

Hypertonic Saline for Management of Symptomatic Hyponatremia

Case Presentation

- MJ is a 56 year-old female, presents to the ED with a chief complaint of progressively worsening weakness and fatigue over the past week, associated with a loss of appetite, nausea, and occasional confusion.
 - MJ denies shortness of breath, chest or abdominal pain, cough, pain or swelling in her legs, other neurological symptoms, fever, vomiting, or diarrhea.
 - Her medical history is significant for hypothyroidism, hypercholesterolemia, and hypertension.
 - According to family, she was hospitalized for three days a few months ago due to “dehydration”, at which time she was given “fluids”.
 - While transporting MJ to the CT scanner, she has a witnessed prolonged tonic-clonic seizure
 - POC labs are unremarkable except a serum sodium of 118 mEq/L

- How would you manage this patient?
 - 3% Hypertonic Saline STAT!

Pharmacology	
	3% Hypertonic Saline (NaCl)
Dose*	<ul style="list-style-type: none"> • 2 ml/kg or 50-150 ml <ul style="list-style-type: none"> ○ Max of 3 boluses of 3% NaCl preferably over 10-30 minutes apart • Option to dose based on calculated sodium deficit
Administration*	<ul style="list-style-type: none"> • IV bolus <ul style="list-style-type: none"> ○ Recommended administration for symptomatic hyponatremia ○ Administered over 10-60 minutes ○ May be given through peripheral access while central access obtained
PK/PD	<ul style="list-style-type: none"> • Onset: Minutes • Duration: Varies based on infusion or bolus dosing
Adverse Effects	<ul style="list-style-type: none"> • Hyponatremia • Fluid or solute overload • Hypokalemia • Acidosis • Overcorrection of hyponatremia
Monitoring	<ul style="list-style-type: none"> • BMP (Na⁺, K⁺, Cl⁻) • Symptoms of hyponatremia • Serum osmolality • Volume status • Neurological Exam
Compatibility	<ul style="list-style-type: none"> • Not compatible with blood products or drugs incompatible with normal saline
Comments	<ul style="list-style-type: none"> • Critical to establish IV access with largest bore at most proximal access • During emergencies it may be acceptable to administer through peripheral IV

*Check institutional guidelines

Keys to Managing Symptomatic Hyponatremia

Indications for Emergency Treatment	<ul style="list-style-type: none"> • Confusion, agitation, coma, or seizures secondary to low serum sodium levels
Goal Na ⁺	<ul style="list-style-type: none"> • Symptoms of severe hyponatremia <ul style="list-style-type: none"> ○ Goal of 5 – 6 mEq/L increase in serum sodium in first 1 – 2 hours ○ Goal of 120 mEq/L initially followed by slower correction to approximately 130 mEq/L over the following 24-48 hours <ul style="list-style-type: none"> ▪ Initial goal serum sodium level should be lower if the baseline serum sodium is < 100 mEq/L

Pharmacologic Agent	Osmolality
<ul style="list-style-type: none"> • 3% NaCl • 7.5% NaCl • 8.4% Sodium Bicarbonate • 23.4% NaCl 	<ul style="list-style-type: none"> • 1027 mOsm/L • 2,567 mOsm/L • 2000 mOsm/L • 8011 mOsm/L

Overview of Evidence			
Author, year	Design/ sample size	Intervention & Comparison	Outcome
Dillion, 2018	Observational, N=66	3% NaCl through PIV	<ul style="list-style-type: none"> • Max rate= 50 ml/hr • Mean duration infusion= 14 hrs (IQR 4–30) • Infusion-related phlebitis= 3%
Perez 2017	Observational, N=28	3% NaCl through PIV	<ul style="list-style-type: none"> • Max rate= 50 ml/hr • Mean duration infusion= 36 hrs (range 1–124) • Infusion-related phlebitis= 3%
Jones, 2016	Observational, N=213	3% NaCl through PIV	<ul style="list-style-type: none"> • Max rate= 30 ml/hr • Mean duration infusion= 0.85 hr (IQR 0.4–1.3) • Infusion-related phlebitis= 4%
Ayus, 2015	Case Series, N=47	3% NaCl 500mL over 6 hrs via PIV	<ul style="list-style-type: none"> • ↑ serum sodium level by 1.26 mEq/L/hr • Improvement in symptoms in 97% of cases
Hew-Butler, 2015	Exercise-Induce Hyponatremia Guideline (EAH)	<p><u>Recommendation for Severe EAH</u></p> <ul style="list-style-type: none"> • “100 mL bolus of 3% NaCl, repeated twice if there is no clinical improvement (10 min intervals have been recommended)” 	
Spasovski G, 2014	European Renal Best Practice (ERBP) Hyponatremia Guidelines	<p><u>Recommendation for Severe Hyponatremia</u></p> <ul style="list-style-type: none"> • “We recommend prompt intravenous infusion of 150 mL 3% hypertonic saline or equivalent over 20 minutes. (1D)” 	
Verbalis JG, 2013	Expert Panel Recommendations for Hyponatremia	<p><u>Recommendation for Symptomatic Acute Hyponatremia</u></p> <ul style="list-style-type: none"> • “For severe symptoms, 100 mL of 3% NaCl infused IV over 10 minutes x 3 as needed.” 	

References

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