

HYPERNATREMIA

(Last updated 07/24/2019; Reviewers: Pramod K. Guru, MBBS)

IMMEDIATE CONSIDERATIONS

FINDINGS

- **Signs & Symptoms**

- Due to osmotic disturbance of the neuronal cells of the brain and depend on the acuity and severity of the rise in serum sodium level
- **Acute (minutes to hours) and severe (above 150 mEq/L)**
 - Altered mental status
 - Headache
 - Disorientation
 - Drowsiness
 - Lethargy
 - Seizures
 - Coma
- **Chronic (>48 hr) and (>145 mEq/L)**
 - Lethargy
 - Muscle weakness
 - Confusion
 - Seizure
 - Coma

- **Labs**

- Serum sodium value > 145 meq/l, with serum Osmolality > 295 mosm/L

- **Predisposing Conditions**

- Unavailability of water

- Abnormality of thirst mechanism
- Difficulty in accessing water to drink for being sick
- Intubated
- Elderly or infants
- Diarrhea
- **Differential Diagnoses**
 - Ingestion or infusion of large amount of concentrated salt
 - Dialysis errors
 - Osmotic diuresis
 - Recovery from hyponatremia and use of vasopressin antagonist
 - Nephrogenic and neurologic diabetes insipidus
 - Diarrhea
 - Lactulose treatment

DIAGNOSTIC INTERVENTIONS

- **Labs**
 - Serum osmolality
 - Urine osmolality
 - Sodium
 - Potassium
 - Chloride
 - Calcium
 - BUN/Creatinine
 - Blood glucose levels
- **Monitoring**

- Monitor neurologic status
- Monitor Serum Na, K, and blood glucose frequently until sodium level below 145 mEq/L
- Water deprivation test
 - In case of undiagnosed diabetes insipidus
- **Imaging**
 - CT head to r/o acute intracranial pathology

THERAPEUTIC INTERVENTIONS

- **Management**
 - Severity of the symptoms dictates the pace of correction
- **Treat the underlying cause**
 - Fever
 - Hyperglycemia
 - Glycosuria
 - Stop lactulose and diuretics
 - Treat hypercalcemia and hypokalemia
 - Correct feeding preparation
 - **Stop and replace ongoing water losses**
 - **Severe symptomatic hypernatremia**
 - Emergent situation
 - Seizure
 - Coma
 - Intracranial bleed
 - Sinus thrombosis
 - Rapid infusion of 5% dextrose in water 3-6 ml/kg/hour or emergent hemodialysis

- Aim for the immediate resolution of clinical signs and symptoms and restoration to normonatremia over time
- Desmopressin therapy in patients with diabetes insipidus
- **Avoid excessively rapid correction**
- **Symptomatic hypernatremia**
 - Nonemergent situation
 - The aim is to slowly decrease sodium level by 0.5-1 mEq/L per hour until plasma sodium is <145 mEq/L
 - Consider to stop the ongoing water losses and replace as needed
 - Options
 - **Oral/enteral free water supplementation** preferred
 - 5% dextrose in water
 - 0.2% or 0.45% saline
 - **Excessive correction should be avoided**
 - Limit of lowering sodium level is 8-10 mEq/L per day in adults

MANAGEMENT AFTER STABILIZATION

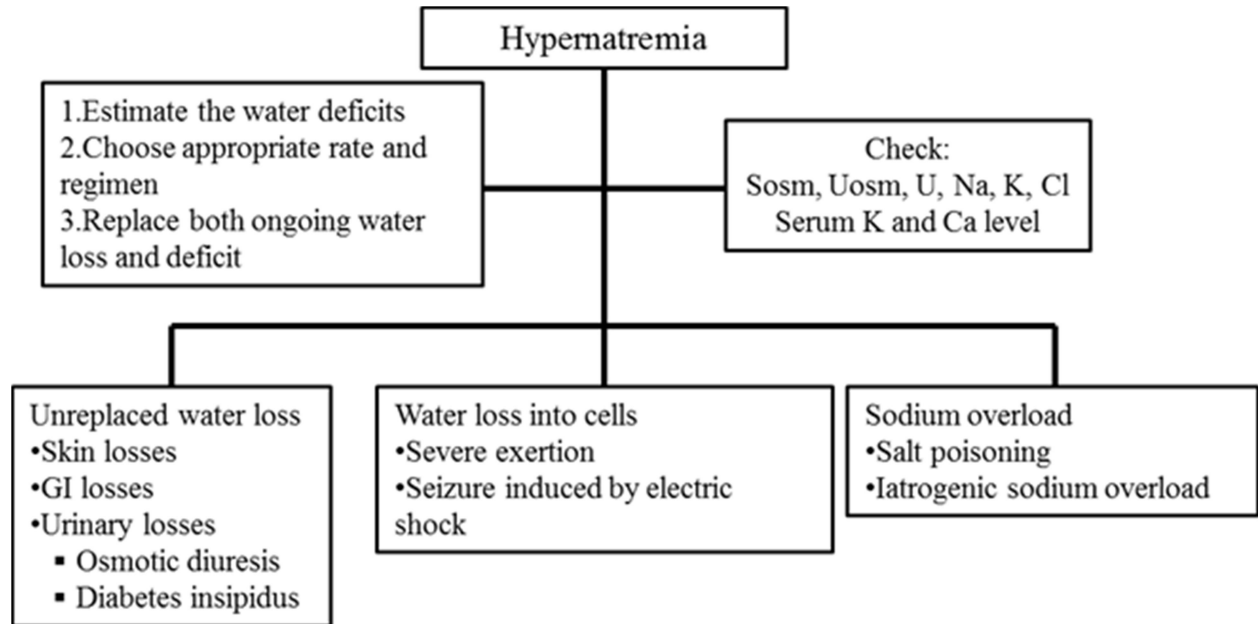
- **Follow-Up**
 - Monitor serum sodium
 - Adjust replacement according to the calculated water deficit and ongoing loss
 - Correct associated electrolyte abnormalities, particularly hypokalemia
 - Close watch on blood sugar level to avoid water losses from glycosuria/osmotic diuresis
- **Further diagnostics**
 - Investigate the underlying cause of water loss after initial stabilization
- **Further Treatment**

- Continue to replace water
- Increase access to water
- Treat diabetes insipidus
- **Manage Complications**
 - Anticonvulsants in case of seizure
 - Respiratory care

CAUTIONS

- **Complications**
 - Devastating complications mostly occur either due to severe hypernatremia itself or the mistake in the correction of the chronic hypernatremia
 - **Fatal Herniation**
 - Predominantly associated with rapid correction of chronic hypernatremia due to precipitous fall in plasma sodium level
 - Causes cerebral edema and uncal herniation similar to rapid onset hyponatremia
 - Higher risk among females, children, and underlying CNS pathology
 - **Seizure**

ALGORITHM



REFERENCES & ACKNOWLEDGEMENT

Acknowledgement: Kianoush Kashani, MD

- Adroge HJ and Madias NE: Hyponatremia. N Engl J Med 2000; 342:1493-99.
- Sterns RH: Disorders of plasma sodium- causes, consequences, and correction. N Engl J Med 2015;372:55-65.