

## POTASSIUM ON THE WARDS

### QUICK POTASSIUM BASICS

98% intracellular. Driven there by Na-K-ATPase pump in the cell membrane

2% Extracellular and tightly controlled at ~**3.7-5.2 mEq/L**. K levels outside of this range potentially life threatening

	Mild-to-Moderate	Severe
<b>Hyperkalemia</b>	6-7 mEq/L	>7 mEq/L and/or symptomatic
<b>Hypokalemia</b>	3-3.4 mEq/L	< 2.5-3 mEq/L and/or symptomatic

### IS IT REAL? PSEUDOHYPERKALEMIA

**Pseudohyperkalemia:** lab findings of **falsely** ↑ serum K due to K movement out of the cells during or after a blood draw. Suspect in an asymptomatic patient with no apparent cause for K elevation

1. Lysis of rbc
2. Specimen deterioration (cooling, prolonged storage)
3. ↑wbc, ↑plt
4. Drawing blood downstream from a vein into which K is infusing
5. Trauma: forcible expression of blood (milking a heel stick)
6. Exercise: fist clenching with blood draws

### HYPERKALEMIA CAUSES

#### I. Shifting of K into extracellular space

- A. Tissue (lots of cells) damage: burns, crush injury, rhabdo, tumor lysis
- B. Acidosis
- C. Hyperosmolar states
- D. Insulin deficiency

#### II. Impaired Renal Excretion (↑ total body K)

- A. Renal insufficiency/failure
- B. Endocrine: ↓ renin, ↓ aldosterone, adrenal insufficiency, pseudohypoaldosteronism

#### III. Iatrogenic

- A. K in IVF/TPN
- B. Lots of meds (NSAIDS, ACE inhibitors, beta blockers, K sparing diuretics, trimethoprim)

### HYPERKALEMIA SIGNS/SYMPTOMS

Resolve with hyperkalemia correction

#### I. Muscle: ascending weakness and paralysis

sphincter tone, cranial nerves, and respiratory muscles typically preserved

#### II. Cardiac

##### A. Conduction abnormalities and arrhythmias

##### B. EKG changes

1. Peaked T waves → Loss of P wave → Widened QRS → Sine wave pattern



2. Rough (NOT perfect) correlation b/w EKG changes and ↑K  
Hyperkalemia can be life-threatening even if EKG nl  
**Any EKG changes should be treated as an emergency**

### HYPERKALEMIA TREATMENT

#### 4 Basic Approaches

1. **Do no harm:** remove any exacerbating factors: K containing IVF, TPN, meds known to cause hyperkalemia
2. **Stabilize cell membranes:** Calcium
3. **Drive K into cells:** insulin/glucose, Beta2 agonist (albuterol)
4. **Remove excess K from the body:** furosemide, Kayexalate, dialysis

**Monitoring:** continuous cardiac monitors, serial EKG's, and q1hr K for pt's who require rapidly acting therapies

## POTASSIUM ON THE WARDS

MEDICATION	DOSING	MECHANISM	NOTES
<b>Calcium IV</b>	10-20mg/kg	<b>Stabilizes myocardium</b>	-Give if any EKG changes and/or K is rapidly increasing (if peaked T waves alone and rapidly acting methods being initiated could consider holding Ca) <b>Onset:</b> immediate <b>Duration:</b> up to 1hr
<b>Insulin/Glucose</b>	Insulin: 0.1 units/kg + D 25W 2m/kg or D10W 5ml/kg	<b>Drives K into cells</b> ↑ activity of the Na-K-ATPase pump	<b>Onset:</b> minutes <b>Duration:</b> Peak ~1hr. Lasts 4-6hrs
<b>Beta2 agonist (Albuterol)</b>	10-20mg neb		<b>Onset:</b> minutes <b>Peak:</b> ~90 min
<b>Loop diuretic (furosemide)</b>	1mg/kg/dose	↓ <b>total body K</b> by ↑ renal K excretion	Consider adding NS bolus to maximize distal sodium delivery and flow <b>Onset:</b> 15 min to 1hr
<b>Cation exchange resin Sodium polystyrene sulfonate (Kayexalate)</b>	1-2g/kg PO/NG/PR	↓ <b>total body K</b> by ↑ GI K excretion Binds K in the colon in exchange for Na	-PO/NG: Peak 4-6hrs Enema 1-2hrs
<b>Dialysis</b>		↓ <b>total body K</b>	<b>Use if:</b> 1) anuric 2) K ↑ rapidly 3) Above measures ineffective

### HYPOKALEMIA CAUSES

#### I. Shifting of K into intracellular space

- A. Alkalosis
- B. Insulin
- C. ↑ Beta-adrenergic activity

#### II. ↑ K losses (↓ total body K)

- A. GI track
- B. Urine

### HYPOKALEMIA SIGNS/SYMPTOMS

Resolve with hypokalemia correction

#### I. Muscle

- A. Ascending weakness and paralysis. Can include respiratory muscles → resp failure, and GI muscles → ileus
- B. Ischemia: cramping, rhabdomyolysis, myoglobinuria

#### II. Cardiac

- A. Conduction abnormalities and arrhythmias
- B. EKG Changes (not seen in all pts): ST segment depression and prominent U wave



### TREATMENT OF HYPOKALEMIA

I. Investigate and manage any underlying causes

II. Investigate and manage any coexisting alkalosis and/or ↓ Mg

III. Replace K

- A. Enteral (preferred unless pt symptomatic or unable to tolerate)  
1-4 mEq of K/kg/day divided QID-BID
- B. Parenteral: 0.3mEq/kg per dose. Worry about over-correcting and causing hyperkalemia. Pt needs to be on a CR monitor during K bolus infusion. Recheck K following infusion.