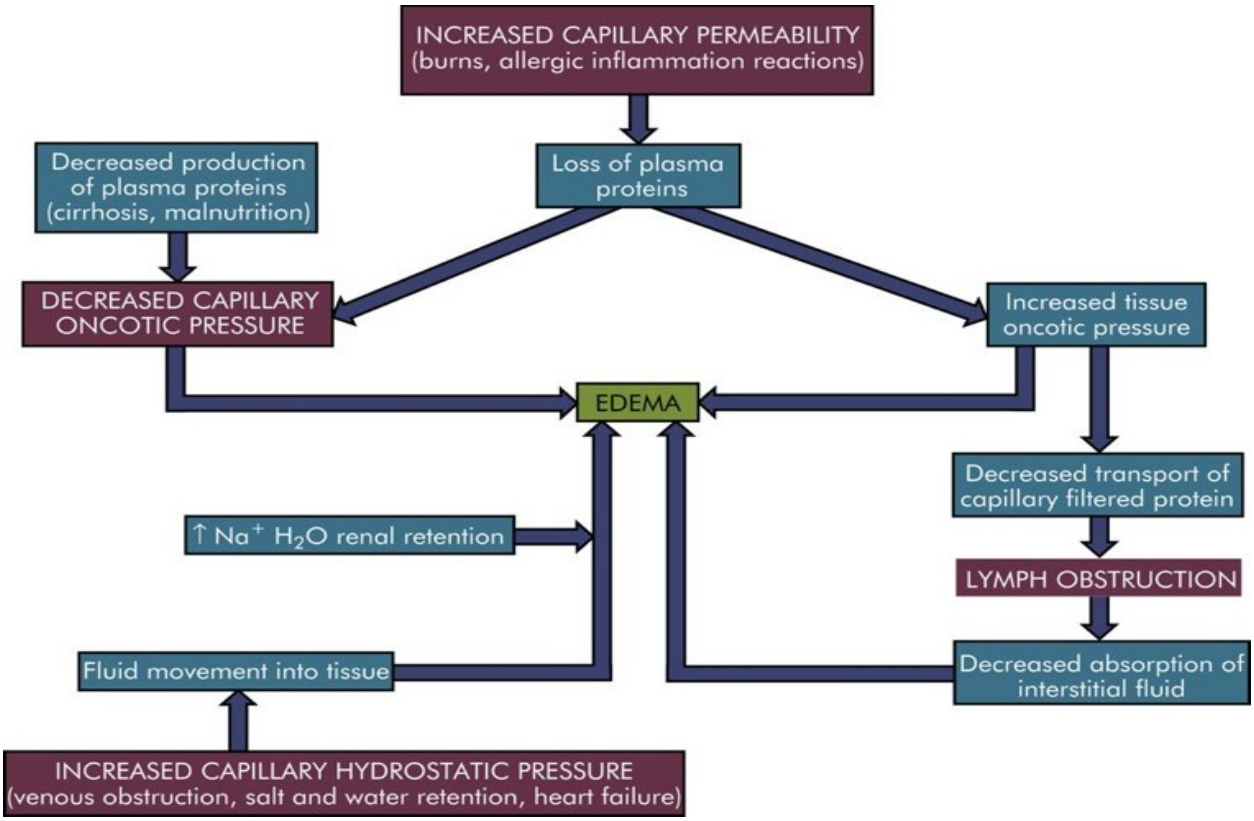
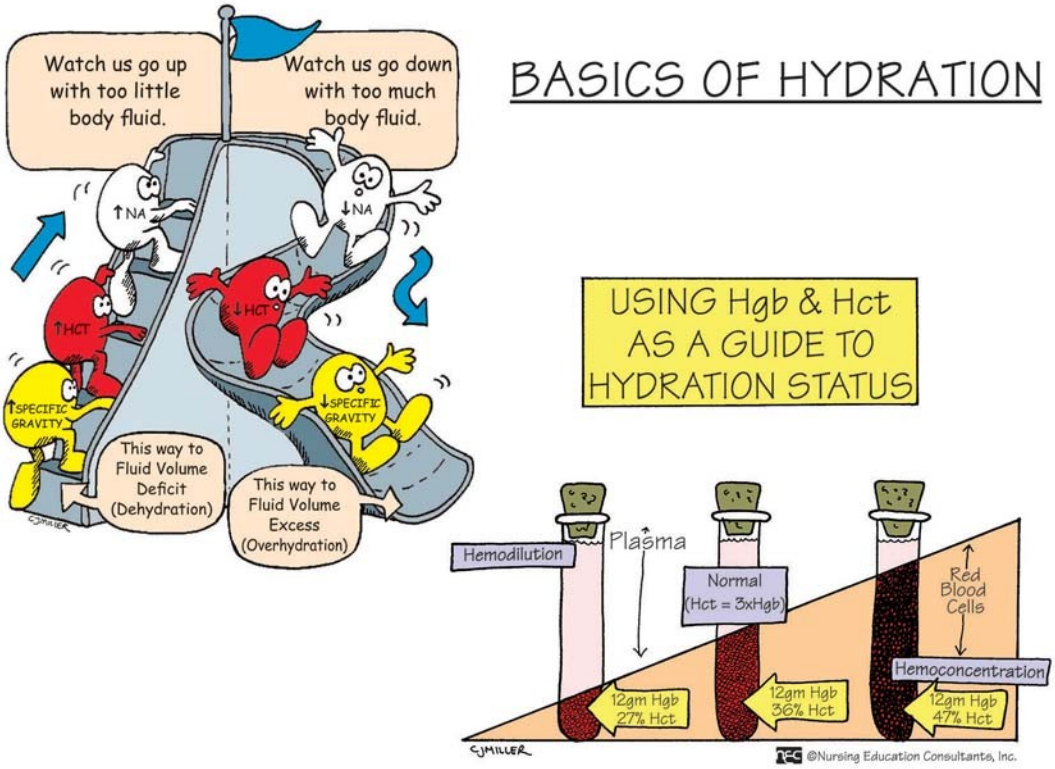
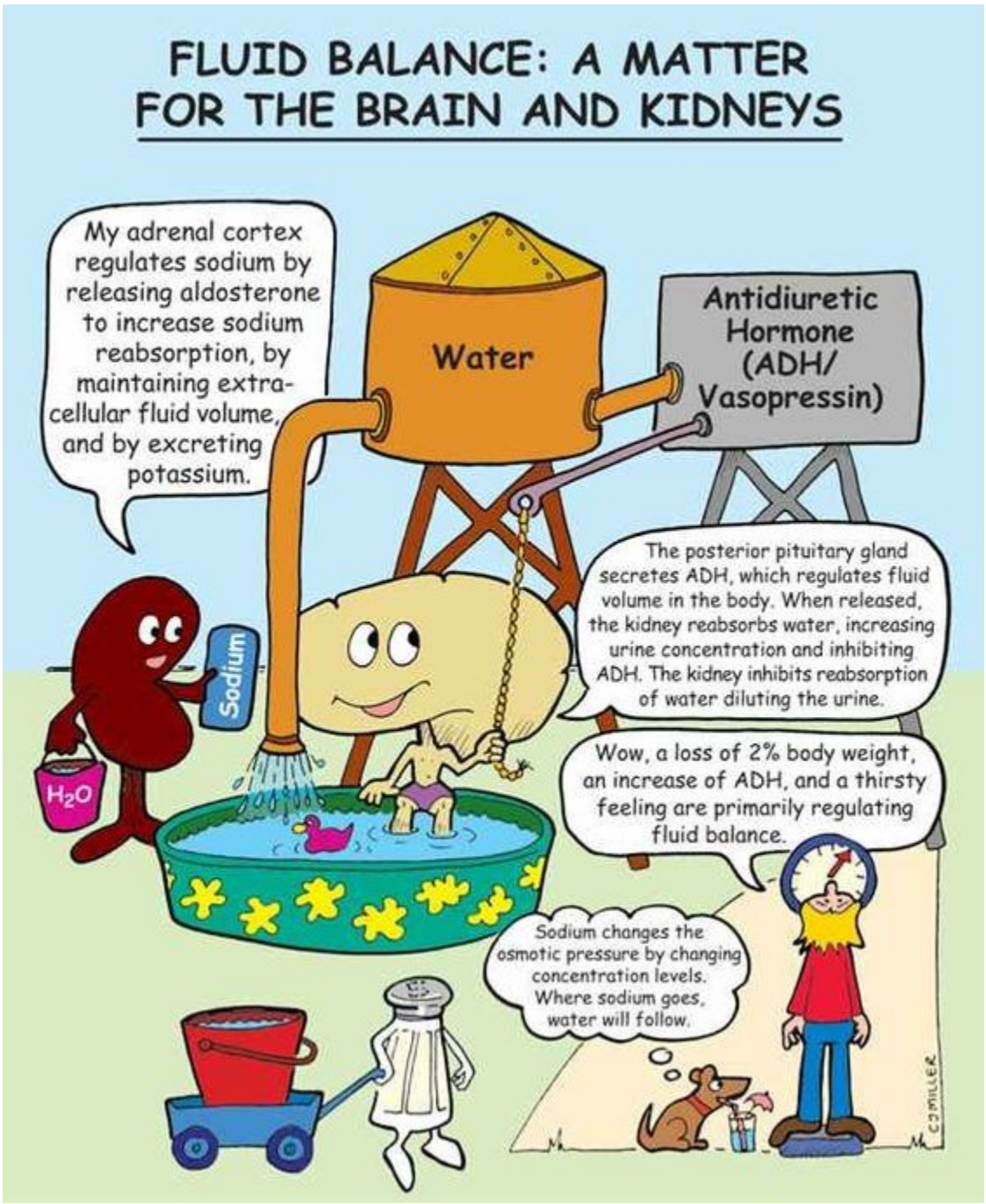
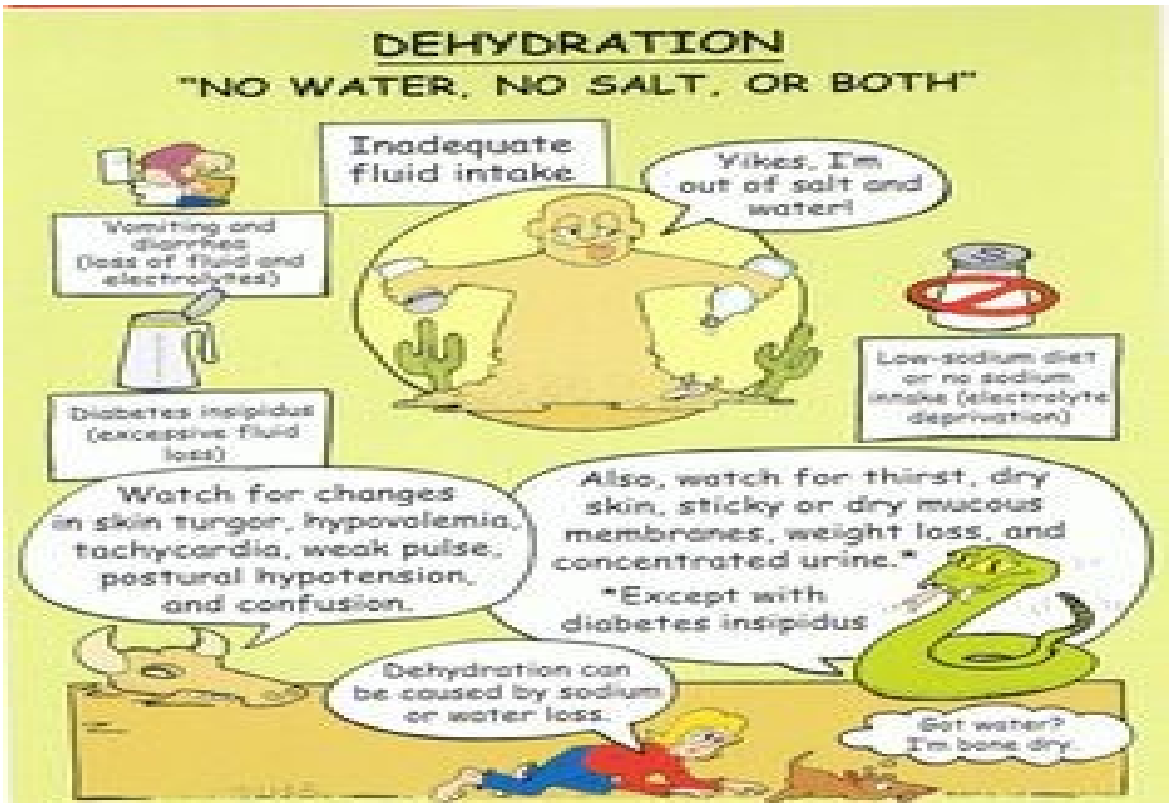

INCREASED CAPILLARY PERMEABILITY
(burns, allergic inflammation reactions)
Loss of plasma proteins
Decreased production of plasma proteins (cirrhosis, malnutrition)
DECREASED CAPILLARY ONCOTIC PRESSURE
Increased tissue oncotic pressure
EDEMA
Decreased transport of capillary filtered protein
↑ Na^+ H_2O renal retention
LYMPH OBSTRUCTION
Fluid movement into tissue
Decreased absorption of interstitial fluid
INCREASED CAPILLARY HYDROSTATIC PRESSURE
(venous obstruction, salt and water retention, heart failure)

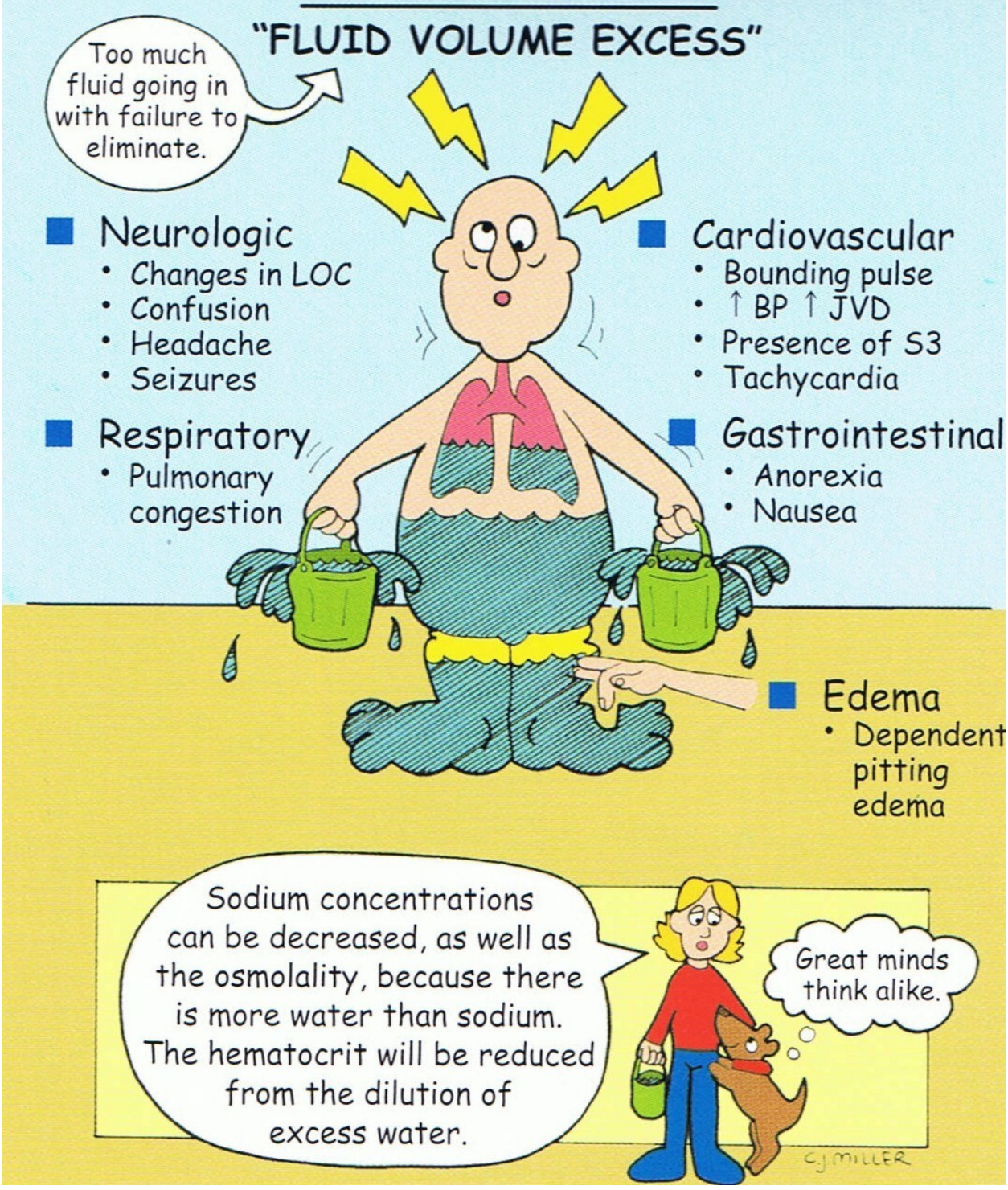

Watch us go up with too little body fluid.
Watch us go down with too much body fluid.
↑NA
↓NA
↑HCT
↓HCT
↑SPECIFIC GRAVITY
↓SPECIFIC GRAVITY
This way to Fluid Volume Deficit (Dehydration)
This way to Fluid Volume Excess (Overhydration)
CJMILLER
BASICS OF HYDRATION
USING Hgb & Hct AS A GUIDE TO HYDRATION STATUS
Hemodilution
Plasma
Normal (Hct = 3xHgb)
Red Blood Cells
Hemoconcentration
12gm Hgb 27% Hct
12gm Hgb 36% Hct
12gm Hgb 47% Hct
CJMILLER
©Nursing Education Consultants, Inc.

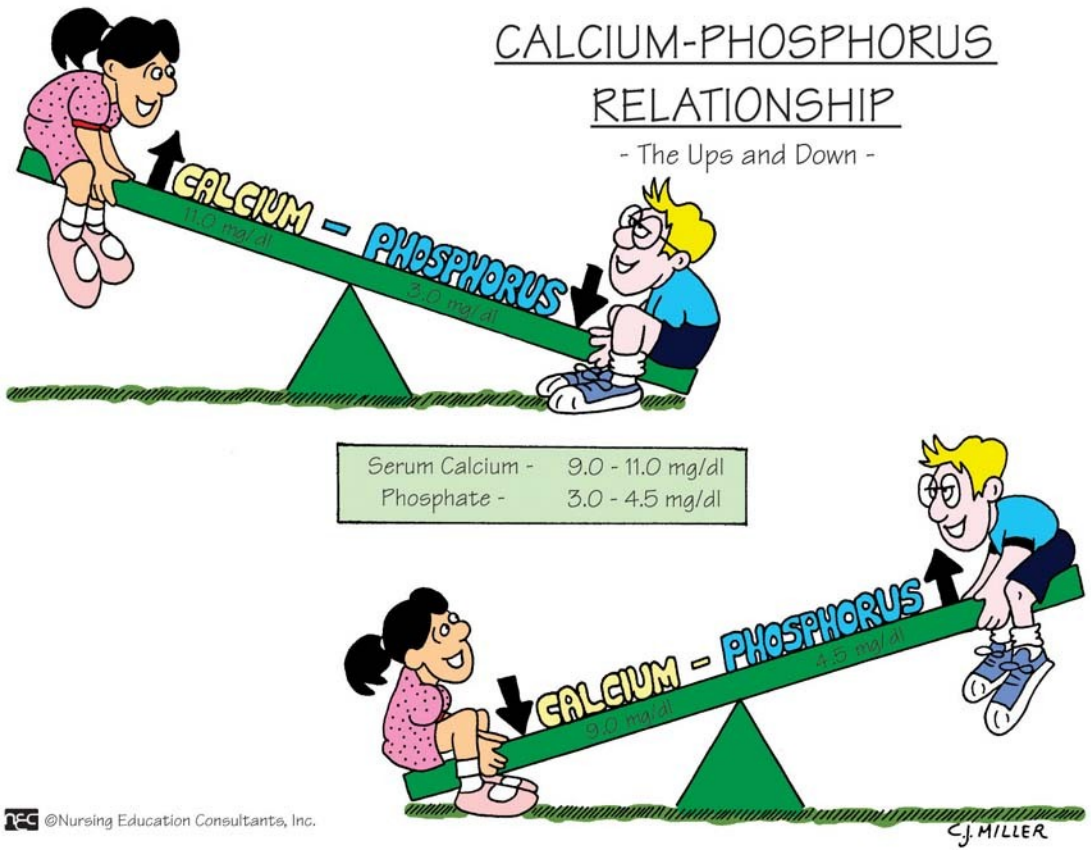

FLUID BALANCE: A MATTER FOR THE BRAIN AND KIDNEYS
My adrenal cortex regulates sodium by releasing aldosterone to increase sodium reabsorption, by maintaining extra-cellular fluid volume, and by excreting potassium.
Water
Antidiuretic Hormone (ADH/ Vasopressin)
The posterior pituitary gland secretes ADH, which regulates fluid volume in the body. When released, the kidney reabsorbs water, increasing urine concentration and inhibiting ADH. The kidney inhibits reabsorption of water diluting the urine.
Sodium
H_2O
Wow, a loss of 2% body weight, an increase of ADH, and a thirsty feeling are primarily regulating fluid balance.
Sodium changes the osmotic pressure by changing concentration levels. Where sodium goes, water will follow.
C.D.MILLER


DEHYDRATION
"NO WATER, NO SALT, OR BOTH"
Inadequate fluid intake
Yikes, I'm out of salt and water!
Vomiting and diarrhea (loss of fluid and electrolytes)
Diabetes insipidus (excessive fluid loss)
Low-sodium diet or no sodium intake (electrolyte deprivation)
Watch for changes in skin turgor, hypovolemia, tachycardia, weak pulse, postural hypotension, and confusion.
Also, watch for thirst, dry skin, sticky or dry mucous membranes, weight loss, and concentrated urine.*
*Except with diabetes insipidus
Dehydration can be caused by sodium or water loss.
Got water? I'm bone dry.

OVERHYDRATION

"FLUID VOLUME EXCESS"




CALCIUM-PHOSPHORUS
RELATIONSHIP
- The Ups and Down -
CALCIUM - PHOSPHORUS
11.0 mg/dl
3.0 mg/dl
Serum Calcium - 9.0 - 11.0 mg/dl
Phosphate - 3.0 - 4.5 mg/dl
CALCIUM - PHOSPHORUS
9.0 mg/dl
4.5 mg/dl
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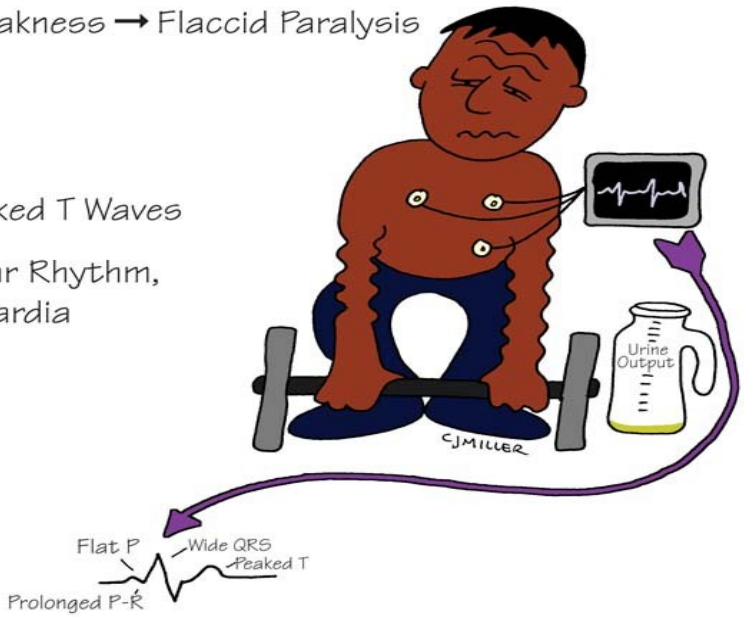
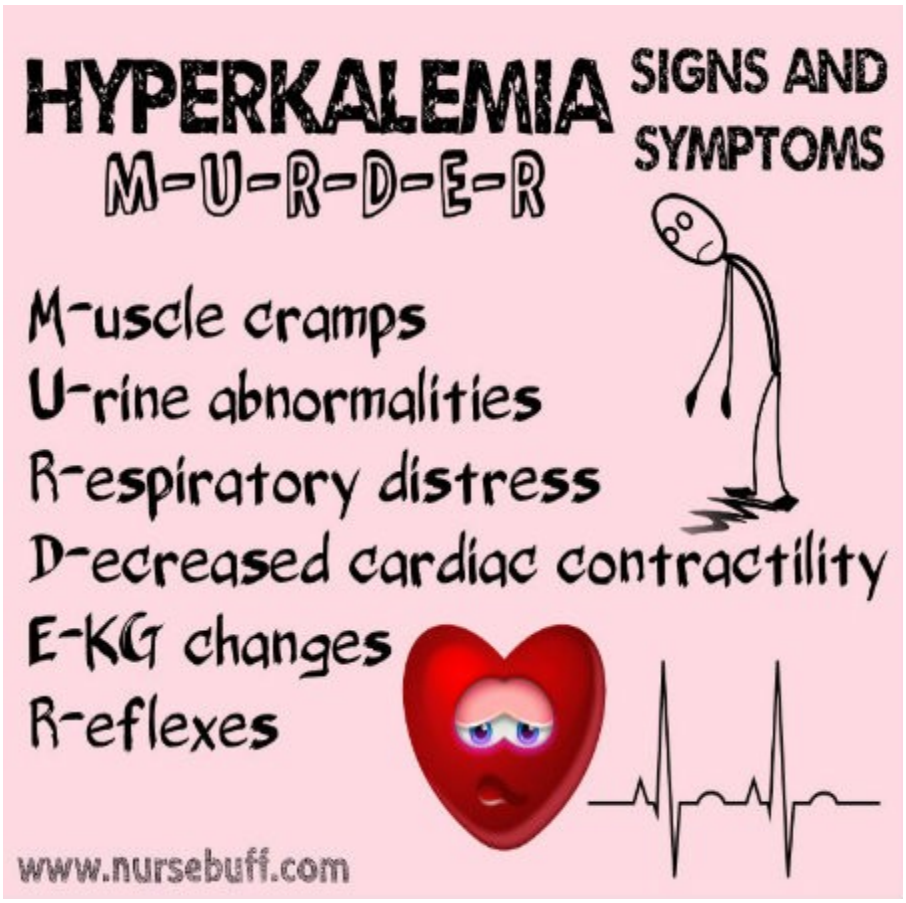
C.J. MILLER

HYPERKALEMIA

* Muscle Twitching → Weakness → Flaccid Paralysis
* Irritability & Anxiety
* ↓ BP
* ECG Changes - Tall Peaked T Waves
* Dysrhythmias - Irregular Rhythm, Bradycardia
* Abdominal Cramping
* Diarrhea




HYPERKALEMIA
SIGNS AND SYMPTOMS
M-U-R-D-E-R
M-uscle cramps
U-rine abnormalities
R-espiratory distress
D-ecreased cardiac contractility
E-KG changes
R-eflexes
www.nursebuff.com

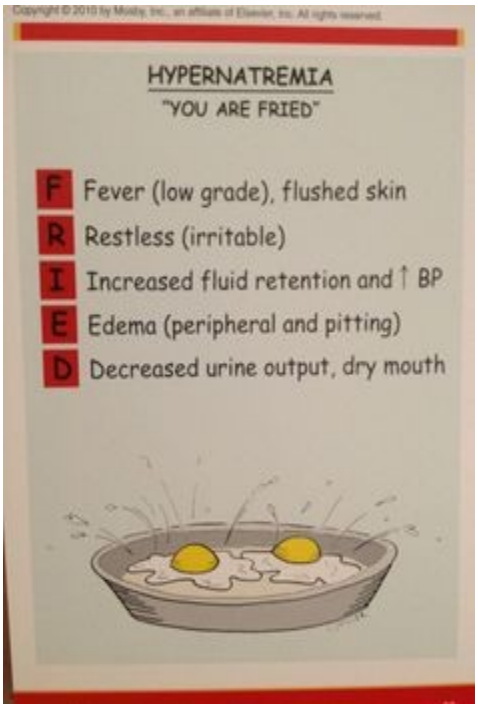
POTASSIUM DEFICIT

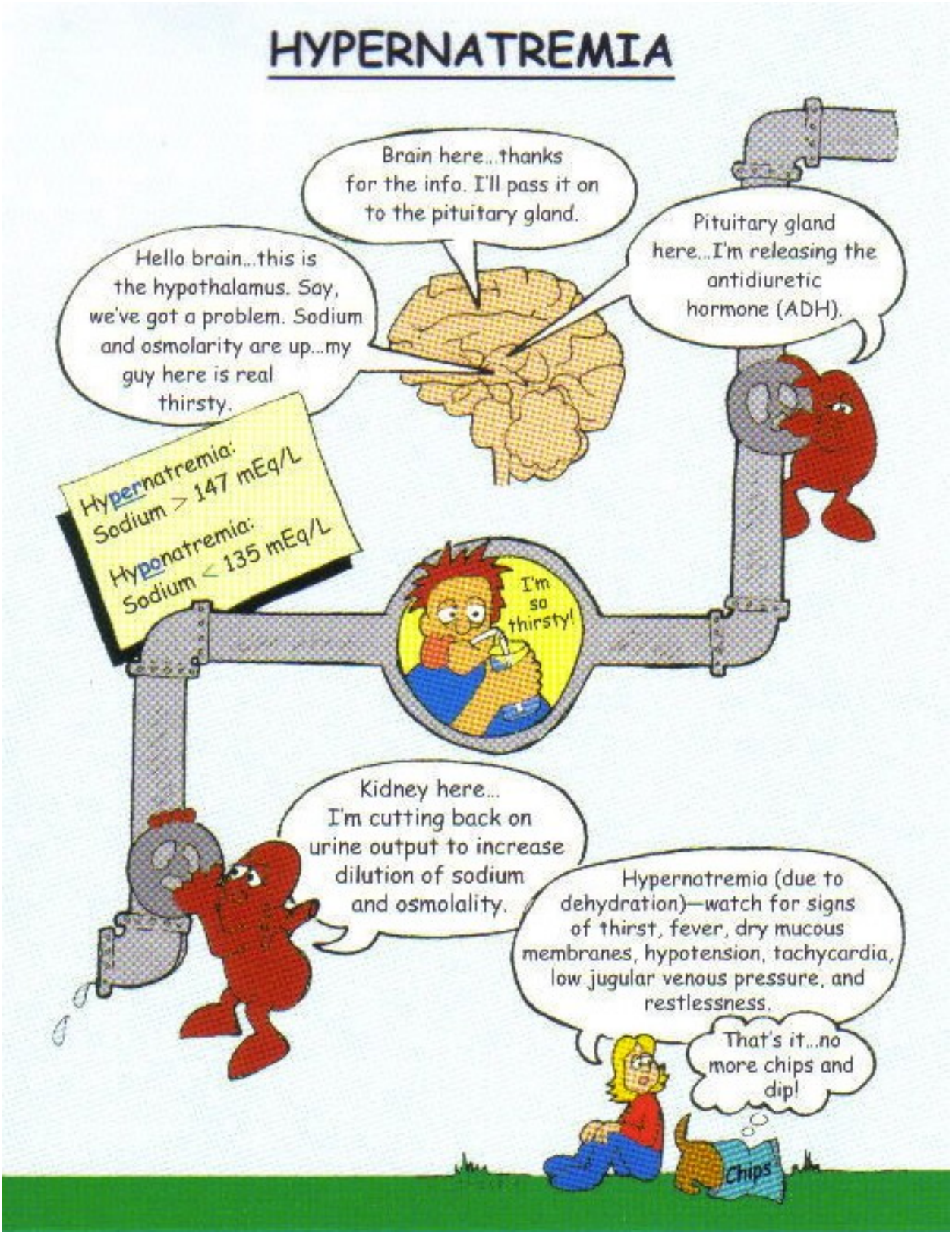
* **A**lkalosis

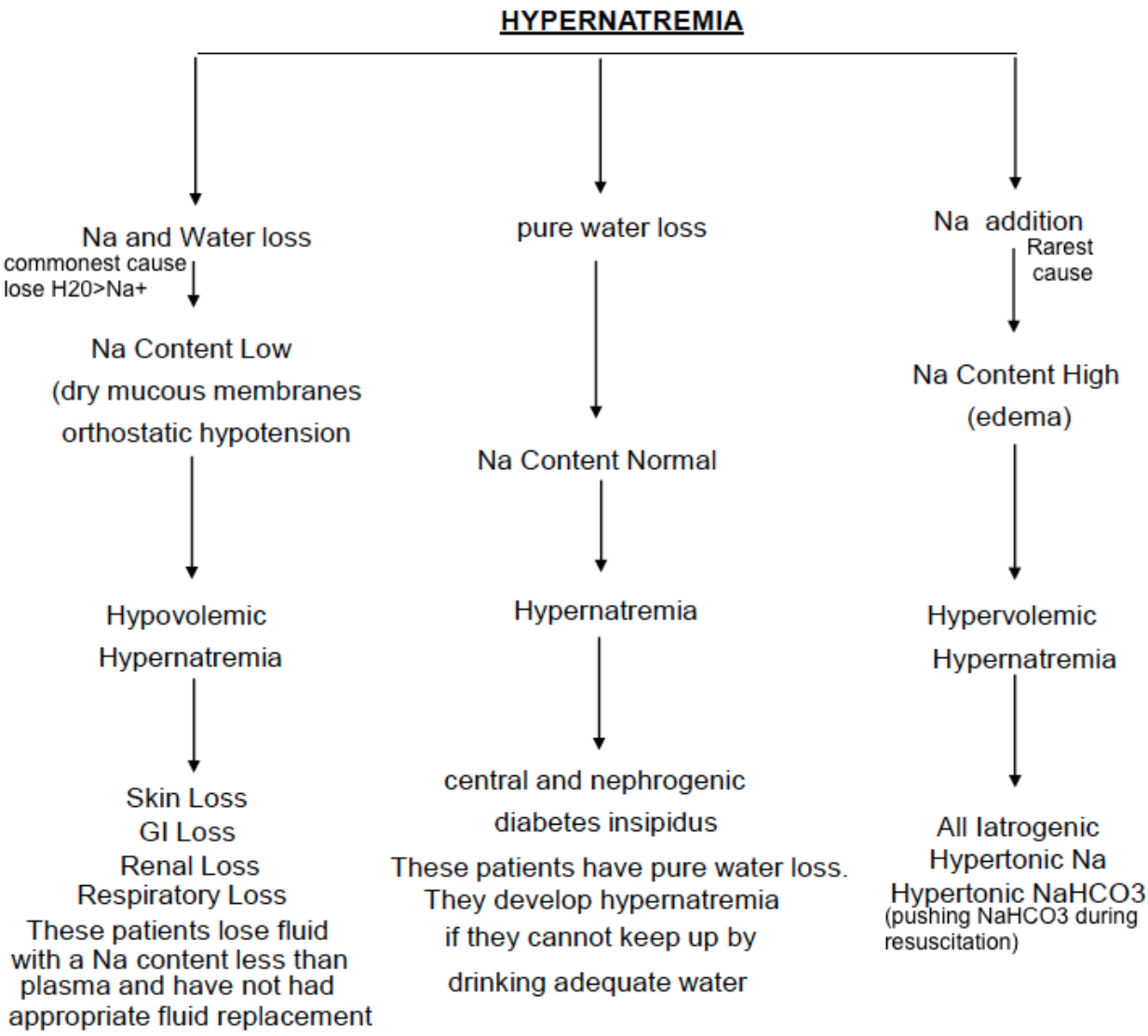
* **S**hallow Respirations
* **I**rritability
* **C**onfusion, Drowsiness

* **W**eakness, Fatigue
* **A**rrhythmias - Irregular rate, Tachycardia
* **L**ethargy
* **T**hready Pulse

* ↓ Intestinal Motility
  Nausea
  Vomiting
  Ileus




HYPERNATREMIA
Brain here...thanks for the info. I'll pass it on to the pituitary gland.
Hello brain...this is the hypothalamus. Say, we've got a problem. Sodium and osmolarity are up...my guy here is real thirsty.
Pituitary gland here...I'm releasing the antidiuretic hormone (ADH).
Hypernatremia: Sodium > 147 mEq/L
Hyponatremia: Sodium < 135 mEq/L
I'm so thirsty!
Kidney here... I'm cutting back on urine output to increase dilution of sodium and osmolality.
Hypernatremia (due to dehydration)—watch for signs of thirst, fever, dry mucous membranes, hypotension, tachycardia, low jugular venous pressure, and restlessness.
That's it...no more chips and dip!
Chips


HYPERNATREMIA
Na and Water loss
commonest cause
lose H20>Na+
Na Content Low
(dry mucous membranes
orthostatic hypotension
Hypovolemic
Hypernatremia
Skin Loss
GI Loss
Renal Loss
Respiratory Loss
These patients lose fluid with a Na content less than plasma and have not had appropriate fluid replacement
pure water loss
Na Content Normal
Hypernatremia
central and nephrogenic
diabetes insipidus
These patients have pure water loss. They develop hypernatremia if they cannot keep up by
drinking adequate water
Na addition
Rarest
cause
Na Content High
(edema)
Hypervolemic
Hypernatremia
All Iatrogenic
Hypertonic Na
Hypertonic NaHCO3
(pushing NaHCO3 during resuscitation)

HYPERNATREMIA

"THE MODEL"
(Causes of ↑ serum sodium)

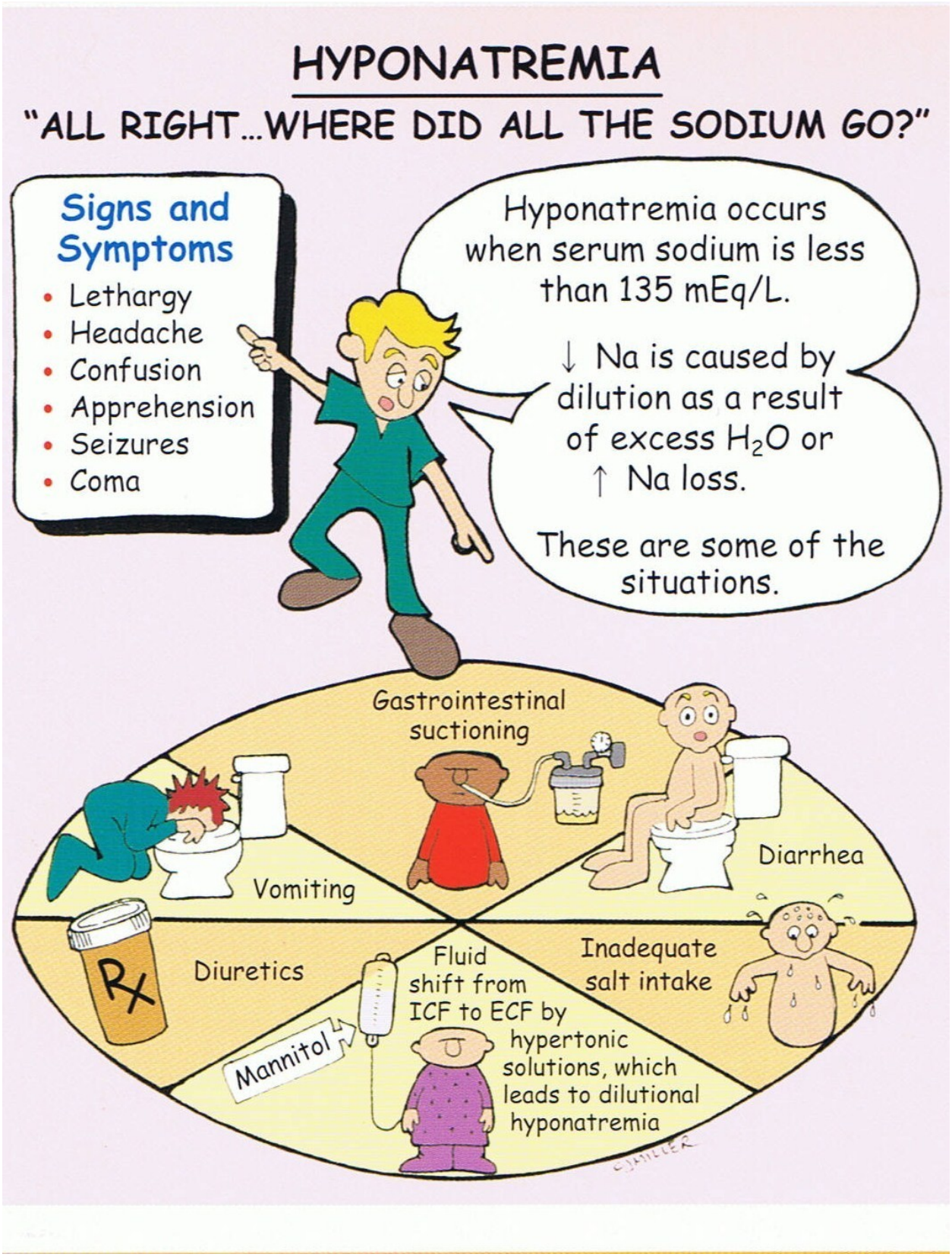
M Medications, meals
(too much sodium intake)

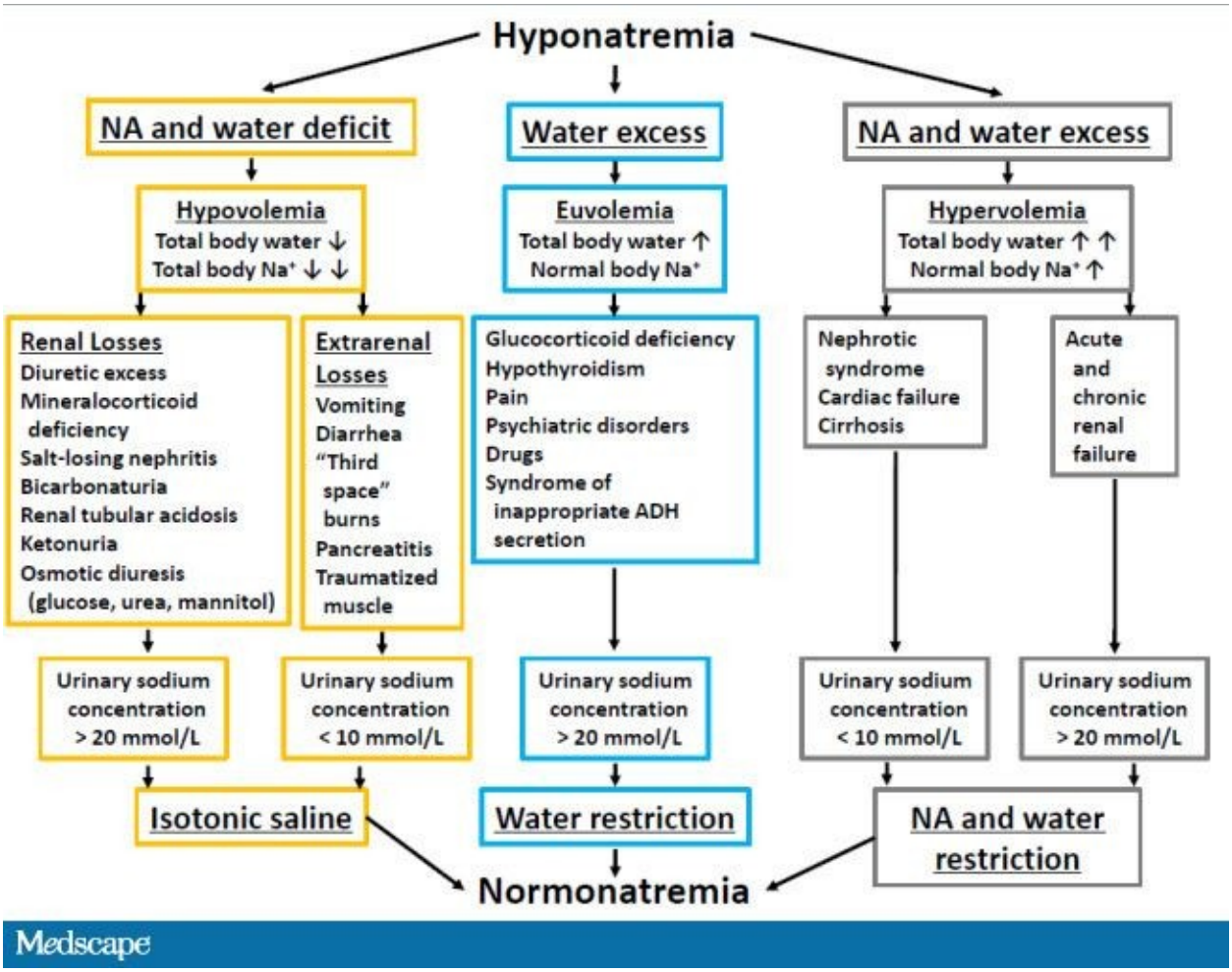
O Osmotic diuretics

D Diabetes insipidus

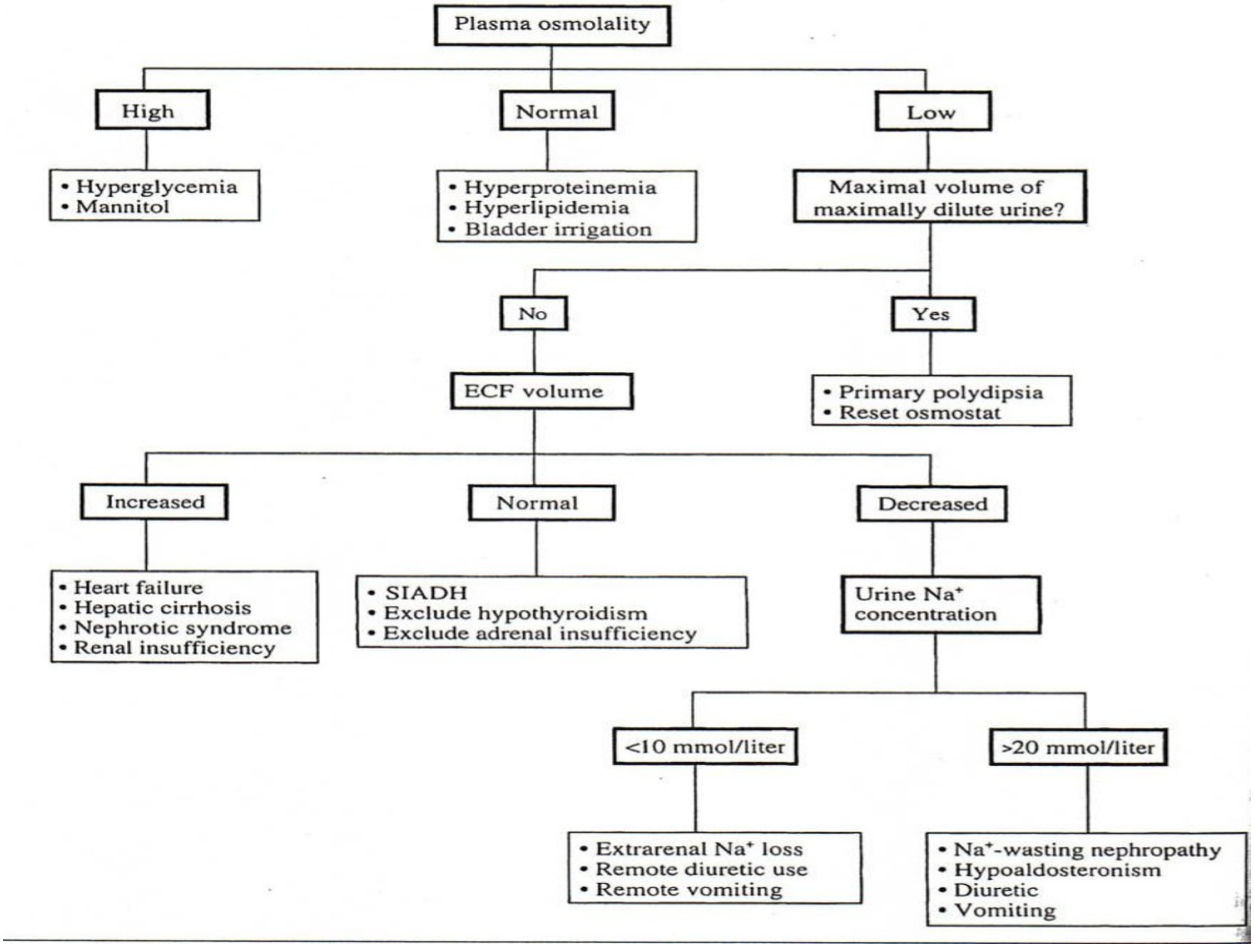
E Excessive H_2O loss

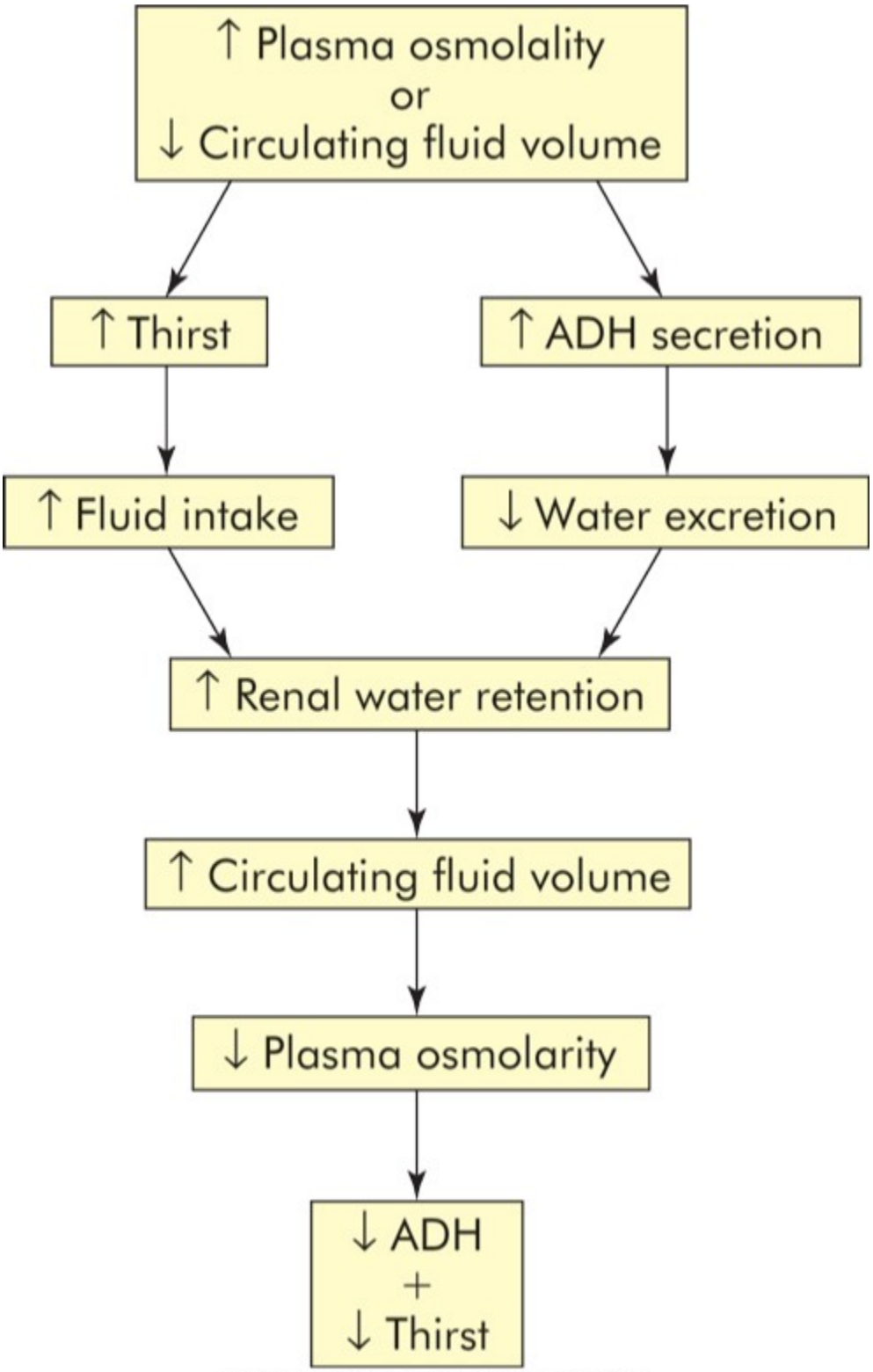
L Low H_2O intake


HYPONATREMIA
"ALL RIGHT...WHERE DID ALL THE SODIUM GO?"
Signs and Symptoms
• Lethargy
• Headache
• Confusion
• Apprehension
• Seizures
• Coma
Hyponatremia occurs when serum sodium is less than 135 mEq/L.
↓ Na is caused by dilution as a result of excess H_2O or ↑ Na loss.
These are some of the situations.
Gastrointestinal suctioning
Diarrhea
Vomiting
Rx
Diuretics
Inadequate salt intake
Fluid shift from ICF to ECF by hypertonic solutions, which leads to dilutional hyponatremia
Mannitol

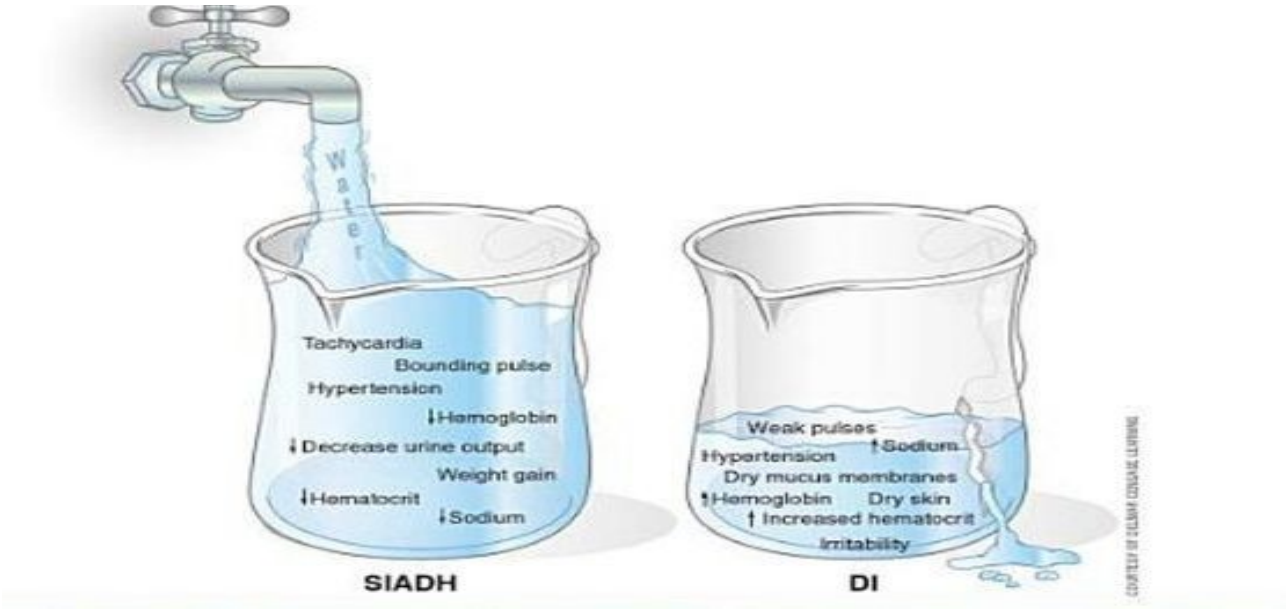

Hyponatremia
NA and water deficit
Water excess
NA and water excess
Hypovolemia
Total body water ↓
Total body Na+ ↓ ↓
Euvolemia
Total body water ↑
Normal body Na+
Hypervolemia
Total body water ↑ ↑
Normal body Na+ ↑
Renal Losses
Diuretic excess
Mineralocorticoid deficiency
Salt-losing nephritis
Bicarbonaturia
Renal tubular acidosis
Ketonuria
Osmotic diuresis (glucose, urea, mannitol)
Extrarenal Losses
Vomiting
Diarrhea
"Third space" burns
Pancreatitis
Traumatized muscle
Glucocorticoid deficiency
Hypothyroidism
Pain
Psychiatric disorders
Drugs
Syndrome of inappropriate ADH secretion
Nephrotic syndrome
Cardiac failure
Cirrhosis
Acute and chronic renal failure
Urinary sodium concentration > 20 mmol/L
Urinary sodium concentration < 10 mmol/L
Urinary sodium concentration > 20 mmol/L
Urinary sodium concentration < 10 mmol/L
Urinary sodium concentration > 20 mmol/L
Isotonic saline
Water restriction
NA and water restriction
Normonatremia
Medscape

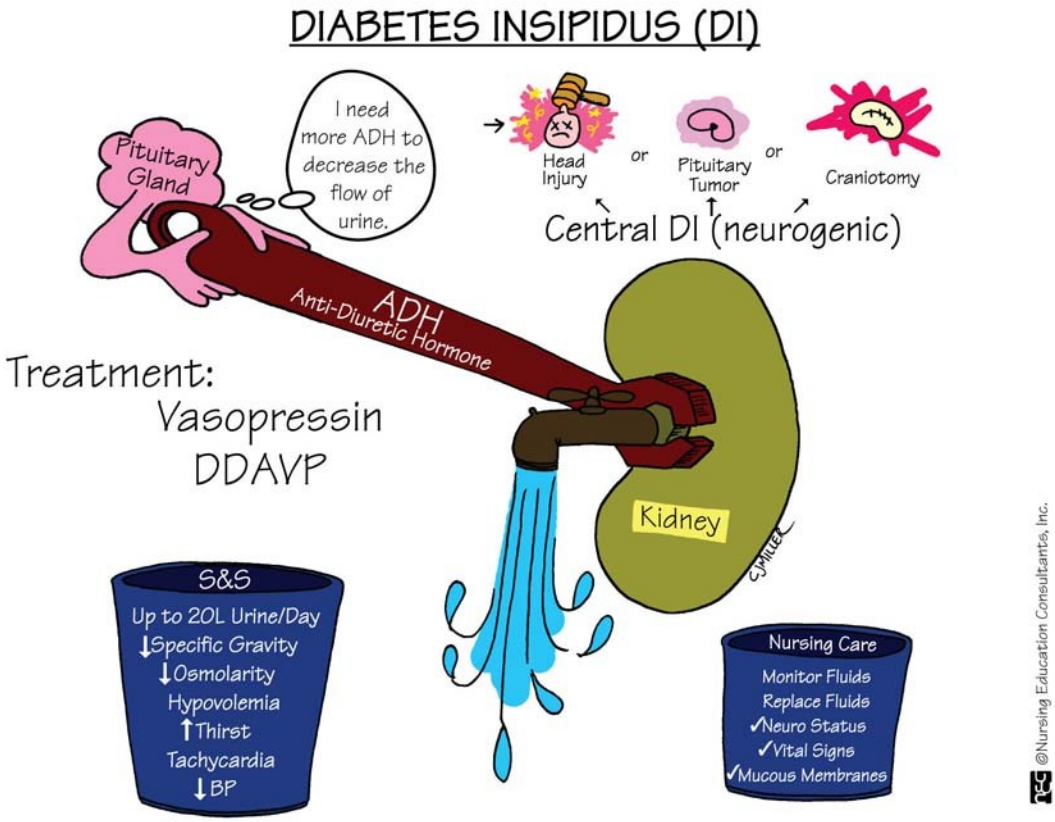
Hyponatremia flow chart






Diabetes Insipidus
- High Urinary Output
- Low Levels of ADH
- Hypernatremia
- Dehydrated
- Lose too much fluid
VS
SIADH
- Low Urinary Outpu
- High Levels of ADI
- Hyponatremia
- Over Hydrated
- Retain too much fl


Water
Tachycardia
Bounding pulse
Hypertension
↓Hemoglobin
↓Decrease urine output
Weight gain
↓Hematocrit
↓Sodium
SIADH
Weak pulses
↑Sodium
Hypertension
Dry mucus membranes
↑Hemoglobin
Dry skin
↑ Increased hematocrit
Irritability
DI


DIABETES INSIPIDUS (DI)
Pituitary Gland
I need more ADH to decrease the flow of urine.
Head Injury
or
Pituitary Tumor
or
Craniotomy
Central DI (neurogenic)
ADH
Anti-Diuretic Hormone
Kidney
Treatment:
Vasopressin
DDAVP
S&S
Up to 20L Urine/Day
↓Specific Gravity
↓Osmolarity
Hypovolemia
↑Thirst
Tachycardia
↓BP
Nursing Care
Monitor Fluids
Replace Fluids
✓Neuro Status
✓Vital Signs
✓Mucous Membranes
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