. Litell, DO