MANAGEMENT OF HYPONATREMIA IN THE ICU

Treatment depend on the severity of symptoms and rapidity of development and severity of hyponatremia.

Symptoms of hyponatremia

- **Severe:** coma, obtundation, seizures, or respiratory arrest
- **Moderate:** confusion, headache, nausea, vomiting, tremors, gait or movement disturbances.
- **Mild:** fatigue and muscle cramps.

Rapidity of development

Acute: hyponatremia that develops within 48 hours.
Chronic: hyponatremia present for longer than 48 hours or unknown duration.

Severity of hyponatremia

- **Mild:** 130 to <135 mEq/L
- **Moderate:** 129 to 120 mEq/L
- **Severe:** <120 mEq/L

TREATMENT

General measures

- Identify and reverse the cause of hyponatremia (see appendix 1)
- Fluid restriction to below the level of urine output

Na level correction treatment

Hypertonic saline 3% is recommended for treatment of moderate to severe hyponatremia (Na < 130) with moderate to severe symptoms. If indicated:

  - It should be discontinued once the daily correction goal of 4 to 6 mEq/L has been achieved.
  - If the serum sodium begins to fall again, hypertonic saline can be resumed as needed to preserve the desired increase in serum sodium for the day.

Na level overcorrection treatment

- **Preventive**
  - For patients at high risk for osmotic demyelination syndrome*, it may be safer to start dDAVP initially along with the Na 3% administration to block renal excretion of water allowing the Na to be predictably manipulated
- **Reactive**
  - dDAVP 2 µg IV every 8 hours to block renal excretion of water
  - D5% in water as needed

Additional measures

- For a patient requiring volume resuscitation, a large volume of normal saline can be used
- If volume overload occurs treat with furosemide

- Conivaptan and Tolvaptan may cause uncontrolled water excretion and over-correction of Na and are not recommended

Acute hyponatremia

- **Moderate or severe (Na <130 mEq/L) with any symptoms**
    - Hypertonic saline 3% bolus 100 ml administered over 10 or 20 minutes and repeated as needed until the desired serum Na level is achieved.
        - The goal is to increase the Na level rapidly in the first 6 h by 4 to 6 mEq/L but no more than 8 to 10 mEq/L within the first 24 hours and 8 mEq/L every 24 h thereafter until the Na level reaches 130 mEq/L.
        - Monitor Na level after each bolus and every 4-6 h over the first 24 h, and while receiving hypertonic saline.
- **Moderate or severe (Na <130 mEq/L) without symptoms**
    - Hypertonic saline 3% bolus 50 ml administered over 10 or 20 minutes and repeated as needed to prevent the serum Na from falling further.
        - Providing autocorrection due to a water diuresis is not occurring
        - Autocorrection can be suspected if the cause of hyponatremia has been reversed, urine output has increased, and the urine is diluted with osmolality <200 mOsm/kg.
    - Monitor Na level after each bolus and every 4-6 h over the first 24 h, and while receiving hypertonic saline.
- **Mild (Na 130-134 mEq/L)**
    - Usually does not produce life threatening symptoms
    - General measures without Na administration
    - Monitor Na levels

Chronic hyponatremia

- **Moderate or severe (Na <130 mEq/L) with severe symptoms**
    - Hypertonic saline 3% bolus 100 ml administered over 10 or 20 minutes and repeated as needed until the desired serum Na level is achieved.
        - The goal is to increase the Na level rapidly in the first 6 h by 4 to 6 mEq/L but no more than 8 to 10 mEq/L within the first 24 hours and 8 mEq/L every 24 h thereafter until the Na level reaches 130 mEq/L.
        - Monitor Na level after each bolus and every 4-6 h over the first 24 h, and while receiving hypertonic saline.
- **Severe (Na <120 mEq/L) without severe symptoms**
        - Hypertonic saline 3% IV continuous infusion beginning at a rate of 15 to 30 ml/h mL/kg/h, or
        - Hypertonic saline 3% 100 mL boluses every 6 h.
        - Monitor Na level after each bolus and every 4-6 h over the first 24 h with the goal to increase Na level by 4 to 6 mEq/L.
        - Some patients may also require dDAVP initially along with Na 3% to prevent overly rapid correction*.
- **Mild or moderate hyponatremia without severe symptoms**

- Usually does not produce life threatening symptoms
- General measures without Na administration
- Monitor Na levels

Hyponatremia and preexistent conditions

- **Intracranial pathology**
  - Recent intracranial hemorrhage or ischemic stroke
  - Recent traumatic brain injury
  - Recent intracranial surgery
  - Intracranial neoplasm or other space-occupying lesion
    - Hypertonic saline 3% serial boluses or titratable continuous infusions at an initial rate of 30–50 mL/h to maintain serum Na 135 to 145 mmol/L and 145-155 mmol/L if patient have intracranial hypertension.
- **Edematous patients with volume overload**
  - Heart failure, renal failure, cirrhosis
    - Hypertonic saline 3% IV continuous infusion beginning at a rate of 15 to 30 ml/h mL/kg/h plus furosemide 40 mg IV q12h and as needed.
    - Monitor Na level every 4-6 h over with the goal of achieving a 24 h increase of Na level by 4 to 6 mEq/L.
    - Discontinue IV infusion when 24 h goal is achieved and Na level >125 mEq/L.

* High risk for osmotic demyelination syndrome (ODS)

- Hypokalemia
- Alcoholism
- Malnutrition
- Advanced liver disease
- Na level ≤105 mEq/L