Hyponatremia in Older Adults: Diagnosis
Sangeetha Murugapandian, MD and Bijin Thajudeen, MD; Department of Medicine, University of Arizona

Prevalence
Hyponatremia, defined as serum sodium level less than 135mEq/L, is one of the most common electrolyte abnormalities seen in older adults. In one study, more than 50% of patients in acute geriatric wards were found to have hyponatremia. Chronic hyponatremia has been reported in 18% of nursing home residents.

Why is the Prevalence Increased in Older Adults?
A number of factors contribute to the high prevalence of hyponatremia in older adults (Table 1.)

What Causes Hyponatremia?
Depending on a patient’s volume status, hyponatremia is classified hypovolemic (low fluid volume status), euvolemic (normal volume status) or hypervolemic (increased volume status). Common causes of each of these forms of hyponatremia are shown in Table 3, but in older adults, the cause is often multifactorial. The algorithm (next page) and the items in Table 4 show the general approach to identifying the cause.

Why is Hyponatremia Important?
Long-standing or slowly developing chronic hyponatremia may be asymptomatic but is associated with increased osteoclastic activity leading to bone demineralization and fractures. Symptoms of acute hyponatremia vary depending on the degree of hyponatremia and rapidity with which it develops (Table 2). Those with severe acute hyponatremia can develop cerebral edema. Less severe cases are associated with confusion, functional and cognitive decline, and gait disturbances that can lead to falls. Patients with hyponatremia also have increased mortality rates and longer hospitalizations.

Table 1. Factors Contributing to the Increased Prevalence of Hyponatremia in Older Adults
- Decreased total body water content
- Decreased urinary concentrating and diluting ability
- Decreased aldosterone levels
- Higher rates of dehydration and malnutrition
- Increased levels of arginine vasopressin
- Lower sensitivity of thirst mechanisms
- Use of medications associated with hyponatremia (some common medications are listed here)
  - Thiazide diuretics
  - Selective serotonin reuptake inhibitors (SSRIs)
  - Neuroleptics (antipsychotic drugs)
  - Carbamazepine
  - Amiodarone

Table 2. Common Clinical Manifestations of Acute Hyponatremia

<table>
<thead>
<tr>
<th>Mild (Sodium Level 130-134 mEq/L)</th>
<th>Moderate (Sodium Level 125-129 mEq/L)</th>
<th>Severe (Sodium Level &lt;125 mEq/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anorexia</td>
<td>Disorientation</td>
<td>Seizures</td>
</tr>
<tr>
<td>Cramping</td>
<td>Confusion</td>
<td>Coma</td>
</tr>
<tr>
<td>Nausea</td>
<td>Weakness</td>
<td>Respiratory arrest</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Lethargy</td>
<td>Brainstem herniation</td>
</tr>
<tr>
<td>Headache</td>
<td></td>
<td>Permanent brain damage</td>
</tr>
<tr>
<td>Irritability</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Common Causes of Hyponatremia

<table>
<thead>
<tr>
<th>Hypovolemic</th>
<th>Euvolemic</th>
<th>Hypervolemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate fluid intake or replacement</td>
<td>Syndrome of inappropriate anti-diuretic hormone secretion</td>
<td>Cardiac failure</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Medications</td>
<td>Nephrotic syndrome</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Hypothyroidism</td>
<td>Chronic kidney disease</td>
</tr>
<tr>
<td>Renal salt wasting</td>
<td>Fluid loss with inappropriate salt replacement</td>
<td>Acute kidney injury</td>
</tr>
<tr>
<td>Burns, with skin loss of fluid</td>
<td>Glucocorticoid deficiency</td>
<td>Cirrhosis</td>
</tr>
<tr>
<td>Mineralocorticoid deficiency</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TIPS ABOUT HYponATREMIA IN OLDER ADULTs
- Hyponatremia, one of the most common electrolyte abnormalities in older adults, is associated with falls, cognitive decline, osteoporosis, fractures, and increased hospital stays and mortality rates. Acute changes are associated with more severe symptoms; severe acute hyponatremia can cause cerebral edema and brainstem herniation.
- Be sure to ask about whether the patient is taking medications associated with hyponatremia (see Table 1).
- Key factors determining the cause of hyponatremia are a patient’s volume status (hypovolemia, euvolemia, or hypervolemia) and measurements of serum osmolality and urine osmolality (see algorithm).
Algorithm to Determine The Cause of Hyponatremia in Older Adults

**HYPONATREMIA (Serum Na <135 mEq/L)**

Clinical Review (History, Comorbidities, Medications, Iatrogenic Interventions—Table 4)

- Serum osmolality >290 mosm/kg: Indicates hyperosmolar state, most commonly severe hyperglycemia
- Measure serum osmolality
- Serum osmolality 280-290 mosm/kg: Indicates pseudo-hyponatremia due to hyperproteinemia or hyperlipidemia
- Measure serum osmolality <280mosm/kg
- Use of hypotonic fluids, medications, surgical history, pain assessment, recent interventions (transurethral resection of prostate, use of hypertonic fluids)
- Likely causes of hyponatremia
  - Primary polydipsia
  - Beer potomania
  - Low solute intake (tea and toast diet)
- Urine osm ≤100mosm/kg
- Measure urine osmolality
- Urine osm >100mosm/kg
- Measure urine sodium
- Urine sodium ≤30meq/L
- Urine sodium >30meq/L
- Likely causes of hyponatremia
  - Gastrointestinal fluid loss
  - Fluid sequestration
  - Bowel obstruction
  - Fluid loss from burns
- Assess volume status (Table 4)
- Hypervolemia w/low effective arterial blood volume
- Hypovolemia
- Likely causes of hyponatremia
  - Heart Failure
  - Cirrhosis
  - Nephrosis
  - Low albumin
- Hypovolemia
- Likely causes of hyponatremia
  - Renal losses
  - Mineralocorticoid deficiency
  - Thiazide diuretics
  - Cerebral salt wasting
  - Osmotic diuresis
- Euvolemia
- Likely causes of hyponatremia
  - Hypothyroidism
  - Adrenal insufficiency
  - Drugs
  - Syndrome of inappropriate anti-diuretic hormone secretion
- Hypovolemia
- Likely causes of hyponatremia
  - Renal failure

**Table 4. Components of the History and Physical in Older Adults with Hyponatremia to Aid in Identifying the Cause**

<table>
<thead>
<tr>
<th>Review Hospital Records</th>
<th>Use of hypotonic fluids, medications, surgical history, pain assessment, recent interventions (transurethral resection of prostate, use of hypertonic fluids)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical History</td>
<td>Vomiting, diarrhea, heart failure, pulmonary disease, liver disease, renal failure, thyroid, neurological disorders, falls, cognitive impairment, adrenal disorders</td>
</tr>
<tr>
<td>Medication Use</td>
<td>Diuretics, SSRIs, neuroleptics (anti-psychotics), carbamazepine, and amiodarone are common causes. But, check prescribing information for all medication a patient is taking to determine potential to cause hyponatremia.</td>
</tr>
<tr>
<td>Social History</td>
<td>Living conditions, diet, alcohol</td>
</tr>
<tr>
<td>Psychiatric History</td>
<td>Abnormal water intake</td>
</tr>
<tr>
<td>Assessment of Volume Status</td>
<td>Signs of hypervolemia = peripheral edema, pulmonary rales</td>
</tr>
<tr>
<td></td>
<td>Signs of hypovolemia = orthostatic hypotension, tachycardia, dry axillae</td>
</tr>
</tbody>
</table>

**References and Resources**


**Interprofessional care improves the outcomes of older adults with complex health problems.**

Editors: Mindy Fain, MD; Jane Mahler, NP-c, MPH, PhD; and Barry D. Weiss, MD

Interprofessional Associate Editors: Tracy Carroll, PT, CHT, MPH; David Coon, PhD; Marilyn Gilbert, MS, CHES; Jeannie Lee, PharmD, BCP; Linnea Nagel, PA-C, MPAS, Marissa Mendola, PhD; Francisco Moreno, MD; Lisa O’Neill, DBH, MPH; Floribella Redondo; Laura Vitkus, BA

The University of Arizona, PO Box 245069, Tucson, AZ 85724-5069 | (520) 626-5800 | http://aging.arizona.edu

Supported by: Donald W. Reynolds Foundation, Arizona Geriatrics Workforce Enhancement Program and the University of Arizona Center on Aging

This project was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant number U1QHP28721, Arizona Geriatrics Workforce Enhancement Program. This information or content and conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS or the U.S. Government.