פרוטוקול למתן נתרן היפרטוני (3%) למטופל מבוגר עם היפונתרמיה

Hypertonic Sodium (3%) administration in adult patients with hyponatremia

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Background

Hyponatremia (serum sodium concentrations < 135 mmol/L=mEq/L) in most cases reflects increased extracellular water. The approach to the patient is complex and depends on the duration of hyponatremia (acute or chronic), the sodium level, andthe presence of clinical signs and symptoms.

Duration	**Acute** (<48 h)	**Chronic** (> 48 h or duration unknown)	
Laboratory severity	**Mild**: 130-134 mmol/L	**Moderate**: 120-129 mmol/L	**Severe**: < 120 mmol/L
Clinical severity	**Mild to moderate** Headache, fatigue, nausea and vomiting, confusion, muscle cramps, gait disturbances		**Severe**: Seizures, reduced consciousness to coma, respiratory arrest

A. Diagnosis:

1. Clinical Assessment:

- Obtain a detailed history (e.g., recent surgery, fluid intake, medications, symptoms).
- Evaluate clinical severity (see Table above)
- Evaluate extracellular volume (hypovolemia: blood pressure, orthostatic blood pressure, tachycardia, hypervolemia: edema, ascites or euvolemia)

2. Laboratory Assessment:

- Serum chemistry:), sodium, potassium, glucose, renal function (urea, creatinine)
- Venous blood gases including osmolality and electrolytes
- Urine: Osmolality and sodium concentration
- Consider additional tests based on clinical suspicion (e.g., cortisol, thyroid function, lipids, proteins incl. immunoglobulins).

- For excessive glucose levels, the expected sodium concentration after glucose level correction can be estimated as:

$$[Na]_{corrected} = [Na]_{measured} + 2.4 \times ([Glucose] - 100)/100$$

3. Consider brain CT in patients with neurological symptoms

B. Management:

- The urgency for the correction of hyponatremia is greatest in patients with **severe clinical signs** and symptoms, in **acute severe** hyponatremia, and in patients **with coexistent intracranial pathology**, since these patients are at risk for cerebral edema herniation, and seizures.
- Overly rapid correction of hyponatremia may lead to **osmotic demyelination syndrome (ODS)**, also called central pontine myelinolysis, with potentially irreversible and severe neurological damage
- Patients with chronic and severe hyponatremia are at the greatest risk for treatment-associated neurologic damage and require particularly careful correction, with close monitoring to avoid too rapid correction. Additional risk factors include: Hypokalemia, older age, alcoholism, malnutrition, and severe liver disease.
- **The recommended correction rate is 6-8 mmol/L during a 24 h period**
- However, in severe cases, **an increase in serum sodium concentration of 4-6 mmol/L is expected to relief neurological symptoms**.
- General measures: Address underlying causes (e.g., polydipsia, medications [e.g., thiazides, SSRI], volume status, endocrine disorders [adrenal insufficiency]).
- ***Always consult a nephrologist when considering the administration of hypertonic saline, but do not delay the administration in urgent cases.***

Treatment protocol for hypertonic saline

Acute hyponatremia

Patients with acute severe hyponatremia are at greatest risk for neurological complications from cerebral edema.

- Goal of therapy is an increase in serum sodium by 4 to 6 mEq/L over a few hours.
- Stop all other intravenous (IV) fluid infusions.
- Note: Serum sodium may decline further after presentation in patients with self-induced water intoxication.
- Monitor urine output and osmolality.

1. Symptomatic patients (*any* symptoms, irrespective of severity, e.g., headache, nausea and vomiting, confusion, tremor and movement disturbances, obtundation and coma, seizures, respiratory arrest):

- Give a 100 mL bolus of 3% hypertonic saline infused over 10 minutes.
- If symptoms persist, give up to two additional doses of 100 mL of 3% saline, each infused over 10 minutes (maximum total dose=300 mL).
- Obtain repeat measurements of serum sodium **every hour**, until serum sodium increases by 4-6 mmol/L, and continue monitoring every 2 hours after hypertonic saline is discontinued.

2. Mild symptomatic patients with sodium level <130 mmol/L

If the cause of hyponatremia has been removed, autocorrection may occur, reflected by *increasing output of dilute urine* and/or evidence that serum sodium concentration is increasing without treatment).

a. Patient *with* autocorrection:

- In such cases, monitor plasma sodium until it has increased by 4-6 mEq/L.
- If plasma sodium declines, consult with a nephrologist.

b. Patients *without* autocorrection:

- Give a 50 mL bolus of 3% hypertonic saline infused over 10 minutes
- Obtain repeat measurements of serum sodium every hour.
- If plasma sodium does not increase sufficiently, consider repeating the dose (50 mL bolus of 3% hypertonic saline infused over 10 minutes) and consult with a nephrologist.
- Monitor urine output and osmolality.

Chronic hyponatremia

Patients with severe chronic hyponatremia are at the greatest risk for neurological complications from overly rapid correction of hyponatremia (osmotic demyelination syndrome).

1. Patients with severe symptoms (e.g., reduced consciousness and coma, seizures, respiratory arrest) or intracranial pathology:

- Give a 100 mL bolus of 3% hypertonic saline infused over 10 minutes.
- If symptoms persist, give up to two additional doses of 100 mL of 3% saline, each infused over 10 minutes (maximum total dose=300 mL).
- Obtain repeat measurements of serum sodium **every hour**, until serum sodium increases by 4-6 mEq/L, and then every 2 hours.
- Consult with a nephrologist for further management.

2. Patients *without* severe symptoms or intracranial pathology

a. Serum sodium ≤ 120 mEq/L

If hyponatremia secondary to water intoxication (e.g., polydipsia):

- Do not administer hypertonic saline
- Fluid restriction, consider increasing dietary salt
- Monitor plasma sodium every 2 hours.

Otherwise, consult with a nephrologist and consider hypertonic saline

b. If serum sodium >120 mEq/L

- Do **NOT** give hypertonic saline.
- Fluid restriction and consult with a nephrologist
- In cases of overcorrection, immediately consult with a nephrologist

References:

UpToDate, “Overview of the treatment of hyponatremia in adults”

Adrogué HJ, Tucker BM, Madias NE. Diagnosis and Management of Hyponatremia: A Review. JAMA. 2022 Jul 19;328(3):280-291.