FLUID AND ELECTROLYTES

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FLUID BALANCE

FUNCTIONS OF FLUID IN THE BODY:
- Help regulate body temperature
- Transport nutrients and gases throughout the body
- Carry cellular waste products to excretion sites

COMPONENTS OF BODY FLUID:
- Intracellular Fluid (ICF)
- Extracellular Fluid (ECF)
  - Interstitial Fluid (ISF)
  - Intravascular Fluid
MAINTAINING FLUID BALANCE

- Kidneys and various hormones and mechanisms work together to maintain fluid balance
- A problem in any one of these things can cause a fluid imbalance
PATIENTS AT RISK FOR DEVELOPING FLUID IMBALANCES:

- BURNS
- CARDIOVASCULAR DISORDERS
- GASTROENTERITIS DISORDERS
- HORMONE DISTURBANCES
- RENAL DISORDERS
- AGE GROUPS
  - ELDERLY
  - INFANTS
ELECTROLYTE BALANCE

- Electrolytes are a major component of body fluids.
- Electrolytes are substances that, when in solution, separate into electrically charged particles called ions.
ELECTROLYTE BALANCE

- **MAJOR INTRACELLULAR ELECTROLYTES:**
  - Potassium
  - Phosphorus
  - Magnesium

- **MAJOR EXTRACELLULAR ELECTROLYTES:**
  - Sodium
  - Chloride
  - Calcium
  - Bicarbonate
ORGANS AND GLANDS IN ELECTROLYTE BALANCE

- LUNGS & LIVER
- HEART
- SWEAT GLANDS
- GI TRACT
- PARATHYROID GLANDS
- THYROID GLAND
CRYSTALLOIDS vs. COLLOIDS

- **CRYSTALLOIDS**: solutions with small molecules that flow easily from the bloodstream into cells and tissues
  - May be
    - Isotonic
    - Hypertonic
    - Hypotonic

- **COLLOIDS**: Solutions with larger molecules used to expand plasma
  - Always hypertonic
THREE BASIC TYPES OF IV SOLUTIONS

IV SOLUTIONS

ISOTONIC

HYPOTONIC

HYPERTONIC
REVIEW OF OSMOSIS:

- Diffusion of water across a selectively permeable membrane
- Fluids (particularly water) move by osmosis
- Movement is caused by existence of a concentration gradient
- Water flows passively across the membrane, from a area of higher water concentration to an area of lower water concentration
- Dilution stops when the solute concentrations on both sides of the membrane are equal
ISOTONIC SOLUTIONS

- Solution has the same osmolarity as serum and other body fluids
- Solution doesn’t alter serum osmolarity, so fluid stays inside the blood vessel (the intravascular compartment)
- Expands this compartment without pulling fluid from other compartments
ISOTONIC SOLUTIONS
ISOTONIC SOLUTIONS

- LACTATED RINGERS (LR)
- NORMAL SALINE (.9NS)
- DEXTROSE 5% IN WATER (D5W)
INDICATIONS FOR ISOTONIC SOLUTIONS

- D5W
  - Fluid loss & dehydration
  - Hypernatremia
  - **NURSING CONSIDERATIONS:**
    - Initially isotonic but hypotonic when dextrose is metabolized
    - Renal patients
    - Cardiac patients
    - Resuscitation purpose
    - Pt at risk for ICP
    - Not intended for long-term use

- LR
  - Acute blood loss
  - Burns
  - Dehydration
  - Hypovolemia caused by 3rd space shifting
  - Lower GI tract fluid loss
  - **NURSING CONSIDERATIONS:**
    - Renal patients
    - Liver disease patients
    - Pts whose blood pH exceeds 7.5
INDICATIONS FOR ISOTONIC SOLUTIONS

- .9NS
  - Blood transfusion
  - Fluid challenge
  - Fluid replacement w/ DKA
  - Hypercalcemia
  - Hyponatremia
  - Metabolic alkalosis
  - Resuscitation
  - Shock

- NURSING CONSIDERATIONS:
  - Replacement for extracellular fluid
  - Heart failure
  - Pts with edema
  - hypernatremia
HYPOTONIC SOLUTIONS

- SOLUTION THAT HAS AN OSMOLARITY LOWER THAN THAT OF SERUM. IT SHIFTS FLUID OUT OF THE INTRAVASCULAR COMPARTMENT, HYDRATING THE CELLS AND INTERSTITIAL COMPARTMENTS
- HYDRATES THE CELLS WHILE REDUCING FLUID IN THE CIRCULATING SYSTEM
HYPOTONIC SOLUTIONS
TYPES OF HYPOTONIC SOLUTIONS

- Half normal saline (1/2NS or 45%NS)
- 0.33% sodium chloride
- Dextrose 2.5% in water (D2.5%W)
- Dextrose 2/5% (D2.5%)
INDICATIONS OF HYPOTONIC SOLUTIONS

- .45 NS
  - DKA after .9NS
  - Gastric fluid loss from NG suctioning or vomiting
  - Hypertonic dehydration
  - Sodium and chloride depletion
  - Water replacement

- CONSIDERATIONS:
  - Use cautiously in general
  - Liver disease pts
  - Trauma pts
  - Burn pts
  - Pts at risk for ICP
HYPERTONIC SOLUTIONS

- Solution that has osmolarity higher than that of serum. It draws fluid **into** the intravascular compartment from the cells and the interstitial compartments.

- Shift fluid into the blood vessels caused by a hypertonic solution has benefits:
  - Reduces risk of edema
  - Stabilizes blood pressure
  - Regulates urine output
HYPERTONIC SOLUTIONS
TYPES OF HYPERTONIC SOLUTIONS

- Dextrose 5% in half-normal saline (D51/2NS)
- Dextrose 5% in normal saline (D5NS)
- Dextrose 5% in lactated ringers (D5LR)
- 3% sodium chloride
- 7.5% sodium chloride
- Dextrose 10% in water (D10W)
INDICATIONS OF HYPERTONIC SOLUTIONS

- **D5NS**
  - Addison crisis
  - Hypotonic dehydration
  - Temporary tx of circulatory insufficiency & shock
  - **CONSIDERATIONS:**
    - Cardiac pts
    - Renal pts

- **D10W**
  - Conditions in which some nutrition w/glucose is required
  - Water therapy
  - **CONSIDERATIONS:**
    - Monitor serum glucose therapy
REVIEW TIME......

- WHICH SOLUTION IS:
  - HYPERTONIC?
  - ISOTONIC?
  - HYPOTONIC?
FLUID IMBALANCES

- FLUID DEFICIT
- FLUID OVERLOAD
FLUID BALANCE: YOUR “NORMAL” FINDINGS ON ASSESSMENT

- **SKIN:**
  - Lips:
  - Membranes:
  - Turgor:
  - Temp:

- **URINE OUTPUT:**
  - Amount:
  - Color:

- **INTAKE:**

- **VITALS:**
FLUID DEFICIT

- BODY LOSES FLUID
- BLOOD SOLUTE CONCENTRATION (OSMALITY) INCREASES
- SERUM SODIUM LEVEL **RISES**
- WATER MOLECULES SHIFT OUT OF CELLS INTO MORE CONCENTRATED BLOOD
- WATER INTAKE AND RETENTION ARE NOT SUFFICIENT TO RESTORE FLUID VOLUME
- CELLS SHRINK AS MORE FLUID SHIFTS OUT OF THEM
- PT DEVELOPES MENTAL STATUS CHANGES, WHICH MAY LEAD TO SEIZURES AND COMA
FLUID DEFICIT

**SIGNS & SYMPTOMS:**
- Decrease in body weight
- Elevated temp
- Pulse weak, rapid, thready
- Respirations rapid/shallow
- BP is generally low
- Skin: warm, dry, flushed, poor turgor
- Lips: dry & chapped
- Tongue: dry coated
- Mucous Membranes: dry

**SIGNS & SYMPTOMS** (cont):
- Eyes: sunken
- Difficulty to feel pulses
- Fatigued
- Elevated h/h
- c/o thirst & constipation
- UO decreased, dark urine with strong smell
- Weak, sleepy, disoriented, irritable
- May lead to seizures, coma, death
FLUID OVERLOAD

- Excess sodium or fluid is consumed or retained
- Fluid moves out of blood vessels into the interstitial space
- Extracellular fluid accumulates in the interstitial or intravascular compartment
- Edema develops in the lungs or other tissues
FLUID OVERLOAD

- **SIGNS & SYMPTOMS:**
  - Increase in weight
  - Normal temp
  - Pulse full/bounding
  - Resp moist/labored
  - Elevated bp
  - Skin: cool, moist, pale
  - Edema of ankles, lower legs, sacral area
  - Membranes: moist
  - Neck veins distended when sitting
  - Low h/h

- **SIGNS & SYMPTOMS (cont):**
  - Moist lung sounds
  - Frequent moist bowel mvmts
  - Intake greater than output
  - Urine light colored, odorless
  - Tense, unable to sleep
  - May experience seizures, coma, can lead to death
PLASMA EXPANDERS

- Also called volume expanders
- Example of colloid
- Two types:
  - Biologic
  - Synthetic
THE END!!!!!!!