Clinical Case Discussion

James J. Cappola, III,M.D., FACP

Chair and Associate Professor of Internal Medicine

CUSOM

March 27, 2025

CAMPBELL UNIVERSITY | Jerry M. Wallace School of Osteopathic Medicine

A 78-year-old woman presents to the emergency department with confusion for the last two days.

She lives with her son and daughter-in-law who accompany her to the emergency department.

The patient is awake but can only state her name. She is unable to name the day, month, year or the hospital. When asked why she is here today, she states, “I don’t know”.

Her family provides the patient’s history . . .

Per her family, the patient was in her usual state of health until about two weeks ago, when she developed gradual onset fatigue and decreased appetite. She had no fever, vomiting, or diarrhea. She had no episodes of falling, focal weakness or slurred speech. The patient cannot provide any further history or review of systems.

PMH:

- HTN
- HLD
- OA
- COPD

- Hospitalized five years ago with influenza.
- No serious injuries
- No surgeries

Medications:

NKDA

- Lisinopril 20 mg po daily
- HCTZ 25 mg po daily
- Tylenol 650 mg po tid prn joint pain
- Albuterol/ipratropium MDI: 2 puffs every 8 hrs prn SOB

Social history: She is widowed and lives with her son and daughter-in-law. She is a retired secretary. She smoked for 40 years but quit five years ago. She does not drink alcohol. There is no history of drug use. She ambulates unassisted but has some difficulty climbing stairs due to knee pain. She tries to walk on a level surface around her neighborhood three times per week.

Family history:

- Mother died age 70 CVA
- Father died age 68 sepsis
- 1 brother age 72, HTN, CKD
- 1 sister age 74, HTN
- 1 son age 43, healthy
- 1 daughter age 48, healthy

ROS unobtainable due to altered mental status

On examination, the patient is a frail-appearing elderly woman in no distress but oriented only x 1. She is cooperative for the examination

Vital signs: bp 100/70 p 85 RR 12 temp 98.6F O2 sat 95% on RA

HEENT: PERRL; EOMI
Neck: full ROM, trachea midline, no thyromegaly; JVP 6 cm at 30 degrees. No carotid bruits. A 5 mm L supraclavicular lymph node, firm and nontender, is palpable

Cardiac: r/r/r without r/m/g

Lungs: fair air movement with a prolonged expiratory phase. Decreased tactile fremitus throughout. No egophony.

Abd: nondistended, active bowel sounds, nontender, no guarding or rebound, no organomegaly.

Extremities: dp pulses trace B/L;
feet warm, no edema.

Skin: Poor skin turgor. Generalized xerosis; no rashes

OMM: L1FRRSR

Neuro:	
MSE:	Oriented to person only
CNs:	II through XII intact
Motor:	Normal bulk and tone
	Strength: wrist ext, wrist flex, forearm ext, forearm flex, hip ext, hip flex, plantar flex all 5/5 B/L
Sensory:	Pain and joint position sense grossly intact
Cerebellar:	Finger to nose and heel to shin testing without dysmetria B/L
Reflexes:	biceps, triceps, patellar 1+; ankle jerks absent B/L; Babinski sign not present B/L
Gait:	Not tested

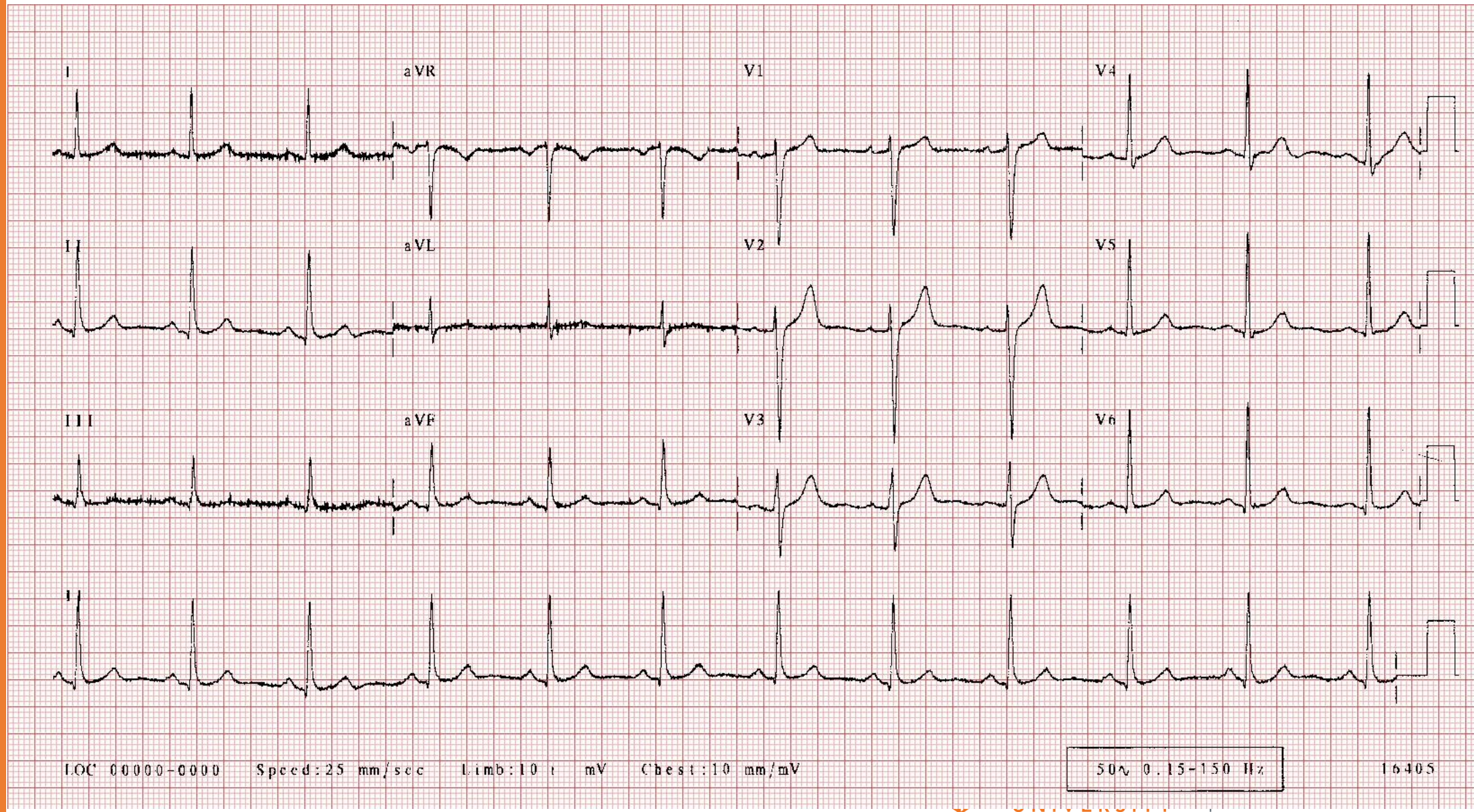
Now what???

Laboratory value	Patient value	Normal value
WBC	5,900	4,500 to 11,000
Hgb	11.3	11.6 to 15 g/dL
Hct	34	36 to 48%
Platelet	176	150,000 to 450,000/mm3

Patient work up

Laboratory value	Patient value	Normal value
Sodium	119	136-145 mEQ/L
Potassium	3.2	3.5-5.0 mEq/L
Chloride	96	98-106 mEq/L
CO2	20	23-28 mEq/L
BUN	10	8-20 mg/dL
Creatinine	1.2	0.7-1.3 mg/dL
Glucose	81	70-100 mg/dL
Calcium	9.3	9-10.5 mg/dl
AST	24	0-35 U/L
ALT	30	0-35 U/L
Albumin	4.1	3.5-5.5 g/dL
Alkaline phosphatase	88	36-92 U/L

A head CT shows mild cortical atropy and mild chronic ischemic white matter changes but no acute findings.


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
LOC 00000-0000
Speed:25 mm/sec
Limb:10 mV
Chest:10 mm/mV
50∿ 0.15-150 Hz
16405

Now what???

"Most" (not all) Hyponatremia

Hypovolemic

- True volume depletion
- Adrenal failure
- Low "effective" intravascular volume:
  - Decompensated heart failure with decreased kidney perfusion
  - Cirrhosis with decreased vascular resistance

Euvolemic

- SIADH
- Pseudohyponatremia from elevated glucose, triglycerides, protein
- Inability to excrete a dilute urine due to inadequate solute intake (ie. "Beer Potomania")
- Hypothyroidism

Hypervolemic

- Psychogenic polydipsia
- Iatrogenic from hypotonic IVFs

So evaluating the cause of hyponatremia always starts with determining a patient's volume status:

- Orthostatic bp readings: 10 to 20 mm Hg drop in systolic bp and/or a greater than 15 bpm rise in HR from lying to sitting to standing

- Skin turgor
- Mucous membranes
- Findings of decompensated CHF: (increased JVP, S3, crackles, edema)
- Findings of decompensated cirrhosis (ascites, edema, spider angiomata, portacaval anastomoses)
- Evidence for acute blood loss (ex: trauma, GI bleed)

Our patient's orthostatics:

Lying:	bp 110/80	p 82
Sitting:	bp 105/75	p 88
Standing:	bp 90/70	p 95

She is orthostatic which fits with her recent poor oral intake over the last two weeks plus her diuretic therapy.

She is admitted to the medical surgical floor.

Her bp medications are stopped and she is slowly hydrated with normal saline at 100 ml/hr overnight. Serum sodium levels are checked every four hours.

Note: If HCTZ is implicated in hyponatremia, it should be stopped permanently. **Hyponatremia from HCTZ may persist more than one week.**

Why serum sodium check every four hours???

To ensure a safe level of sodium correction, not to exceed 8 to 12 meQ/L in 24 hours or 0.5 mEq/L per hour to **avoid central pontine myelinolysis**

Central pontine myelinolysis/ osmotic demyelination syndrome:

- Two to six days after overly rapid correction of hyponatremia
- Dysarthria
- Dysphagia
- Paraparesis
- Quadriparesis
- Behavioral disturbance
- Lethargy
- Confusion
- Disorientation
- Obtundation
- Coma

https://hkuelcn.hku.hk/category/neurology-and-neurosurgery/neuro-imaging/others-radiographs/

Risk of death or often irreversible functional impairment 40%

Sterns, R UpToDate 2023

The patient is slowly hydrated overnight. The next morning, she feels a little better and is more conversant. Her vital signs are stable. She is no longer orthostatic. She has no evidence of fluid overload.

Her serum sodium has corrected from 119 to 124 over the last 24 hours 5 mEq/L or 0.2 meQ/L/hour.

On hospital day 3, she is clinically euvolemic and is starting to eat and drink a little.

Between hospital day 2 and 3, her serum sodium has remained at 124 mEq/L.

Now what????

"Most" (not all) Hyponatremia

Hypovolemic

- True volume depletion
- Adrenal failure
- Low "effective" intravascular volume:
  - Decompensated heart failure with decreased kidney perfusion
  - Cirrhosis with decreased vascular resistance

8 am cortisol 10 mcg/dl

To definitively rule out adrenal failure, cosyntropin stimulation test

Euvolemic

- SIADH
- Pseudohyponatremia from elevated glucose, triglycerides, protein
- Inability to excrete a dilute urine due to inadequate solute intake (ie. "Beer Potomania")
- Hypothyroidism

TSH 1.2 (normal)

Hypervolemic

- Psychogenic polydipsia
- Iatrogenic from hypotonic IVFs

Work up for SIADH: **urine studies OFF all diuretics**

Urine Na usually > 40 mEq/L

Urine Osmolality usually > 300 mOsm/kg

Our patient:

Urine Na 62 mEq/L

Urine Osmolality 410 mOSm/kg

SIADH

Syndrome of Inappropriate ADH (SIADH): Treatment

- Fluid restriction. Insensible fluid loss is about 1500 ml/day. Therefore, restrict to 1000 to 1200 ml/day (all fluid combined)
- Low-dose furosemide (ex: 20 mg po bid) to excrete a dilute urine
- “-vaptan” therapy (ADH antagonist—nephrologist-restricted

Sterns, R UpToDate 2023

Syndrome of Inappropriate ADH (SIADH): ddx

- CNS process (CVA, tumor)
- Malignancy (small cell lung
- cancer)
- Medications
- Pulmonary process (pneumonia)
- Surgery
- Hypothyroidism
- HIV infection
- Pain
- Nausea

Sterns, R UpToDate 2023

Sterns, R UpToDate 2023

A CXR is done to follow up her palpable L supraclavicular lymph node . . .

A lung tumor is found.

Our patient is placed on a 1200 ml fluid restriction daily.

On hospital day 4, her serum sodium increases to 125 mEq/L. She feels about the same.

On hospital day 5, her fluid restriction is continued and she is started on furosemide 20 mg po bid.

On hospital day 6, her serum sodium increases to 127.

On hospital day 7, her serum sodium increases to 130.

She continues to feel better with an improve appetite. She works with physical therapy. Your team discusses your suspicion of lung cancer with her and pulmonology and heme/onc are consulted to see her.

Osteopathic considerations: SIADH

- L1FRRSR → Treat with muscle energy or facilitated positional release
- Rib raising T10 to L2 → Optimize blood flow to kidneys to aid diuresis
- Myofascial release of the thoracic inlet → Improve lymphatic return
- Dome the diaphragm → Improve lymphatic return
- Pedal pump → Improve lymphatic return

On hospital day 8, her sodium increases to 133 and she feels ready to go home. She is discharged to home with her family.

She is prescribed furosemide 20 mg po bid at discharge and a moderate fluid restriction of 1200 ml/day.

She is declared “allergic” to HCTZ and it is added to her allergy list with an intolerance of “hyponatremia”

An outpatient bronchoscopy with lung biopsy is schedule the following week.

Questions?

Thank you!