



CRRT in patients with sodium disorders

Adam Romanovsky
Nephrology & Critical Care
University of Alberta
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Acute Kidney Injury and Renal Support

I have no actual or potential conflict of interest in relation to this program or presentation.

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Objectives

- Review consequences of rapid changes in serum sodium (SNa) concentration
- Understand the electrolyte composition of commercially available dialysate and replacement fluids
- Discuss different methods of limiting SNa changes during CRRT
 - CRRT efficiency
 - Alterations to dialysate & replacement fluids

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Rapid sodium correction

- Chronic hyponatremia
 - Adaptation with shift of osmolytes
 - Rapid correction can lead to the osmotic demyelination syndrome
- Hypernatremia
 - Rapid decrease in serum osmolality leads to intracellular shift of fluid
 - May result in cerebral edema

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Commercial CRRT fluids

- Sterile electrolyte solutions
 - Varying concentrations of Na, Cl, K, Mg, Ca, glucose
- Contain buffer
 - Most commonly bicarbonate
 - Acetate & lactate rarely used
- Final Na concentration typically 140 mmol/L

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Commercial CRRT fluids

- If using regional citrate anticoagulation must use a fluid with lower Na and buffer concentration
 - Citrate formulations are hypertonic
 - 225 – 420 mmol/L of Na
 - Converted to bicarbonate therefore acts as a buffer
- Caution using RCA in patients with Na disorders

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CRRT fluid Na

- Hemodialysis or hemofiltration with a fixed Na concentration of 140 mmol/L places patients with Na disorders at risk of rapid correction
- Must alter CRRT prescription to prevent complications

Alterations to CRRT prescription

- Decrease efficiency
 - Lower effluent volume
 - May be limited by acidosis or need to remove solute
- Customize dialysate/replacement fluid
 - From scratch
 - Alter commercial fluids
 - Run a separate IV infusion of hyper or hypotonic solution

CAUTION!

Which ever way you chose, the most important step is frequent monitoring and therapeutic adjustment

Hyponatremia

- Rapid correction may result in osmotic demyelination
 - Potentially fatal
 - > 8-12 mmol/L day
- May be mitigated with drop in serum urea during CRRT

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Hyponatremia - example

- Patient with cirrhosis & chronic hyponatremia (SNa 120 meq/L), now anuric requiring CRRT
 - Target initial fluid Na ~ 125
- 5L fluid bag with 140 meq/L Na
 - 700 meq Na
 - Remove 500 cc fluid (70 meq Na) and add 500 cc sterile water or D5W
 - 630 meq Na in 5L = 126 meq/L

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Hyponatremia - example

- This will also result in a decreased HCO_3 concentration
- Can be avoided by removing 750 cc from the bag
 - Replace with 750 cc of free water
 - Add 30 mmol of NaHCO_3
 - Resultant fluid will have Na concentration of 124 mmol/L and a HCO_3 of 31 mmol/L

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Hyponatremia - example

- Removing & replacing large volumes from bags is cumbersome and risks bacterial contamination
- Alternative approach
 - Prescribe 2.5 L/hr with standard fluid
 - Infuse sterile water or D5W @ 250 cc/hr and remove volume with ultrafiltration
 - Effectively 5.5 L of effluent with 700 meq of Na in 2 hours = 127 meq/L

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CAUTION!

- Common practice of adding NaHCO_3 to dialysate & replacement
 - 1 amp (50 mL) contains 50 meq of bicarbonate as well as Na
- Each amp added to a 5 L bag will increase Na concentration of ~ 8.5 meq/L

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Hypernatremia

- Rapid drop in SNa may result in cerebral edema
- Drop in urea during CRRT increases the drop in osmolality
 - Dialysis dysequilibrium
 - Increased risk of cerebral edema

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Hypernatremia - example

- Septic Shock with AKI and C. Difficile diarrhea receiving enteral tube feeds
 - Now anuric requiring CRRT
 - SNa 160 mmol/L
- Target initial dialysate/replacement fluid Na ~ 150-155 meq/L

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Hypernatremia - example

- If patient is acidemic, can add concentrated NaHCO_3
 - Increase of ~ 8.5 meq/L with each 50 mL amp
- Alternatively, can add hypertonic NaCl
 - Each 100 cc of 3% saline added to a 5 L bag increases Na by ~ 7.3 meq/L

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Ongoing management

- As SNa concentration start to correct will need to adjust dialysate & replacement fluid accordingly
- Again, frequent monitoring is crucial

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