HYPONATREMIA

(Last updated 05/25/2019; Reviewers: Pramod K. Guru, MBBS)

IMMEDIATE CONSIDERATIONS

FINDINGS

- **Signs & Symptoms**
    - Due to cerebral edema and depends on the acuity and severity of fall in serum sodium level
    - **Acute (< 125-130 mEq/L)**
        - Malaise
        - Vomiting
        - Nausea
        - Restlessness
    - **Acute (< 24 hr) and severe (< 115-120 mEq/L)**
        - Headache
        - Disorientation
        - Drowsiness
        - Lethargy
        - Seizures
        - Coma
        - Brain stem herniation
        - Respiratory depression
    - **Chronic**
        - Usually asymptomatic
        - Lethargy
        - Confusion
        - Gait disturbance

        - Muscle cramps
        - Fatigue
- **Lab Findings**
    - Serum sodium value below 135 mEq/L, with serum osmolality below 285 mosm/L
- **Predisposing Conditions**
    - Premenopausal females
    - Young children
    - Postoperative status
    - Heart failure
    - Cirrhosis
- **Differential Diagnoses**
    - Dilutional hyponatremia
    - Pseudo-hyponatremia
        - Hyperglycemia
    - Tranlocational hyponatremia
    - Hypothyroidism
    - Adrenal insufficiency

DIAGNOSTIC INTERVENTIONS

- **Labs**
    - TSH
    - Cortisol level
    - BUN/Creatinine
    - Blood glucose level
    - Serum osmolality

- Urine osmolality
- Urine sodium
- Potassium
- Chloride levels
- ABG
- Serum uric acid

- **Monitoring**
  - During every 2-4 hour for the first 12-24 hour of therapy, monitor:
    - Serum Na
    - K
    - Osmolality
    - Urine Osmolality
    - Na
  - Monitor neurologic status
    - Seizure
    - Focal deficits

- **Imaging**
  - CT head to r/o acute intracranial pathology
  - CT Chest in case of SIADH

THERAPEUTIC INTERVENTIONS

- **Management**
  - Severity of the symptoms dictates the pace of correction
  - **Treat the underlying cause,** including poor water excretion and excess ADH
    - Correction of hypovolemia
    - Glucocorticoids for adrenal insufficiency

        - Treat nausea
        - Pain
        - Stop SSRI
        - Desmopressin
        - Treatment of heart failure
    - **Severe symptomatic hyponatremia**
        - Emergent situation
            - Seizure
            - Self-intoxicated
            - Postoperative hyperacute state
        - Give hypertonic saline (100 ml bolus of 3%) and aim to increase the serum sodium by 1 to 1.5 mEq/hr until symptoms improve or use of the bolus X 3
        - Correction should be limited to less than 8-10mEq/L in the first 24 hour period and 18 mEq/L within the first 48 hours
    - **Symptomatic hyponatremia**
        - Nonemergent situation
        - Address the underlying cause
            - Usually close monitoring without active correction (beyond treatment of underlying cause) is the safest approach
        - The aim is to slowly raise the sodium level and not to exceed 8 mEq/L in a given 24-hour period
        - Options
            - Hypertonic saline + desmopressin or furosemide
            - Salt tablet
            - V_2 receptor blockers

- **Asymptomatic patients**
    - Address the underlying cause

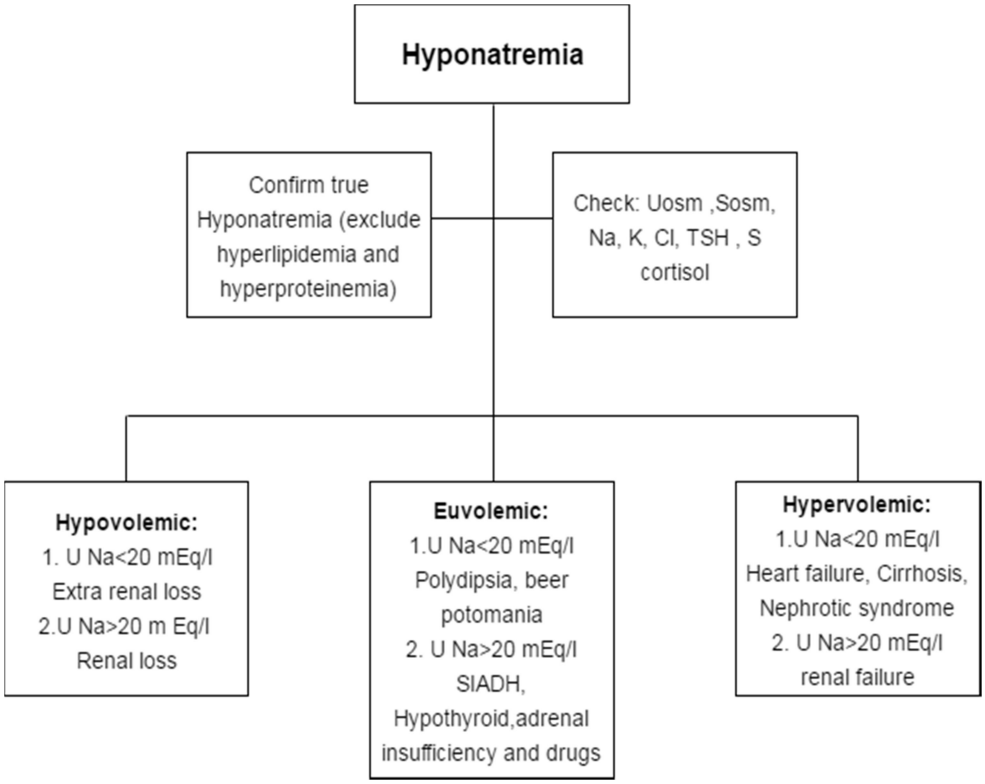
MANAGEMENT AFTER STABILIZATION

- **Follow-Up**
    - Maintain the achieved sodium goal for the rest of 24 hours after initial correction
        - With frequent monitoring of serum sodium and urine output
    - Free water restriction
    - Avoid overcorrection
    - Correct associated electrolyte abnormality, particularly hypokalemia, and count its role in correction of sodium
    - Re-lower the sodium to the desired level in case of overcorrection to minimize the risk of cerebral complication
- **Further diagnostics**
    - Investigate the cause of hyponatremia after initials stabilization
- **Further Treatment**
    - Continue to:
        - Restrict free water
        - Increase solute intake
        - Treat the cause of excess ADH secretions
- **Manage Complications**
    - Anticonvulsants in case of seizure
    - Respiratory care

CAUTIONS

- **Complications**
    - Devastating complications may occur either due to hyponatremia itself or the mistake in its managements
    - Osmotic demyelination
        - Rare but devastating complication
            - Can develop one to several days after the rapid correction of hyponatremia
            - Predominantly affects pontine and extrapontine neurons of the brain
        - Symptoms
            - Seizures
            - Pseudobulbar palsy
            - Quadriplegia
            - Death
        - Risk factors for demyelination
            - Malnutrition
            - Hepatic failure
            - Hypokalemia
    - Fatal Herniation
        - Higher risk in:
            - Females
            - Children
            - Underlying CNS pathology
    - Seizure

ALGORITHM



Adopted from: Sahay M and Sahay R: Hyponatremia: A practical approach. Indian Journal of Endocrinology and Metabolism;2014

REFERENCES & ACKNOWLEDGEMENTS

Acknowledgement**:** Kianoush Kashani, MD

- Adrogue HJ and Madias NE: Hyponatremia. NEJM 2000; 342:1581-89.
- Sahay M and Sahay R: Hyponatremia: A practical approach. Indian Journal of Endocrinology and Metabolism **DOI:**-10.4103/2230-8210.141320.