

HYPERNATREMIA

DEFINITION: Serum sodium concentration $[\text{Na}^+]$ greater than 145 mEq/dL.

INCIDENCE IN CRITICAL ILLNESS: 15%.

ETIOLOGY:

- **Hypovolemic hyponatremia:** Total body water deficit + lesser degree of total body sodium deficit.
 - **Renal losses** (urine $[\text{Na}^+] > 20$ mmol/L): Diuretic excess; postobstructive uropathy; intrinsic renal disease.
 - **Extrarenal losses** (urine $[\text{Na}^+] < 20$ mmol/L): Excessive sweating; burns; diarrhea, fistulas.
- **Euvolemic hyponatremia:** Decrease in total body water + normal total body sodium.
 - Urine $[\text{Na}^+]$ is variable.
 - **Renal losses:** Diabetes insipidus; hypodipsia.
 - **Extrarenal losses:** Insensible losses (respiratory; dermal).
- **Hypervolemic hyponatremia:** Increase in total body water + greater degree of increase in total body sodium.
 - Least common subtype of hyponatremia.
 - Urine $[\text{Na}^+]$ is typically > 20 mmol/L.
 - **Excessive sodium intake:** 3% NaCl; NaCl tablets; hypertonic NaHCO_3 .
 - **Primary hyperaldosteronism.**
 - **Cushing's syndrome.**
 - **Hypertonic dialysis.**

CLINICAL MANIFESTATIONS:

- **Hypovolemic hyponatremia:** Volume depletion (tachycardia, orthostatic hypotension, flat neck veins, dry mucous membranes, decreased skin turgor).
- **Euvolemic hyponatremia:** Edema is absent.
- **Hypervolemic hyponatremia:** Edema may be present.
- **Neurological manifestations:** Confusion, weakness, lethargy → seizures, coma, death.

TREATMENT:

- **Free Water Deficit = $[0.6 \times \text{Total Body Weight}] \times [(\text{Measured } [\text{Na}^+]/140) - 1]$.**
- **Half the free water deficit is replaced in the first 12-24 hours, no more rapidly than 2 mEq/L/hour. The second half of the deficit is replaced over the ensuing 48 hours.**
- **Correct hyponatremia with caution.**
- **Cerebral edema if correction occurs too quickly.**
- **Hypovolemic hyponatremia:** Treatment of the underlying cause of volume loss. **Correction of the volume deficit with isotonic fluid. Correction of the free water deficit.**
- **Euvolemic hyponatremia:** **Correction of the free water deficit.**
 - Central diabetes insipidus: **Desmopressin.**
 - Nephrogenic diabetes insipidus: **Thiazide diuretics; NSAIDs; amiloride.**
- **Hypervolemic hyponatremia:** Removal of excess sodium. **Furosemide** diuresis. **Hemodialysis** in patients with renal failure.

KEY REFERENCES:

- Palevsky PM, Bhargava R, Greenberg A. Hyponatremia in hospitalized patients. *Ann Intern Med* 1996;124:197-203.
- Snyder NA, Feigl DW, Arieff AI. Hyponatremia in elderly patients: A heterogeneous, morbid and iatrogenic entity. *Ann Intern Med* 1987;107:319-323.