Electrolyte Disorders

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What we will cover

• Quotidian Electrolytes
• Panic Electrolytes
• A movie that might change your life
What we won’t cover

- All Electrolytes
- Every aspect of dosing electrolytes (sorry, pediatrons)
- EKG finer points
Hyperkalemia

Is for Killer . . . .
Hyperkalemia

Q: What is the most common cause of hyperK?
Q: What is the most common cause of hyperK?

A: We are!
Hyperkalemia

Five Most Common Causes

- Pseudo hyperK
- CKD
- Acidosis
- Cell Death (Rhabdo, Burns, Crush, Tumor Lysis, Hemolysis)
- Drugs
Hyperkalemia

Five Most Common Drugs

- ACE Inhibitors
- ARBs
- NSAIDS, COX-2 Inhibitors
- Potassium Sparing diuretics
- Bactrim
Hyperkalemia

If you remember nothing else I ever say to you . . . .
Hyperkalemia

Hyper K = EKG
Hyperkalemia

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Hyperkalemia

EKG Changes in Hyper K

• Tall Peaked T Waves (5.5-6.5)
• Loss of P Wave (6.5-7.5)
• Widened QRS (Usually > 8.0)
Hyperkalemia
Hyperkalemia
Hyperkalemia
Hyperkalemia
Hyperkalemia

Steps in Treating Hyper K

• Step 1: Reverse Electrical Effects
• Step 2: Drive potassium into cells
• Step 3: Remove potassium from the premises
Hyperkalemia

Step 1: Reverse Electrical Effects

• Calcium tricks cells

• Calcium does not affect levels
Hyperkalemia

Step 1: Calcium

- Recreates the electrical gradient
- Temporary, lasts only 20-30 minutes
- Dose is 10ml CaCl IV
- Potentially dangerous!
Hyperkalemia

CaCl
- 13.6 meq/10cc
- More sclerosing
- Adults
- Acute
- Emergency

Ca Gluconate
- 4.6 meq/10cc
- Less sclerosing
- Kids
- Chronic
- Slow infusion
Hyperkalemia

Steps in Treating Hyper K

• Step 1: Reverse Electrical Effects
• Step 2: Drive potassium into cells
• Step 3: Remove potassium from the premises
Hyperkalemia

Step 2: Drive Potassium Into Cells

- Insulin/Glucose
- Beta Agonists
- Bicarb
Hyperkalemia

Q: How effective is bicarb in hyperkalemia?
Hyperkalemia

Q: How effective is bicarb in hyperkalemia?

A: Great, but only if the patient is acidotic
Hyperkalemia

Steps in Treating Hyper K

• Step 1: Reverse Electrical Effects
• Step 2: Drive potassium into cells
• Step 3: Remove potassium from the premises
Hyperkalemia

Step 3: Removing Potassium from the Premises

• How helpful is kayexalate?

• What are your other options?
Hyperkalemia
Hyperkalemia

Hyper K = EKG
Hyperkalemia

- Calcium = Wide QRS
- Bicarb = acidosis
- Gluc/Insulin = hypoglycemia
- Beta Agonists = Easy Win
- Volume = Selected Cases
Hypokalemia
Hypokalemia

- Decreased Intake: EtOH and malnourished
- Intracellular shift: hyperventilation or metabolic alkalosis
- Increased losses
  - Urine: Non K+, non Mg sparing diuretics; s/p vomiting
  - GI: Chronic diarrhea, laxative abuse
Hypokalemia

Five Most Common EKG Changes

• Loss of T Wave
• U Waves
• Prolonged Q-T
• Torsades, VT, VF
• Diffuse, Non-specific ST and T wave changes
Hypokalemia
Hypokalemia
Q: When is hypokalemia an emergency?
Hypokalemia

A: QTc > 500ms
Hypokalemia
Hypokalemia

Q: Severe or intractable hypokalemia should make you think?
Hypokalemia

A: Hypomagnesemia!
Hypokalemia

Q: A patient with a K of 2.9 has a total body potassium deficit of?
Hypokalemia

A: Way more than you think

[Every 0.3 under 3.5 requires 100meq of KCl]
Hypokalemia

Five Key Treatment Concepts

• Repletion takes more than you think
• 10-20 meq/hr is safe
• Use PO too
• HypoK = HypoMg
• Ouch!
Hyponatremia

• Most patients have no symptoms and are stable
• CNS or otherwise symptomatic patients require salty water
Hyponatremia
Hyponatremia

Q: How quickly can you safely raise someone’s serum sodium?
Hyponatremia

A: Correct patients at a rate of 0.5 meq/hr or less.

Never, ever, ever change the serum Na level more than 10-12 meq per day.
Hyponatremia

Hypertonic Saline

A. Indication

B. Serum sodium is usually

C. Concentration

D. What rate

E. How long
Hyponatremia

Hypertonic Saline

A. Indication: Seizure, Coma, Focal Findings
B. Serum sodium is usually: 100-110meq
C. Concentration: 3%
D. What rate: 100cc over 10min, then 100cc over 50 minutes
E. How long: one hour
Hypercalcemia

- Hypercalcemia =
- When do you use Lasix?
Hypercalcemia

Hypercalcemia = Saline
Hypercalcemia

Saline

- Inhibits proximal reabsorption
- NSS bolus until resuscitated
- Continue at 150-250 cc/hr
Hypercalcemia

Lasix

- Flimsy evidence to support efficacy
- Fluids, calcitonin, and bisphosphonates are better
- Reserve for the volume overloaded
Hypercalcemia

Mistakes

• Lasix before resuscitation

• Too Much Saline
Hypomagnesemia

HypoK = HypoMag
RECAP
Number one cause of HyperK
HyperK =
Wide QRS? Give . . .
Bicarb only if . . . .
HypoK = HypoMag
Don’t raise sodium by more than ....
Give hypertonic saline if . . .
Hypercalcemia =