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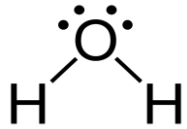

Water Intoxication:

Psychiatric Management of Polydipsia

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Learning Objectives

- **LO1**: Review the epidemiology and pathophysiology of primary polydipsia
- **LO2**: Differentiate clinical manifestations of psychogenic polydipsia from other causes with similar symptoms
- **LO3**: Identify various treatment modalities for psychogenic polydipsia

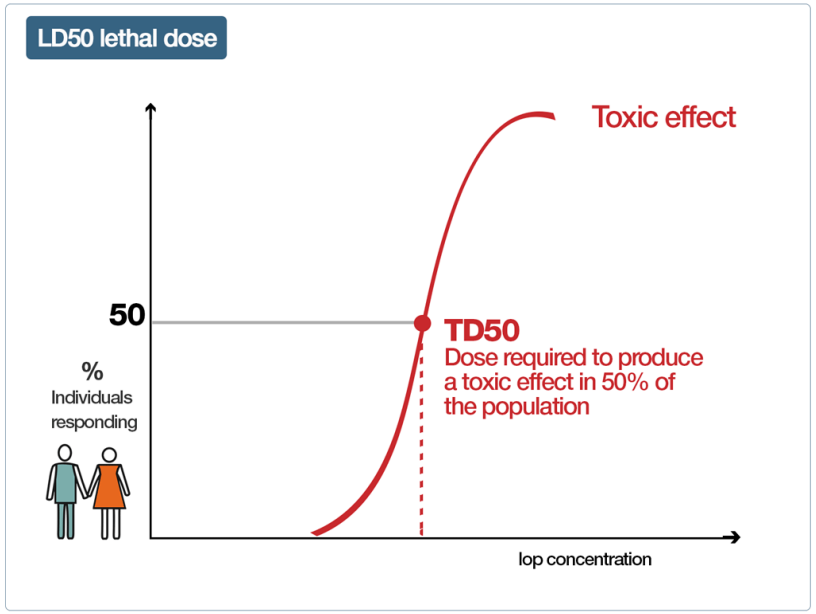
Outline

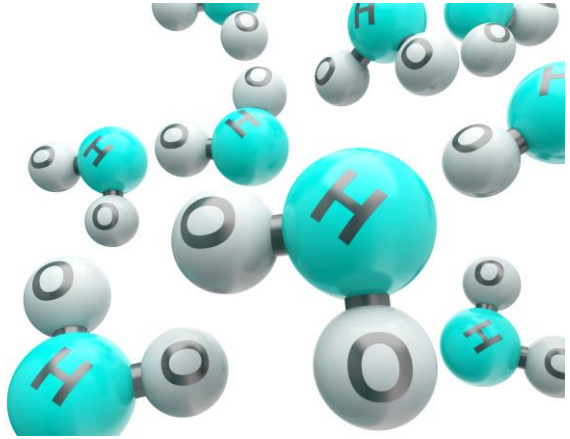
- Epidemiology
- Symptoms
- Pathogenesis
- Dx / DDx
- Tx
- Conclusions

Water, water, everywhere, but not a drop to drink

Dose determines toxicity

Paracelsus (b 1493 Switzerland; d 1541 Austria)





In the news...

MODULE SA
210
211
214
111
114

Primary polydipsia

- Psychogenic polydipsia
- Increase in thirst / water-seeking behaviors
- Polyuria: >3L /day

- National Academies of Sciences, Engineering, and Medicine
  - Men: 3.5L (15.5 cups) H20/ day
  - Women: 2.5L (11.5 cups) H20/ day
  - Modifying factors

PPD: Epidemiology

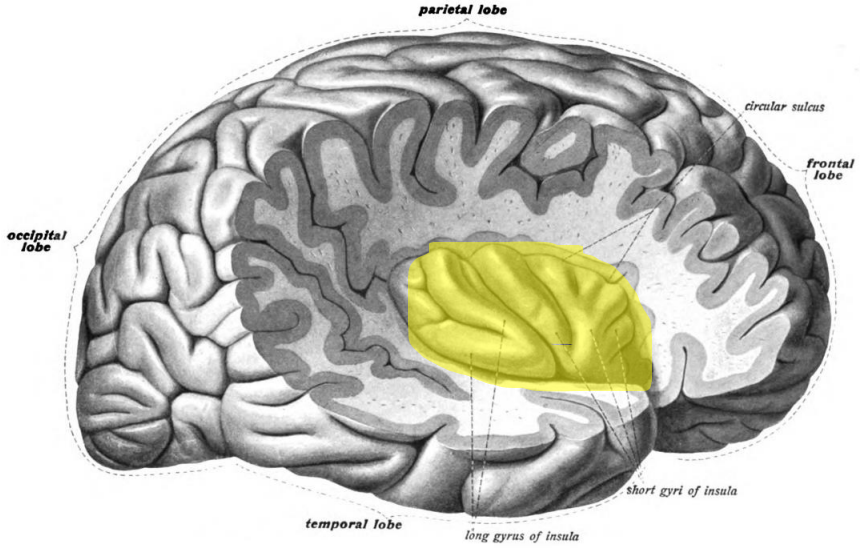
- Most often seen in psychiatric illnesses
  - 6%-18% of psychiatric inpatients

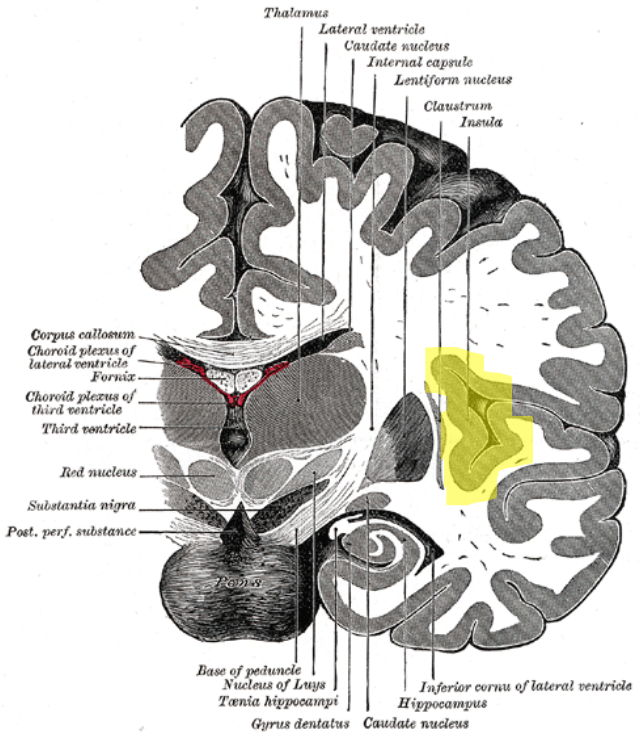
- 80% of pts with PPD have schizophrenia
  - ASD, IDD, middle-aged women

- Up to 20% schizophrenic pts with PPD
  - 20% develop hypoNa
  - 5% develop serious complications
  - Px: increased morbidity, mortality

PPD: Neuroimaging

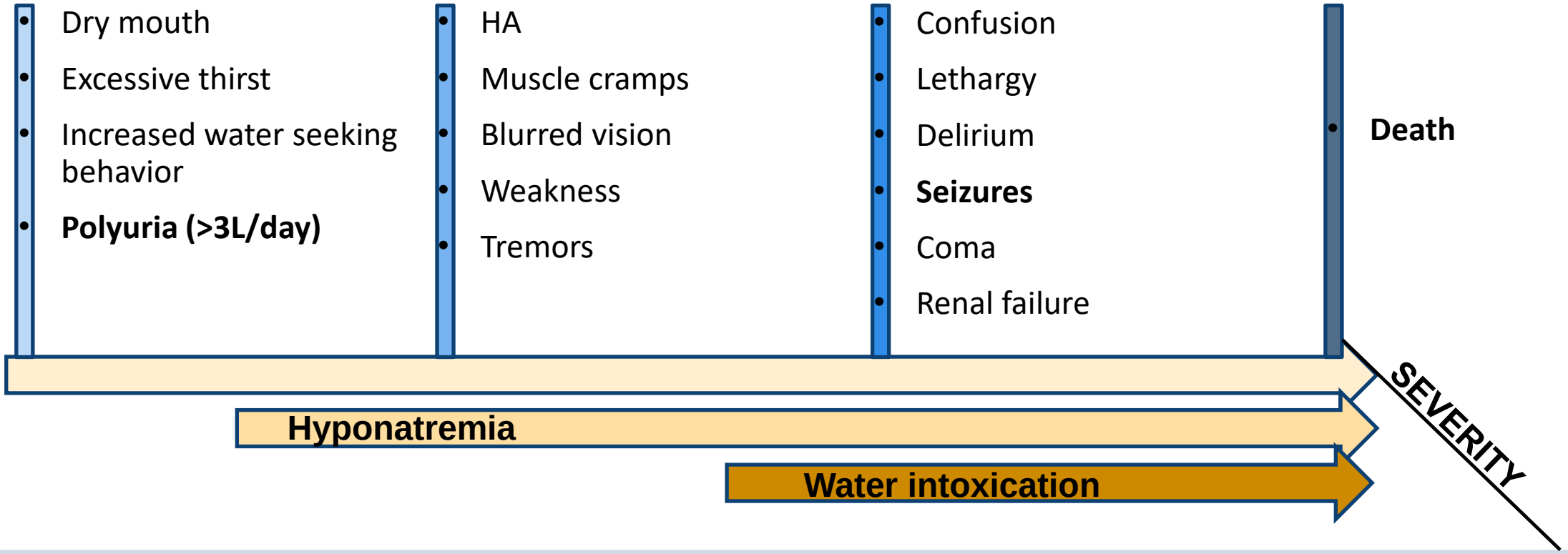
- Volume reduction
  - Rt posterior lobe
  - Rt inferior temporal gyrus
  - **Hippocamus**
  - **Insular cortex**





- Cause and effect?
  - Dysfunction of thirst mechanism
  - Involvement of hippocampus
  - Stress-reducing behaviors

PPD: Symptoms



Normal homeostasis

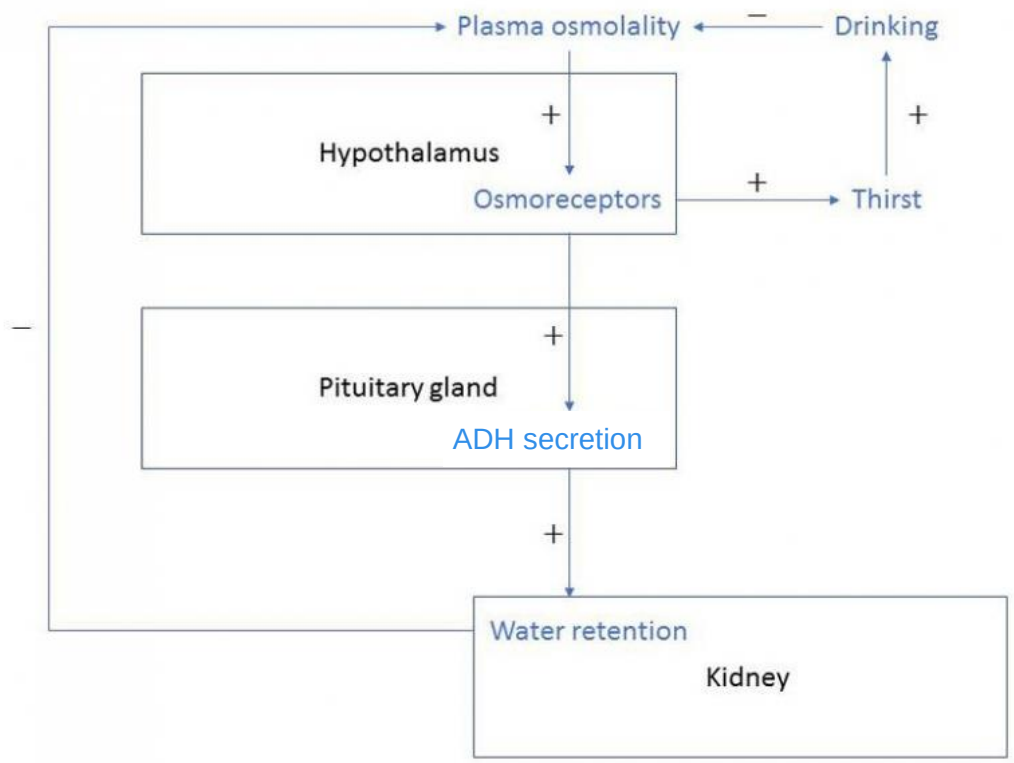


Fig. 1:
ADH feedback loop responding to increased plasma osmolality

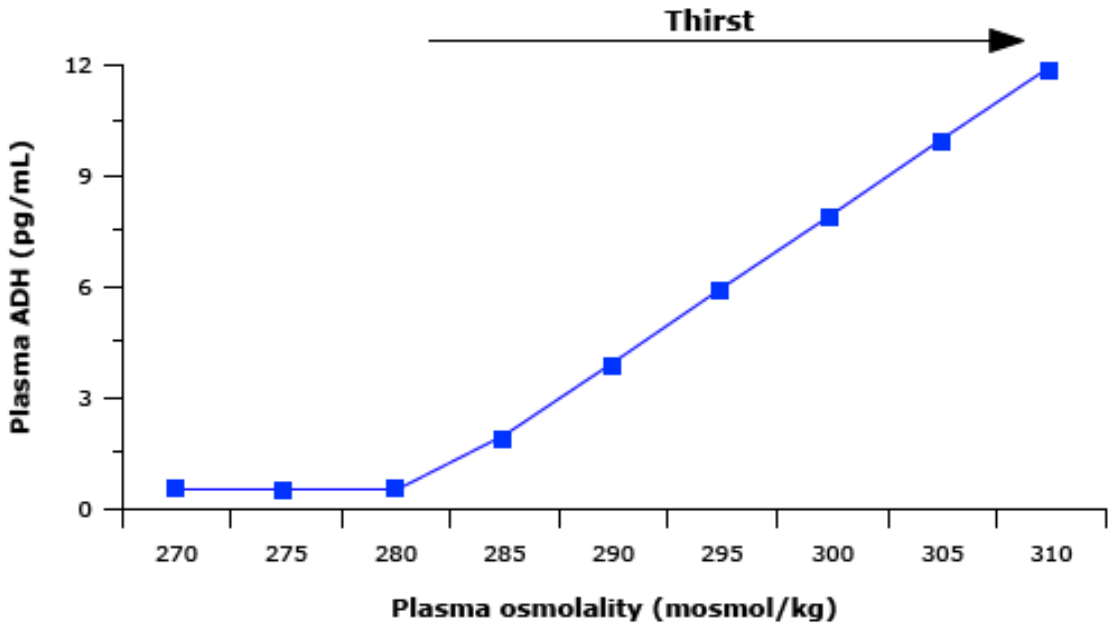


Fig. 2:
Osmotic regulation of ADH release and thirst

Hypotonic hyponatremia

- [Na] < 135mEq/L

  130 to 134 mEq/L = mild
  120 to 129 mEq/L = moderate
  <120 mEq/L = severe

- Chronic hypoNa in PPD
  - 'Asymptomatic'
    - ADH regulation + kidney function intact

Water intoxication

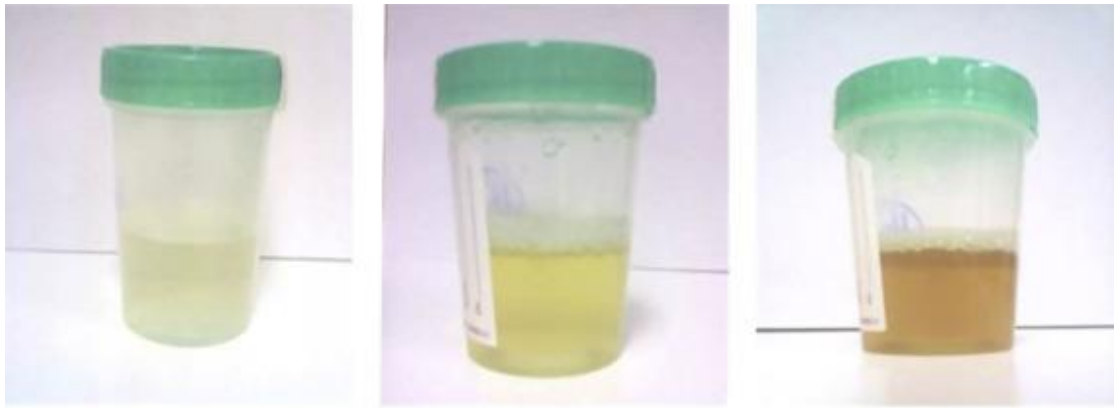
- Acute
  - 'Water poisoning', 'water toxemia'

- Pathophysiology:
  - Osmotic intracellular shift --> cellular swelling
  - ICP increased: first observable symptoms
  - Respiratory distress, abnl VS
  - Cerebral edema, CNS dysfunction
  - Seizures, brain damage, death

Water intoxication

- Nl ADH-mediated kidney function:
  - Up to 400-600ml urine excreted/ hr
  - Maximally dilute urine to between 40-100mosml/kg

- Symptomatic hypoNa can be induced with an acute 3-4L water load
  - Non- PPD examples
    - (un)intentional OD
  - PPD with acute psychosis



USG = 1.004
Uosm = 105
Ucolor = 5

USG = 1.016
Uosm = 522
Ucolor = 4

USG = 1.035
Uosm = 1257
Ucolor = 7

Water intoxication

- Psychotic pts have altered H20 metabolism
  - Transient stimulation of ADH --> SIADH
  - Increase in net renal response to ADH
  - Iatrogenic drug adverse effects
    - Increase ADH effect: AP, AD, AED, Li
    - Xerostomia

- **Hospital referral**
  - Na <120 mEq/L
  - Severe symptoms

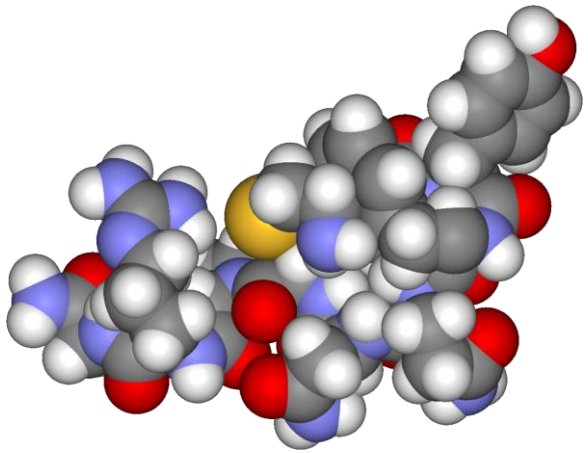
Primary Polydipsia: DDx

PPD DDx

- **Polyuria + Nl Na**
  - Distinguish between osmotic vs water diuresis
    - 24hr urine volume collection

  - Osmotic (solute) diuresis
    - Uosm >600 osmol/kg
      - Glucosuria

  - Water diuresis
    - Uosm <300 osmol/kg
      - **PPD** vs. central or nephrogenic DI
      - H20 restriction +/- desmopressin challenge



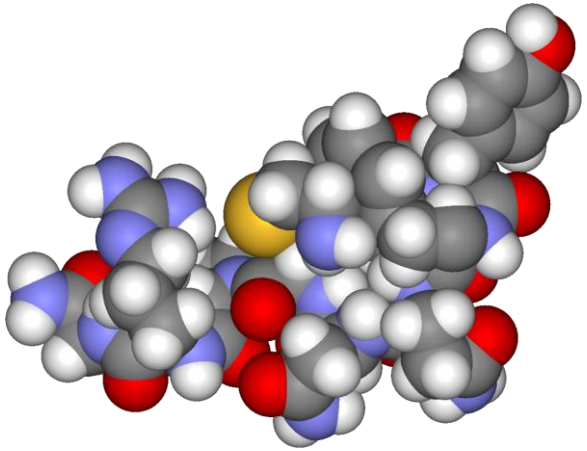
Spacefilling model of ADH

PPD DDx

- Hyponatremia [Na] < 135mEq/L:
  - SIADH
    - CNS disturbances
    - Malignancies
    - Drugs

Testing:

CMP
Uosm
Urine Na
CBC



Spacefilling model of ADH

Psychotropics and SIADH

- Mood stabilizers
  - Carbamazepine, oxcarbazepine, VPA, lamotrigine
  - 5% -40% incidence rate

- AD
  - SSRIs, SNRIs, TCAs
  - Serotonin effects 5-HT2/ 5-HT1C increase ADH

- AP
  - Haloperidol, thioridazine vs. SGA

PPD vs SIADH

Disease	Signs/symptoms	Lab values/notes
Hyponatremia from polydipsia	Lethargy Confusion Seizures Ataxia	Serum osmolality: <280 mOsm/kg Urine osmolality: <100 mOsm/kg Urine sodium: ≤20 mmol/L Serum sodium: <135 mmol/L
SIADH	Lethargy Confusion Seizures Ataxia	Serum osmolality: <280 mOsm/kg Urine sodium: >40 mmol/L Patient is receiving a medication that can cause SIADH (antidepressants, antipsychotics, mood stabilizers)

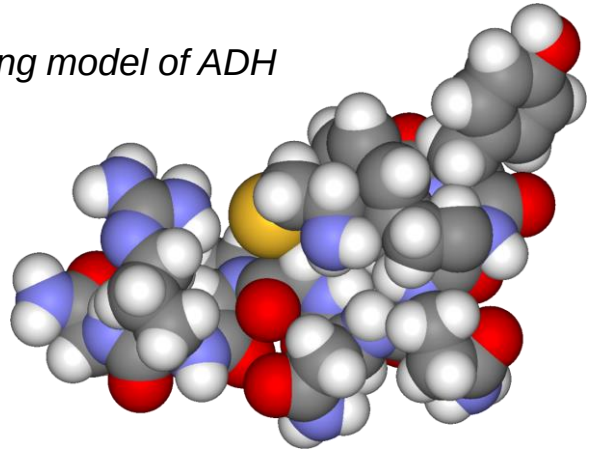
Diagnosis of SIADH vs psychogenic polydipsia

PPD DDx

- Polyuria + nl Na:
  - Osmotic diuresis
    - Glucosuria
  - Water diuresis
    - **PPD**
    - Central DI
    - Nephrogenic DI

- Hyponatremia:
  - SIADH
    - CNS disturbances
    - Malignancies
    - Drugs

Spacefilling model of ADH



Testing:

CMP
Uosm
Urine Na
CBC

PPD Management

General strategies for the psychiatrist

- Develop rapport/ psychoeducate
- Inquire about underlying psychiatric symptoms
- Review psychotropic medications
- Consult with medical service
- Referral to a higher level of care
- Encourage communication amongst treatment/ custodial team members

Inpatient units/ infirmary-level care

- Restrict fluids
  - 2-3L day + 'token economy'
- Monitor adherence
  - Twice daily wt check
  - Check Na levels frequently

- Communication and collaboration!

Literature review

- Limited evidence indicating efficacy in decreasing polydiptic behavior
  - Clozaril
  - Phenytoin
  - Bupropion
  - Inderal
  - Demeclocyline

Conclusions

Learning objectives revisited

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Questions?

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