

MANAGEMENT OF HYPERKALEMIA IN ADULTS

Informational Handout

I. DEFINITIONS

Hyperkalemia is defined as serum potassium greater than 5.5 mEq/L

It is further categorized as:

Mild hyperkalemia	= serum potassium 5.5 - 6 mEq/L
Moderate hyperkalemia	= serum potassium 6.1 - 6.9 mEq/L
Severe hyperkalemia	= serum potassium > 6.9 mEq/L

II. CLINICAL EFFECTS OF HYPERKALEMIA

- A. Neuromuscular manifestations including weakness, paresthesias, and ascending paralysis.
- B. ECG changes which often parallel rises in potassium concentration
 1. Potassium 5.5 - 6 mEq/L → peaked T wave and shortened QT interval
 2. Potassium 6 - 7 mEq/L → lengthening of the PR interval and QRS widening.
 3. Potassium 7 - 7.5 mEq/L → flattening of the P waves and further widening of the QRS.
 4. Potassium > 8 mEq/L → biphasic sine wave representing fusion of the widened QRS and T wave.
- C. Cardiac arrhythmias including sinus bradycardia, sinus arrest, slow idioventricular tachycardia, ventricular fibrillation, or asystole.

KEYNOTE: The correlation between ECG changes and serum potassium does not always follow the above mentioned sequence. The absence of typical ECG changes does not exclude the need for immediate intervention for hyperkalemia. The progression from benign to lethal arrhythmias in hyperkalemia is unpredictable—potentially fatal ventricular arrhythmias and asystole may occur without warning.

III. TREATMENT

- A. Patient Selection
 1. Patients usually requiring treatment:
Any patient with ECG findings consistent with hyperkalemia as well any patient with serum potassium >6 - 7mEq/L. The selected therapeutic interventions as a short-term plan will depend on the degree of ECG changes and the serum potassium value.
 2. Patient generally not requiring treatment to directly lower the potassium:
 - a. Hyperkalemia associated with Diabetic Ketoacidosis
 - b. Pseudohyperkalemia: Hyperkalemia due to in vitro hemolysis, leukocytosis (>70,000/cm³), or thrombocytosis (>1,000,000/cm³)
- B. Goals of therapy and treatment sequence:
 1. Block the adverse effects of potassium on the heart muscle with calcium.
 2. Redistribute potassium from outside to inside cells with insulin/dextrose, albuterol, or sodium bicarbonate as single agents or in combination.
 3. Enhance excretion of potassium from the body with furosemide, sodium polystyrene sulfonate (Kayexalate®), and/or dialysis.
- C. Specific Therapeutic Agents (see table)

THERAPEUTIC ALTERNATIVES FOR MANAGEMENT OF HYPERKALEMIA

Medication	Indication	Dose	Route of Administration	Onset/ Duration of Action	Expected Result	Effect on Plasma K+	Effect on Total Body K+	Notes
Calcium Gluconate	Severe ↑ K with ECG changes	1-2 grams	IV over 5-10 minutes	1-3 min/ 30-60 min	Reverses ECG effects by antagonizing membrane excitability	None	None	Fastest action, monitor ECG. MR in 5-10min if abnormal ECG persists. Hazardous in conjunction with digoxin (if used, give over 20-30 min)
Regular Insulin and Dextrose **	Moderate ↑ K	Insulin 5-10 units/ Dextrose 50% 50ml (25gm)	Insulin IV or SQ Dextrose IV	30 min/ 2-6 hours	Move K+ intracellularly temporarily	↓	None	Repeat every 15 minutes if needed. Give insulin without dextrose if patient hyperglycemic. Monitor CBG
Albuterol	Moderate ↑ K	10-20mg	Nebulized over 10-20 minutes	15-30 min/ 1-2 hours	Move K+ intracellularly temporarily	↓	None	Less effective in elderly, hypertensive, vol. overloaded, ESRD, African American patients. Common ADR include tachycardia, tremor, vasomotor flushing, hyperglycemia
Sodium Bicarbonate	Moderate ↑ K	50-100mEq	IV over 2-5 minutes	5-10 min/ 1-2 hours	Move K+ intracellularly temporarily	↓	None	Most effective when acidosis present. Most risk in CHF, hypernatremia. Beware of hypocalcemic tetany.
Furosemide (Lasix®)	Moderate ↑ K	40-80mg	IV slowly	5-10 min/ 4-6 hours	Increased urinary K+ excretion	↓	↓	Most useful if inadequate K+ excretion contributes to ↑ K+. Ineffective in ESRD.
Sodium Polystyrene Sulfonate (Kayexalate®)	Moderate ↑ K	15-60 grams	Oral or Rectal	1-2 hours/ 4-6 hours Variable	Increased K+ excretion	↓	↓	Each gram removes about 1 mEq/L K+ orally and 0.5mEq/L rectally. May repeat q4h. Use with caution in CHF
Hemodialysis	Hyperkalemia with renal failure	N/A	N/A	Immediate/ Until run complete	Removal of K+ from plasma	↓	↓	Most effective, definitive treatment. Improves acidosis

** Insulin/Dextrose may be given in combination with albuterol for added efficacy and reduced incidence of hypoglycemia.