HYPONATREMIA

- DR.AKIF A.B

Na (sodium)	135 – 145
K (potassium)	3.5 – 5.0
Ca (calcium)	9 – 11
Mg (magnesium)	1.8 – 3
Cl (chloride)	96 – 106
P (phosphorus)	3.0 – 4.5

A common understanding is that deficiency should be treated with Supplementation.

e.g : hypokalemia is treated with Potassium supplementation

Hyponatremia = sodium deficit

So salt supplementation is required in all

Wrong concept

Hyponatremia usually means water overload but not sodium deficit

Hyponatremia can occur with normal, high or low body sodium.

Hyponatremia

Usually means

Water retention

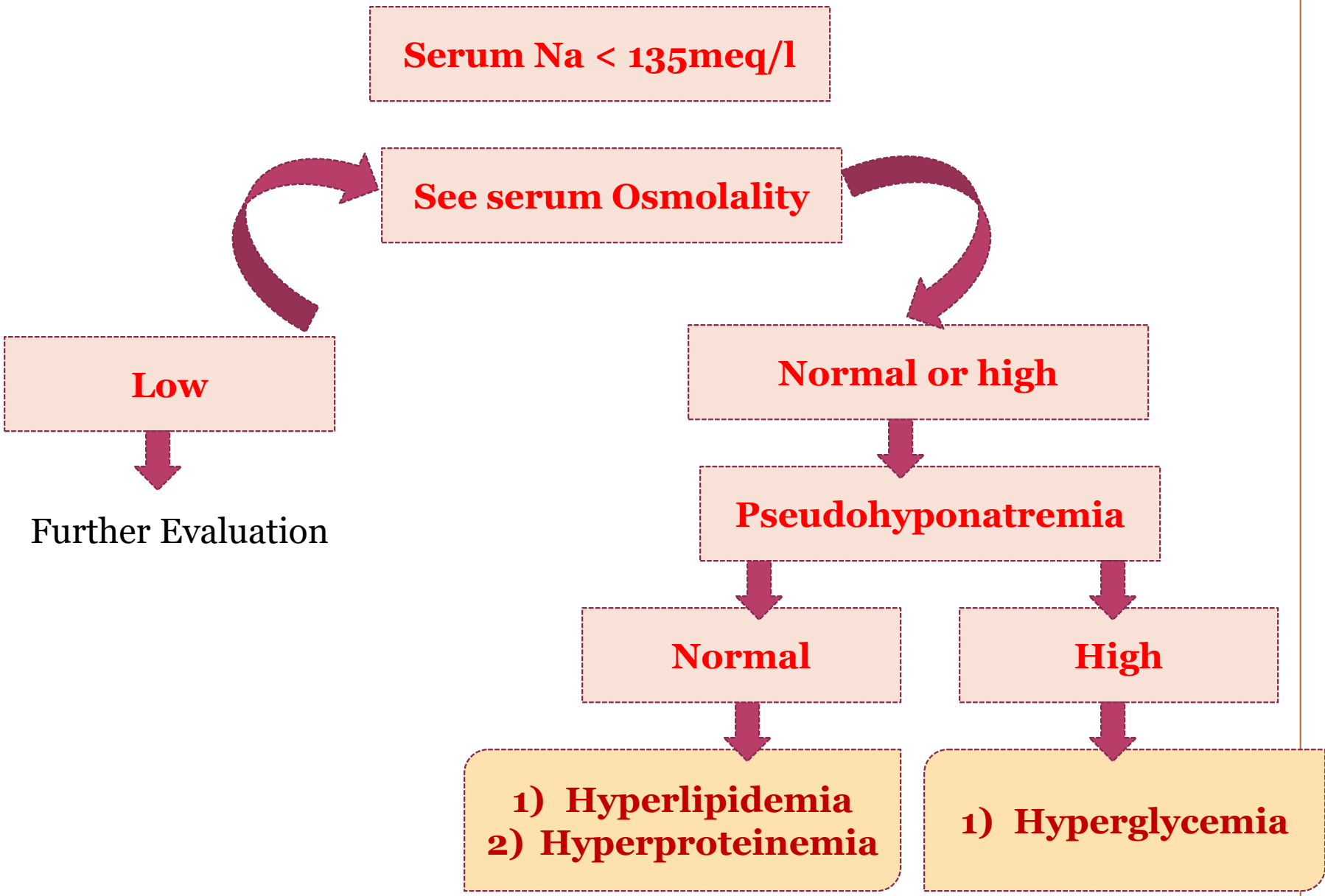
Serum Osmolality

$$2Na\ (mEq/L) + 2K\ (mEq/L) + \frac{glucose\ (mg/dL)}{18} + \frac{BUN\ (mg/dL)}{2.8}$$

that is,

$$2(Na + K) + \frac{BUN}{2.8} + \frac{glucose}{18}$$

So if sodium decreases, serum osmolality should also decrease


Serum Na < 135meq/l
See serum Osmolality
Low
Further Evaluation
Normal or high
Pseudohyponatremia
Normal
High
1) Hyperlipidemia
2) Hyperproteinemia
1) Hyperglycemia

True hyponatremia

Assess volume status

Hyponatremia with ECF volume depletion

Patient dehydrated

Reduction in total body sodium exceeds reduction in Total body water

Hyponatremia with ECF volume depletion

Renal losses

1) Excess diuretics
2) Cerebral salt wasting Sx
3) Salt losing nephropathy
4) Diabetic ketoacidosis

Urine Na > 20

Extra- Renal losses

-Vomitings

-Diarrhoea

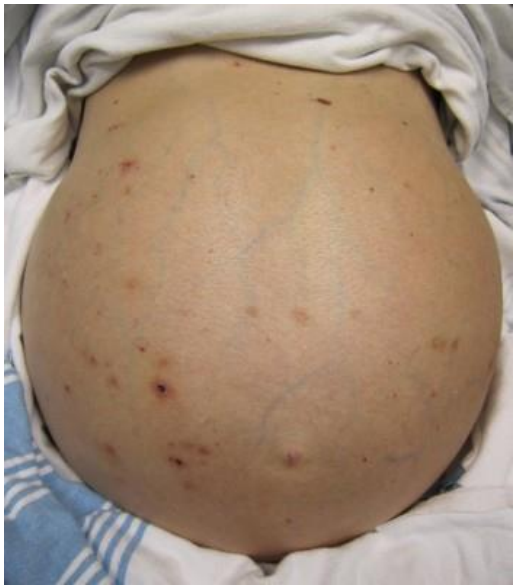
-Peritonitis

Urine Na <20

Hyponatremia with Increase ECF volume

-Patient edematous

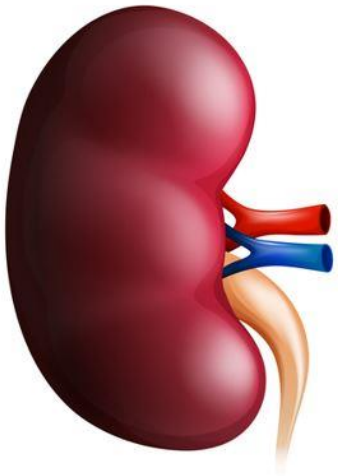
-Increase in total body water is more than total body sodium



Hyponatremia with Increase ECF volume

Urine Na > 20

Renal failure



Urine Na <20

Heart failure

Cirrhosis

Nephrotic Sx

Hyponatremia with Normal ECF volume

Urine Na > 20

SIADH

Psychogenic Polydipsia

Hypothyroisism

Cortisol deficiency

Stress

Post operative Pain

CLINICAL FEATURES

Plasma concentration (mEq/L)	Signs/symptoms
130-135	Asymptomatic
125-130	Nausea and malaise
115-120	Headache, lethargy, disorientation
Severe and rapidly developing	Seizure, coma, permanent brain damage, respiratory arrest, brainstem herniation, and death

Why Hyponatremia mainly causes Neurogenic Symptoms ??

Hyponatremia

↓

Decreases ECF osmolality

↓

So water moves from ECF to ICF

↓

So cell swells

↓

And since skull is a closed space,
Increase in cell size increases intracranial pressure

↓

Increase intracranial pressure decreases Cerebral blood flow

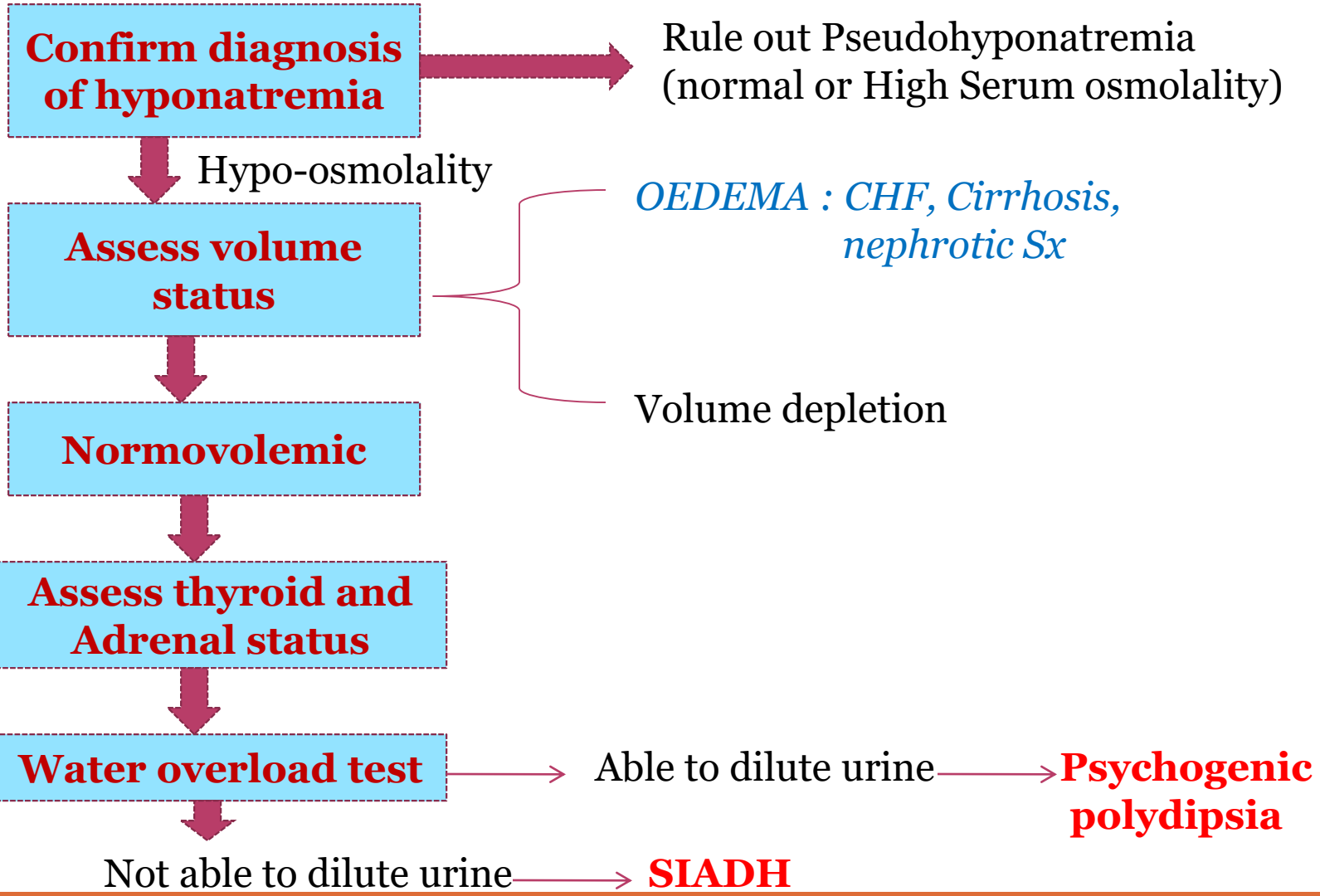
↓

Leads to hypoxic brain damage

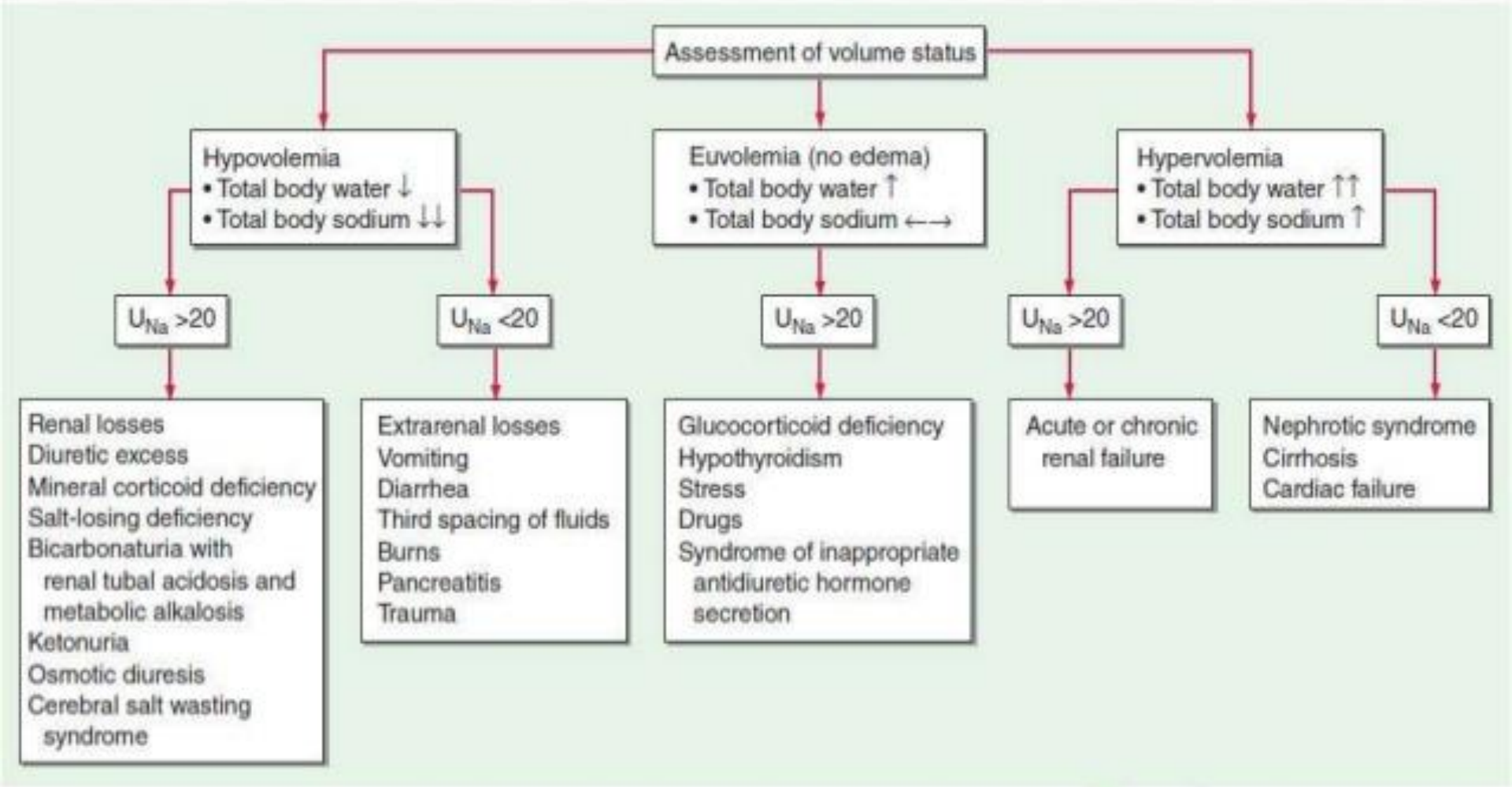
↓

Thus Neurological symptoms

APPROACH TO A PATIENT WITH HYPONATREMIA



Approach to hyponatremia



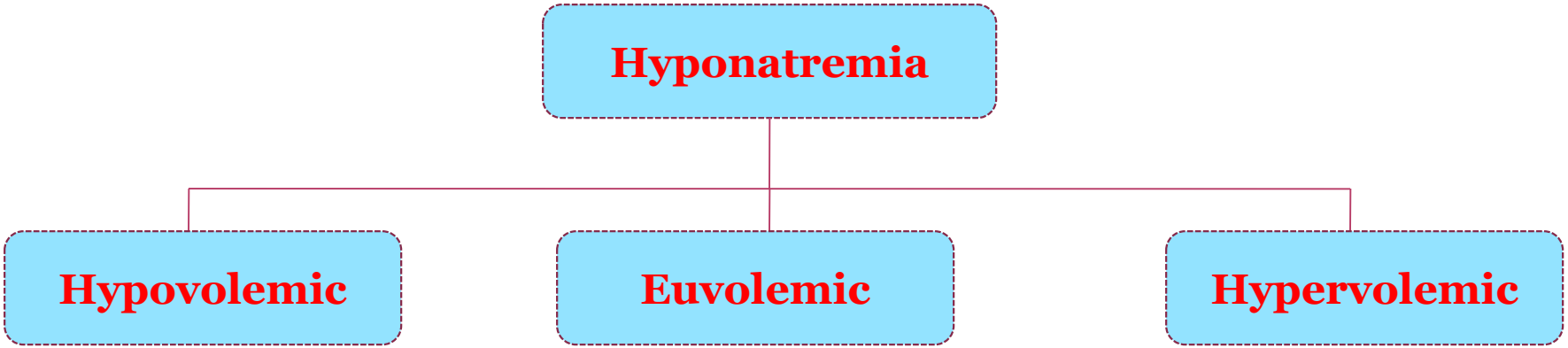
TREATMENT OF HYPONATREMIA

DICTUM

Hyponatremia which develops quickly should be treated fast.

Hyponatremia which develops slowly should be treated slowly.

BASIC TREATMENT RULE



- Thiazide diuretics causes maximum hyponatremia among Diuretics.


WHY DID YOU DRINK A WHOLE PITCHER OF WATER? YOU'RE NOT SUPPOSED TO HAVE ALL THAT WATER!
YOU'RE ON FLUID RESTRICTIONS!

SPECIFIC TREATMENT

1) Removal of Drugs causing Hyponatremia

2) Management of physical stress and postoperative pain

3) Treatment of

hypothyroidism
CHF
Adrenal insufficiency
nephrotic Sx
Uncontrolled diabetes

1) Thiazide diuretics

2) Chlorpropamide

3) NSAIDs

4) Cyclophosphomide

5) SSRIs

To treat or Not Treat ??

-Rapid correction of hyponatremia can lead to **Central Pontine Myelinosis**

-Severe hyponatremia < 115meq/l can lead to severe irreversible neurological damage

-So decision has to be taken carefully whether to treat or not based on symptoms.

Rapid Treatment indicated in :

1) Acute <48hrs symptomatic
2) Severe hyponatremia <115meq/l

Rapid Treatment should be stopped once:

1) Patient is Asymptomatic
2) Serum Na reaches 120-125meq/l

CENTRAL PONTINE MYELINOSIS

-It is a severe neurological disorder characterised by

Dysphasia

dysarthria

coma

flaccid paresis

MRI is the investigation of Choice

Rate of Na correction Recommended is

0.5meq/l per hour

or

10-12meq/l per day

Fluid preferred for Treatment is

0.9% NS – Fluid of choice

3%NS – used in cases where Rapid correction is recommended

References:

1) harrison's 19th edition

2) Fluid therapy by Dr. Sanjay Pandya


Thank
you

Case 1

- A 60-year-old man is admitted to hospital with severe septic shock from pneumonia.
- He receives vasopressor therapy for hypotension.
- During the first 10 days of his stay he receives many litres of intravenous fluids, mainly normal saline (0.9%), and has received 10 L in excess of urine volume excretion.
- On day 5, he develops acute kidney injury with oliguria and his serum sodium concentration is 132 mmol/L.
- By day 20, his blood pressure and sepsis have improved, as has his renal function.
- His urine output has progressively increased, urine sodium level is 37 mmol/L, urine potassium level is 42 mmol/L, and urine osmolality is 410 mmol/kg.
- His serum sodium concentration rises over the next 4 days to 154 mmol/L.
- At this time, he is no longer receiving intravenous fluids and weighs 8 kg more than when he presented to hospital.

Case 2

- An 85-year-old female nursing home resident
- History of dementia presents to hospital with fever
- On admission
  - blood pressure is 85/55 mmHg
  - serum sodium concentration is 174 mmol/L
  - urine osmolality is 645 mmol/kg,
  - serum urea is 122 mg/dL and serum creatinine is 1.1 mg/dL