

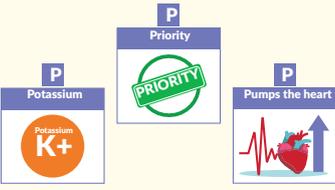
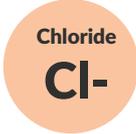
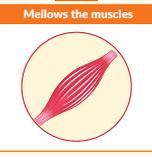
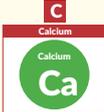
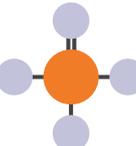
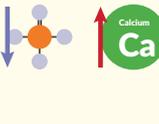
# Fluids and Electrolytes Review



# Fluid & Electrolyte Basics

## Fundamentals of Nursing

**TEST TIP** The **MOST deadly** conditions are typically the **MOST tested** conditions, since the main goal of nursing school is to create safe nurses.

Electrolytes	Function	HYPER "HIGH"	Hypo "low"
<p>Potassium K+ <b>3.5 - 5.0</b></p> 		<p><b>HYPERkalemia</b> (over <b>5.0</b>)</p> <p>Heart = HIGH pumps 1 - Peaked T Waves &amp; ST Elevation 2 - Severe: V-FIB</p> <p>Hypotension &amp; Bradycardia Neuromuscular = HIGH 1 - Increased DTR 2 - Paralysis &amp; paresthesia (tingling) 3 - Muscle weakness (general feeling of heaviness) GI = HIGH pumps 1 - Diarrhea 2 - Hyperactive bowel sounds</p> <p>Causes: - Renal failure - Low aldosterone Memory Trick for AL: A - Adds Sodium L - Loses Potassium</p>	<p><b>HYPOkalemia</b> (below <b>3.0</b>)</p> <p>Heart = Low &amp; slow pump 1 - Flat T waves, ST depression &amp; U waves Neuromuscular = Low &amp; slow 1 - Shallow Respirations! Most DEADLY 2 - Decreased DTR 3 - Muscle cramping &amp; flaccid paralysis (paralyzed limbs) GI = Low &amp; slow 1 - Constipation 2 - HypoActive bowel sounds 3 - Paralytic ileus (paralyzed intestine) Priority risk for SBO</p> <p>Causes: Fluid loss/electrolyte loss "Where fluids flow, electrolytes goooo!" Diarrhea, Diuretics, Diet, DKA, Aldosterone</p>
<p>Sodium Na+ <b>135 - 145</b></p> 	<p>Maintains:</p> <ul style="list-style-type: none"> <li>Blood Pressure</li> <li>Blood volume</li> <li>pH balance</li> </ul>  <p>Sweats the body with FLUID</p> 	<p><b>HYPERnatremia</b> (over <b>145</b>)</p> <p>Manifestations (S/S) Body = Big &amp; Bloated 1 - Edema (swollen body) 2 - Flushed "red &amp; rosey" skin 3 - Increased muscle tone 4 - Swollen dry tongue 5 - Nausea &amp; Vomiting</p> <p>Causes: - Low ADH (antidiuretic hormone) DI: Diabetes Insipidus Think: Dry Inside - Rapid respirations - Watery diarrhea - Loss of thirst</p>	<p><b>HYPONatremia</b> (below <b>135</b>)</p> <p>Manifestations (S/S) Brain = Low &amp; slow 1 - Headache = Cerebral edema 2 - Mental status changes 3 - Seizures &amp; Coma Muscular = Low &amp; slow - Fatigue &amp; muscle cramps Respiratory = Low &amp; slow - Respiratory Arrest</p> <p>Causes: Sweating - Excess water intake (running in the extreme heat) TEST TIP - SIADH (Excess ADH) - Vomiting &amp; diarrhea, Diuretics &amp; Diuresis - Diet low in salt - Low aldosterone</p>
<p>Chloride Cl- <b>97 - 107</b></p> 	<p>Related to sodium Maintains:</p> <ul style="list-style-type: none"> <li>Blood pressure</li> <li>Blood Volume</li> <li>pH balance</li> </ul> 	<p><b>HYPERchloremia</b> (over <b>107</b>)</p> <p><b>NEARLY SAME AS HIGH SODIUM</b></p> <p>1 - Swollen dry tongue 2 - Nausea &amp; vomiting Metabolic Alkalosis - vomiting</p>   	<p><b>HYPOchloremia</b> (below <b>97</b>)</p> <p><b>NEARLY SAME AS low SODIUM</b></p> <p>1 - Fatigue &amp; muscle cramps 2 - Fever (only difference)</p>   
<p>Magnesium Mg+ <b>1.3 - 2.1</b></p> 	 <p>Mellows the muscles</p> 	<p><b>HYPERmagnesemia</b> (over <b>2.1</b>)</p> <p>Manifestations (S/S) Heart = High Mellow 1 - Heart block 2 - Hypotension, bradycardia DTR = High Mellow - Hyporeflexia (decreased DTR) Lungs &amp; GI = High Mellow - Depressed respirations - Hypoactive bowel sounds</p> <p>Causes: - Renal failure - Alcoholism - Malnourishment</p>	<p><b>HYPOmagnesemia</b> (below <b>1.3</b>)</p> <p>Manifestations (S/S) Heart = Low Mellow - Excited! 1 - Torsades de Pointes (TOP TESTED) &amp; V-Fib (ventricular fibrillation) DTR = Low Mellow - Excited! - HYPERReflexia (increased DTR) GI = Low Mellow - Excited! - Diarrhea - Hyperactive bowel sounds</p> <p>Causes: - Crohn's disease - Celiac disease</p>
<p>Calcium Ca <b>9.0 - 10.5</b></p> 	<p>Keeps the <b>3 Bs Strong</b> B - Bone B - Blood (clotting) B - Beats (heart)</p> <p>Inverse relationship with <b>Phosphate</b></p>  <p>Contracts the muscles</p> 	<p><b>HYPERcalcemia</b> (over <b>10.5</b>)</p> <p>Manifestations (S/S) HIGH Calm 1 - Kidney stones, moans &amp; groans (Renal Calculi) 2 - Constipation 3 - Bone pain 4 - Severe muscle weakness &amp; lethargy</p> <p>Causes: - Hyperparathyroidism High PTH = High Calcium - Cancer - Immobility</p>	<p><b>HYPOcalcemia</b> (below <b>9.0</b>)</p> <p>Manifestations (S/S) Low Calm = Excited! 1 - Trousseau's Sign Twisting arm when BP cuff on Tetany: muscle spasms all over 2 - Chvostek's Sign Cheeky smile when stroking face 3 - Diarrhea 4 - Weak B's Weak Bones = Fractures Weak Blood clotting = r/f bleeding Weak Beats = Cardiac dysrhythmias</p> <p>Causes: - Hypoparathyroidism Low PTH = Low Calcium - Renal failure TEST TIP - Chronic kidney disease (CKD)</p>
<p>Phosphate <b>3.0 - 4.5</b></p> 	<p>- Ca HIGH = Phosphate Low - Ca Low = Phosphate HIGH</p> <p>Inverse relationship with <b>Calcium</b></p>  	<p><b>HYPERphosphatemia</b> (over <b>4.5</b>)</p> <p>Manifestations (S/S) Think Low Calcium signs 1 - Trousseau's &amp; Tetany 2 - Chvostek's 3 - Weak B's (bones, blood, beats)</p> <p>Causes: - Renal failure TEST TIP - Chronic kidney disease (CKD)</p>	<p><b>HYPOphosphatemia</b> (below <b>3.0</b>)</p> <p>Manifestations (S/S) Think High Calcium signs 1 - Kidney stones, moans &amp; groans (Renal Calculi) 2 - Constipation 3 - Bone Pain 4 - Severe muscle weakness &amp; lethargy</p> <p>Causes: - Hyperparathyroidism High PTH = High Calcium - Genetics - Cancer</p>

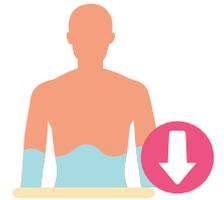
## Fundamentals of Nursing

### Fluid Volume Deficit - Dehydration

FVD is a common manifestation of dehydration, where there is a **deficit or decrease in body fluid!** Clients present sucked in, shrivelled up & very weak, like a **dried out raisin in the sun!**

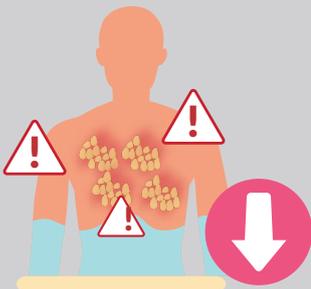
### MEMORY TRICK

**D**RY  
**D**ehydration  
**D**eficit of fluid



### Top 4 Causes:

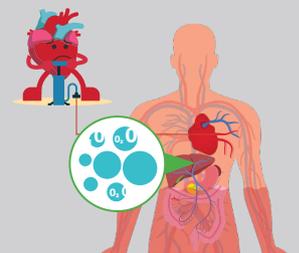
- Vomiting & Diarrhea
- Hot body & Sweating:
  - Fever, Heat Stroke, Thyroid Crisis
- Severe burns
- Urination &
- **3 Ds:** DI, DKA, Diuretics



Top Reasons	Memory Trick
<b>DI</b> - Diabetes Insipidus	<b>DI</b> think <b>D</b> ry <b>I</b> nside
<b>DKA</b> - Diabetic Ketoacidosis	<b>DKA</b> think <b>D</b> - Dry <ul style="list-style-type: none"> <li>• Increased sugar concentration in the blood (hyperglycemia)</li> <li>• Typically caused by infection</li> <li>• Kussmaul respiration (insensible losses)</li> </ul>
<b>Diuretics</b> Furosemide, Hydrochlorothiazide	End in "-ide" = body dried

### Compensation of FVD & Dehydration:

- Increased thirst
- Holding on to urine (concentration)
- Increased HR & Vasoconstriction



### Notes

## Fundamentals of Nursing

### Factors that Influence Fluid Balance

- Muscle (more fluid)
- Body Fat (less fluid)
- Gender (men retain more fluid)
- Age

#### MUSCLE RETAINS MORE H<sub>2</sub>O



### Key Terms

#### Osmosis:

The movement of **fluid** from an area of **LOWER** concentration to an area of **HIGHER** concentration, leading to equalization.  
**Example:** Large intestines that absorb high nutrients & balance fluids.

#### Diffusion:

The movement of **solutes** from an area of **GREATER** concentration to an area of **LESSER** concentration, leading to equalization.  
**Example:** exchange of O<sub>2</sub> & CO<sub>2</sub> inside the lungs.

#### Filtration:

The movement of **BOTH fluid & solutes** from an area of **HIGH** hydrostatic pressure to an area of low pressure.  
**Example:** Kidneys that filter the blood.

#### Osmolality:

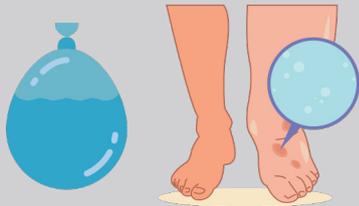
The concentration of a solution.  
 Higher osmolality = Higher solutes (heavy)  
 Lower osmolality = Lower solutes (light & dilute)

#### Examples:

- **Isotonic** solutions: Equal osmolality 270 - 300 millimoles / kg (same as blood concentration)
- **Hypertonic** solutions: High osmolality (heavy & thick concentration) **OVER 300** millimoles / kg
- **Hypotonic** solutions: Lower osmolality (lighter & dilute) **Less than 300** millimoles / kg

### Fluid Volume Overload - Overhydration

Clients puff up like a big water balloon manifesting as edema (the swelling of soft tissues from excess fluid).



#### Overhydration for Overload!



#### Other Names:

- Fluid Volume Excess
- **Hyper**volemia
- FVO (Fluid Volume Overload)

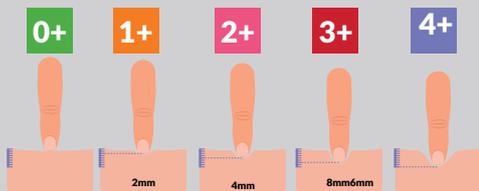
#### Edema:

The swelling of soft tissues as a result of excess fluid accumulation

### Grading the Pitting Edema

Edema makes the skin look like a memory foam mattress, ranging from **0+ to 4+ pitting edema**.

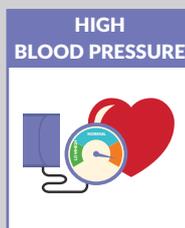
<b>0+</b>	No pitting edema
<b>1+</b>	2 mm or less <b>Mild</b> (immediate rebound)
<b>2+</b>	3-4 mm <b>Moderate</b> (15 seconds rebound)
<b>3+</b>	5-6 mm <b>Moderately Severe</b> (30 seconds to rebound)
<b>4+</b>	8 mm or deeper <b>SEVERE!</b> (1-2 minutes to rebound)



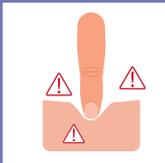
### 4 Main Causes of Edema

#### 1. Increased hydrostatic pressure **TEST TIP**

- Increased volume
  - Manifestations:
    - High blood pressure (BP)
    - Pitting edema
  - **Examples:**
    - Renal Failure
    - Heart Failure
- Memory Trick**
- HF - heart failure
  - HF - heavy fluid



#### PITTING EDEMA



#### 2. Decreased colloid osmotic pressure

- **Low Albumin** (Low plasma proteins)

#### Memory Trick

- **A** - Albumin
- **A** - Attracts fluid

#### Examples:

- Cirrhosis (liver disease)
- Starvation

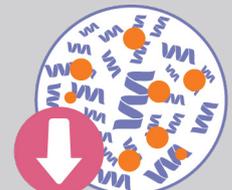
#### 3. Increased capillary permeability

#### Examples:

- Bacteria (infection)
- Burns

#### 4. Obstruction of the lymphatic system

- Cancer (tumor blockage)
- Infection (big lymph nodes)



## Fundamentals of Nursing

### Isotonic Solutions

ISO-tonic think "I-SO-perfect"

These solutions have **perfect balance** (equilibrium) of solutes both inside & outside the cell, therefore no fluid shifts are made. Human blood is isotonic thus very little osmosis occurs, since isotonic solutions have the same osmolality as body fluids.

- Equilibrium or are **equal in concentration**

#### Memory Trick

- Iso-tonic Solutions
- I-so-Perfect "I'm so perfect" (no fluid shift)



### Caution

- Too much isotonic Fluid volume overload! (FVO)
- **Monitor: Blood Pressure Key**  
**Manifestation: HTN crisis!**
  - BP over **180/systolic**
  - Risk for CVA stroke

#### List of fluids:

- 0.9% Sodium Chloride (**normal saline**)
- Lactated Ringer's (**LR**)

#### Uses:

- Hypotension (low blood pressure)
- Blood transfusions
- Hemorrhaging (blood loss)
- DKA (Type 1 diabetic disorder)
- HHNS (Type 2 diabetic disorder)



### Hypotonic Solutions

HYPO-tonic think **LOW**.

These solutions have a **LOWER** osmolality & **LOWER** concentration of solutes than body fluids. They cause the movement of water into cells by osmosis, **swelling the cells like a BIG fat hippo**, and therefore should be administered slowly to **prevent cellular edema**.

- **LOW**er Osmolarity than body fluids

#### Memory Trick

- HypO - tonic
- HippO - tonic (cells swell with fluid)

### Caution

- Give slowly to prevent: Cellular edema & **cerebral swelling**
- **NOT for:** ICP (intracranial pressure)
- **Manifestation to monitor** Cerebral Edema
  1. Headache
  2. Mental Status Changes "Altered level of consciousness" New Confusion, Restless, Agitated
  3. Seizures & Coma

#### List of fluids:

- 0.45% Sodium Chloride (**1/2 NS**)
- 0.225% Sodium Chloride (**1/4 NS**)
- 0.33% Sodium Chloride (**1/3 NS**)
- 5% Dextrose in 0.225% Saline (**D51/4NS**)
- 5% Dextrose in Water (**D5W**)

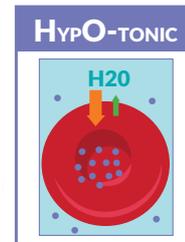
**Side Note D5W!**  
Isotonic in bag  
**Hypo**tonic in body

#### Used for Cellular Dehydration

- Hyponatremia (Sodium **over 145** mEq/L)

#### Memory Trick

- **A** lot of numbers
- **B** lot of fluid in the cell!



### Hypertonic Solutions

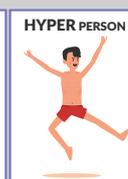
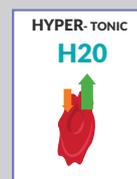
HYPER-tonic think **HIGH & dry**.

These solutions have a **HIGHER** osmolality & **HIGHER** concentration of solutes than body fluids. They are **very thick salty solutions** having more solutes & less water, causing water to be moved outside the cells and **making the cells skinny like a hyper person**.

- **HIGHER** Osmolarity than body fluids

#### Memory Trick

- **HYPER** - tonic
- **HYPER** person (very skinny cells)



### Caution

- Give **slowly** to prevent: Cellular dehydration
- Fluid volume overload! (**FVO**)  
**Monitor: Blood Pressure Key**  
**Manifestation: HTN crisis!**
  - BP over **180/systolic**
  - Risk for CVA stroke

#### List of fluids:

- 3% Sodium Chloride (**3% NS**)
- 5% Sodium Chloride (**5% NS**)
- 10% Dextrose in Water (**D10W**)
- 5% Dextrose in 0.9% Sodium Chloride (**D5NS**)
- 5% Dextrose in 0.45% Sodium Chloride (**D51/2NS**)
- 5% dextrose in Lactated Ringer's (**D5LR**)

#### Memory Trick

- **very little numbers**
- **very little fluid** in the cell!

#### Used for clients:

- Hypovolemia
- Heat related (heat exhaustion)
- Peritonitis
- **Peritoneal Dialysis**

## Highest Priority - Safety

### Who to see first

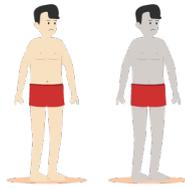
#### ABCs

Airway, Breathing = Oxygenation

- Low PaO<sub>2</sub> norm: 80 -100
- High CO<sub>2</sub> **OVER 45**
- Mental changes:** Restless, agitation
- Skin:** Pale, dusky, cool & clammy

Circulation

- Bleeding - High PTT / INR
- Shock - Severe low BP
- Chest pain (any kind)
- HTN crisis (over 180 sys)



**PTT & INR**

#### Infection

- Priority: Less than 5,000 WBC "Leukopenia"

#### Kidney Labs

- Creatinine **OVER 1.3** = Bad kidney!

#### Pain

- Lose life or limb**
  - Chest Pain = #1 priority
  - Compartment Syndrome
    - Cast / broken limb pain = **Unrelieved with pain meds**

**PRIORITY**



**< 5000**  
Leukopenia

**Creatinine > 1.3**



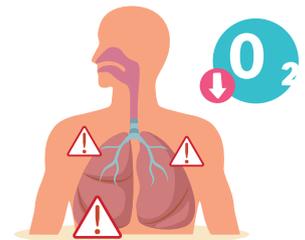
### ABGs (not pulse oximeter)

- PaO<sub>2</sub>: 80 - 100 normal **60 or less**  
= HypOXemic Respiratory failure **LOW O<sub>2</sub>**
- PaCO<sub>2</sub>: 35 - 45 **50 or MORE**  
= HyperCapnic Respiratory failure **HIGH CO<sub>2</sub>**
  - HyperCap = Give BiPAP
  - Intubate & ventilate

### Abnormal blood gases (ABGs)



ABG	HCO <sub>3</sub>	pCO <sub>2</sub>	pH
Respiratory Acidosis	Normal	↑	↓
Respiratory Alkalosis	Normal	↓	↑



### Bleeding

- INR - Over 4
- aPTT - Over 100

- STOP / Hold drug
- Assess - bleeding
- Prep antidote

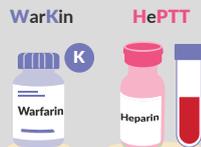
Warfarin - Vitamin K  
Heparin - Protamine Sulfate

- Report to HCP

**INR > 1.3    aPTT > 100**



**Memory tricks**



### Infection

- Priority: Less than **5,000 WBC** "Leukopenia"

**Low Grade FEVER = KILL!**

- Immunocompromised
- Chemotherapy
- Taking Immunosuppressants

**PRIORITY**



**< 5000**  
Leukopenia

Low Grade **FEVER <100.4 F**



### Common NCLEX Question

An emergency room nurse is presented with four clients at the same time. Which of the following clients should the nurse see **FIRST**?

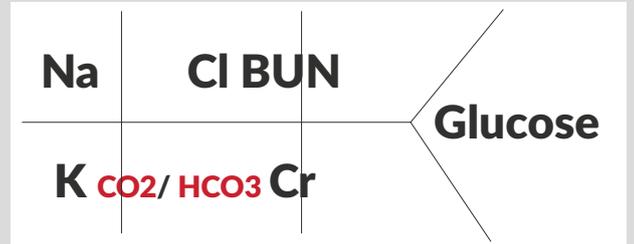
- 1. A client with a low-grade fever, headache, and fatigue for the past 72 hours.
- 2. A client with swelling and bruising to the left foot following a running accident.
- 3. A client with abdominal and chest pain following a large, spicy meal.
- 4. A child with a 10 cm laceration to the chin



## BMP Panel & Electrolytes

### BMP Basic Metabolic Panel

<b>Sodium (Na+)</b>	Swells the body
<b>Potassium (K+)</b>	Potassium pumps the heart muscles
<b>Chloride (Cl-)</b>	Helps to maintain acid base balance
<b>CO2 (Carbon Dioxide)</b>	Helps to maintain acid base pH balance (too much can put the body in Acidosis) <b>Memory trick: Carbon DiACID</b>
<b>HCO3 (Bicarbonate)</b>	Pushes the body into an alkalotic state <b>Memory trick: Bicarb Base</b>
<b>BUN &amp; Creatinine</b>	2 labs for 2 kidneys. High BUN over 20, usually means dehydration. <b>Creatinine over 1.3 = Bad Kidney</b> (kidney injury)
<b>Glucose</b>	70 - 110 <b>Normal</b> <b>Hyperglycemia</b> (over 120) usually clients with uncontrolled diabetes, <b>Hypoglycemia</b> (60 or less) brain will DIE! Very deadly



### Electrolytes Labs

**K+ 3.5 - 5.0 mEq/L**

**P**

Potassium

**P**

Priority

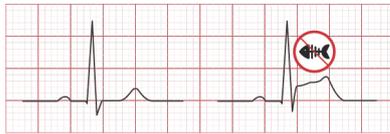
**P**

Pumps the heart

**NCLEX TIP**

**LAB:** High or Low Potassium (K+) 3.5-5.0 (normal)

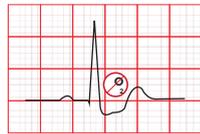
**HIGH Potassium** (5.0+)  
**HIGH Pump**  
Peaked T waves, ST elevation



Normal

ST elevation

**LOW Potassium** (Below 3.5)  
**LOW Pump**  
Flat T wave, ST depress, U wave



ST Depression

### Treatment

#### Hyperkalemia

**PHARMACOLOGY FOR HIGH K+**

1. IV Calcium Gluconate = Dysrhythmias
2. IV 50% Dextrose + Regular INSulin
3. Kayexalate (polystyrene sulfonate)
4. Dialysis

#### Hypokalemia

Potassium IV (Normal 3.5-5.0)

1. First Action = Heart monitor
2. Never push = **DEATH**
3. Only 10-20 mEq MAX per HOUR IV!!! (IV Pump)
4. Slow infusion (if arm burns)

### Common NCLEX Question

Patient with chronic kidney disease missed 3 dialysis sessions... **potassium level of 8.1** ... **wide QRS complexes, heart rate of 58** & lethargy. Which order should the nurse implement first?

- 1V 50% Dextrose & regular insulin
- 2. Sodium polystyrene sulfonate
- 3. Hemodialysis
- 4. IV calcium gluconate

End stage renal disease... **potassium 7.2**, BUN 35, **creatinine of 3.8**, and urine output of 300 ml in 24 hours. Which order is the **PRIORITY**?

- 1V Regular insulin R & 50% Dextrose 2.
- IV loop diuretic
- 3. Dialysis
- 4. Put in for vacation time?

**Na 135 - 145 mEq/L**

**S**

Sodium

**S**

Swells the body with FLUID

**Na 135 - 145 mEq/L**

#### Low Sodium - Low & Slow

- "Mental Status change" = **PRIORITY**
- Seizures & Coma
- Respiratory Arrest

#### HIGH sodium = Big & Bloated

- Edema (swollen body)
- Increased muscle tone
- Flushed "red & rosy" skin

**Ca 9.0 - 10.5 mEq/L**

**C**

Calcium

**C**

Contracts the muscles

**Ca 9.0 - 10.5 mEq/L**

#### Low calcium

- Diarrhea
- 2 dance moves:
- **T & C**
  - **T** - Trousseau's Twerking arm when BP cuff on
  - **C** - Chvostek's Cheek smile when stroking face

#### HIGH Calcium

- Stones, moans & groans
- Kidney Stones
- Constipation

**T**

Trousseau's Twerking arm when BP cuff on

**C**

Chvostek's Cheek smile when stroking face

**Mg+ 1.3 - 2.1 mEq/L**

**M**

Magnesium

**M**

Mellows the muscles

**Mg+ 1.3 - 2.1 mEq/L**

#### Low magnesium

- **Torsades De Pointes & V Fib!** **NCLEX TIP**
- Hyperreflexia
- Increased DTR

#### HIGH magnesium

- Decreased DTR
- Hyporeflexia



Torsades de pointes



Ventricular Fibrillation

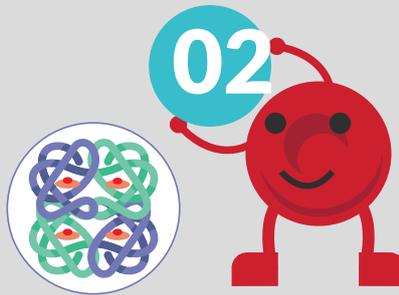
## CBC - Complete Blood Count



White Blood Cells (WBC)	<b>Immunity</b> - the defense system of the body to fight infection. Normal: 5,000 - 10,000
Hemoglobin & Hematocrit (H & H)	The whole blood in the blood vessels. <b>Hemoglobin:</b> oxygen carriers on the red blood cells. <b>Hematocrit:</b> the ratio of RBC & total blood volume.
Platelets (PLT)	<b>Blood clotting proteins</b> that help to stop bleeding by forming scabs, but also creates blood clots which can KILL! Platelets <b>Plug</b> the bleeding

### Hemoglobin

- Normal: 12 - 18
- Risky: 8 - 11
  - REPORT to HCP & Surgeon (if before surgery)
  - Bleeding & Anemia**  
Malnutrition, Cancers
- Below 7 = Heaven or blood transfusion**
  - Top S/S: NCLEX TIP**
    - Pale skin: pallor, dusky skin tones
    - Cool clammy skin
    - Fatigue, Weakness



**Normal** 12 - 18

**Risky** 8 - 11

**Below** 7



Hematocrit - hemato creek



### Hematocrit

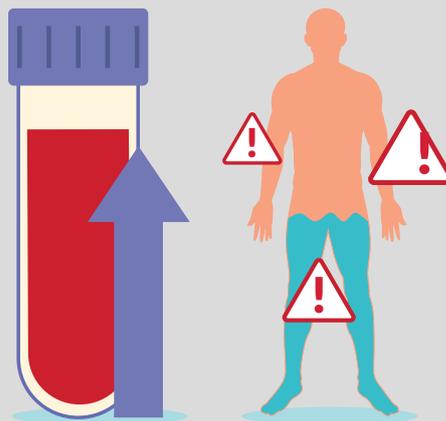
- Normal: 36 - 54%
- Elevated Hct = Dehydration
- Decreased Hct =
  - Fluid Volume Overload
  - Bleeding, Anemia, Malnutrition

### H/H: Ratio

1/3 ratio	12/36 ratio	18/54 ratio
<b>1:3</b>	<b>12:36</b>	<b>18:54</b>

### RBC - Red blood cell count

- 4 - 6 million
- Low = Anemia, Renal Failure
  - Iron (Fe+)
  - Erythropoietin
- High = Dehydration
  - High Labs = Dry body

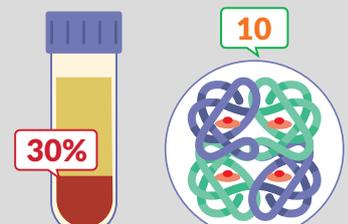


### Saunders's

Client with gastrointestinal (GI) **bleeding...** laboratory results **hematocrit level of 30%**. Which **action** should the nurse take?  
**10 Hemoglobin**

- Report the abnormally low level

**Abnormally low level**



## WBC's & Coagulation Panel

### WBC - White Blood Cells

#### 1. WBC Total Count

Normal: 5,000-10,000

- Higher = Leukocytosis
  - Infection (Sepsis)
  - Steroids (prednisone)
- Low = "Leukopenia"
  - Chemotherapy
  - Radiation - Bone Marrow Suppression
  - Immunosuppressant Drugs
  - Lupus - Autoimmune Diseases

#### Neutropenic precautions:

- Low Grade Fever = Priority
- Private Room
- No fresh fruits / flowers
- Avoid crowds & sick people
- NO drinking water pitcher or sitting out

#### 2. CD4 Count

Norm: Over 200

- Below = AIDS (active form of HIV)



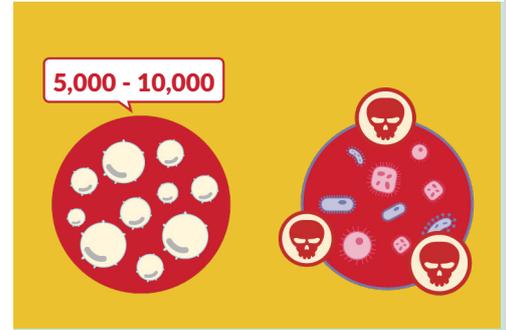
**PRIORITY**



### Common Exam Question

Which blood laboratory test results should the nurse report to the HCP?  
Select all that apply

- ✓ 1. Hemoglobin 6 g/dL
- ✓ 2. Potassium 6.5 mEq/L
- ✓ 3. Sodium 150 mEq/L
- ✓ 4. White blood cells, 2,000 mm<sup>3</sup>
- ✓ 5. Platelets 45,000 mm<sup>3</sup>



### Coagulation Panel

#### PLATELETS

150k - 400k



#### PTT

30 - 40

HeParin  
46 - 70



#### INR

0.9 - 1.2

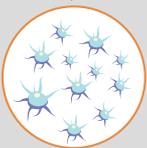
WarfarIN  
2 - 3



Never be more than these max ranges!



<150k



<50k



**NCLEX**

**SAFETY FIRST!**

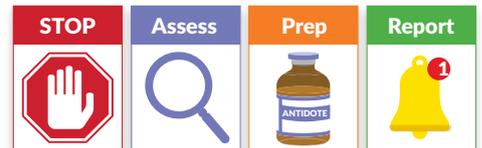
Focus on things that **WILL KILL** the patient **FIRST!**



### NCLEX Question

Client is on Warfarin with an INR of 4.5 ...  
Client on Heparin PTT of 100

- ✓ 1. Stop or Hold drug
- ✓ 2. Assess - bleeding
- ✓ 3. Prep antidote
- ✓ 4. Report to HCP



### Notes

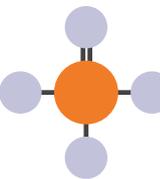
<b>LABS</b>	<b>NORMAL RANGE</b>	
<b>Na+</b>	135 - 145	Sodium Swells the body
<b>K+</b>	3.5 - 5.0	Potassium Pumps Heart
<b>Cl-</b>	97 - 107	
<b>Ca</b>	9.0 - 10.5	Calcium Contracts Muscles
<b>Mg+</b>	1.3 - 2.1	Mag. Mellows Muscles
<b>Albumin</b>	3.5 - 5.0	Liver
<b>Creatinine</b>	Over 1.3	Bad Kidney
<b>BUN</b>	10 - 20	Kidney
<b>Glucose</b>	70 - 110	Hypogly = Brain Die
<b>WBC</b>	5,000 - 10,000	High = Infection
<b>RBC</b>	(M) 4.7 - 6.1 (F) 4.2 - 5.4	Low = Anemia
<b>Hgb</b>	(M) 14 - 18 (F) 12 - 16	Below 7 = Blood Trans
<b>Hct</b>	(M) 42 - 52 (F) 37 - 47	
<b>PLTS</b>	150k - 400k	AsaParin, CloPidogrel
<b>PT</b>	11 - 12.5	
<b>aPTT</b>	30 - 40	
<b>INR</b>	0.9 - 1.2	
<b>Therapeutic Range while on Anticoags</b>		
<b>aPTT</b>	46 - 70	
<b>INR</b>	2 - 3	
<b>* 3 x MAX range</b>		

# Fluid & Electrolyte Basics

## Fundamentals of Nursing

Electrolytes	Function	Hyper HIGH	HypO LOW
<b>Magnesium Mg<sup>+</sup></b> <b>1.3 - 2.1</b> 	 Magnesium   Mellows the muscles 	<b>HYPER</b> magnesemia (over <b>2.1</b> ) <b>Manifestations (S/S)</b> <b>Heart = High Mellow</b> 1 - Heart block, 2 - Hypotension, Bradycardia <b>DTR = High Mellow</b> - <b>Lungs &amp; GI = High Mellow</b> -Depressed respirations -Hypoactive bowel sounds <b>Causes:</b> -Renal failure -Alcoholism -Malnourishment	<b>HYPO</b> magnesemia (below <b>1.3</b> ) <b>Manifestations (S/S)</b> <b>Heart = Low Mellow - Excited!</b> 1 - <b>Torsades de Pointes</b> <b>TOPTESTED</b> & V Fib (ventricular fibrillation) <b>DTR = Low Mellow - Excited!</b> - <b>HYPER</b> reflexia (increased DTR) <b>GI = Low Mellow - Excited!</b> -Diarrhea -Hyperactive bowel sounds <b>Causes:</b> -Crohn's disease -Celiac disease

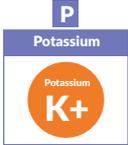
Electrolytes	Function	Hyper HIGH	HypO LOW
<b>Calcium Ca</b> <b>9.0 - 10.5</b> 	 Calcium   Contracts the muscles  <b>Keeps the 3 B's Strong</b> B - Bone B - Blood (clotting) B - Beats (heart)	<b>HYPER</b> calcemia (over <b>10.5</b> ) <b>Manifestations (S/S)</b> <b>HIGH Calm</b> 1 - Kidney stones, moans & groans (Renal Calculi) 2 - Constipation 3 - Bone pain 4 - Severe muscle weakness & lethargy <b>Causes:</b> - <b>Hyper</b> parathyroidism <b>High PTH</b> = High Calcium -Cancer -Immobility	<b>HYPO</b> calcemia (below <b>9.0</b> ) <b>Manifestations (S/S)</b> Low Calm = Excited! 1 - <b>T</b> - Trousseau's Sign Twerker arm when BP cuff on Tetany: muscle spasms all over 2 - <b>C</b> - Chvostek's Sign Cheek smile when stroking face 3 - Diarrhea 4 - Weak B's Weak Bones = Fractures Weak Blood clotting = r/f bleeding Weak Beats = Cardiac dysrhythmias <b>Causes:</b> - <b>Hypo</b> parathyroidism <b>Low PTH</b> = Low Calcium -Renal failure <b>TEST TIP</b> Chronic kidney disease (CKD)

Electrolytes	Function	Hyper HIGH	HypO LOW
<b>Phosphate</b> <b>3.0 - 4.5</b> 	Inverse relationship with <b>Calcium</b> -Ca <b>HIGH</b> = Phosphate <b>Low</b> -Ca <b>Low</b> = Phosphate <b>HIGH</b>  	<b>HYPER</b> phosphatemia (over <b>4.5</b> ) <b>Manifestations (S/S)</b> <b>Think Low Calcium signs</b> 1 - Trousseau's & Tetany 2 - Chvostek's 3 - Weak B's (bones, blood, beats) <b>Causes:</b> -Renal failure <b>TEST TIP</b> Chronic kidney disease (CKD)	<b>HYPO</b> phosphatemia (below <b>3.0</b> ) <b>Manifestations (S/S)</b> <b>Think High Calcium signs</b> 1 - Kidney stones, moans & groans (Renal Calculi) 2 - Constipation 3 - Bone Pain 4 - Severe muscle weakness & lethargy <b>Causes:</b> - <b>Hyper</b> parathyroidism <b>High PTH</b> = High Calcium -Genetics -Cancer

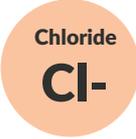
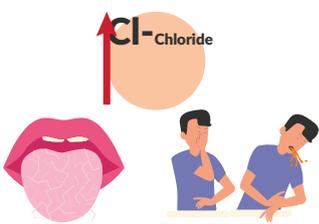
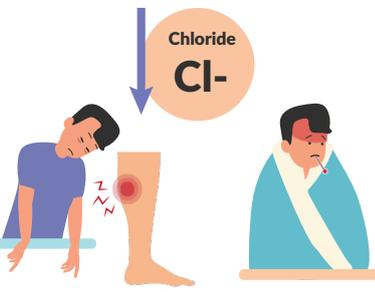
## Fundamentals of Nursing

### Electrolyte Imbalances

We are breaking down the **top tested** causes & critical manifestations (signs & symptoms) of how our clients present when electrolytes are out of balance. Some imbalances can be deadly. Remember, the **MOST deadly** conditions are typically the **MOST tested** conditions since the main goal of nursing school is to create safe nurses who know how to **spot when something is not right**.

Electrolytes	Function	Hyper HIGH	HypO LOW
<b>Potassium K+</b> <b>3.5 - 5.0</b>  	  	<b>HYPERkalemia</b> (over 5.0)  <b>Manifestations (S/S)</b> <b>Heart = HIGH pumps</b> 1 - <b>Peaked T waves</b> & ST elevation 2 - Severe: V Fib & cardiac arrest 3 - Hypotension & bradycardia <b>Neuromuscular = HIGH</b> 1 - <b>Increased DTR</b> 2 - Paralysis & paresthesia (tingling) 3 - <b>Muscle weakness</b> (general feeling heaviness) <b>GI =</b> <b>HIGH pumps</b> 1 - Diarrhea 2 - <b>Hyper</b> active bowel sounds  <b>Causes:</b> - Renal failure - Low aldosterone <b>Memory Trick for AL</b> <b>A</b> - Adds Sodium <b>L</b> - Loses Potassium	<b>HYPOkalemia</b> (below 3.5)  <b>Manifestations (S/S)</b> <b>Heart = Low &amp; slow pump</b> 1 - Flat T waves, ST depression, & U waves <b>Neuromuscular = Low &amp; slow</b> 1 - <b>Shallow respirations! Most DEADLY</b> 2 - <b>Decreased DTR</b> 3 - Muscle cramping & flaccid paralysis (paralyzed limbs) <b>GI = Low &amp; slow</b> 1 - Constipation 2 - <b>HypO</b> active bowel sounds 3 - Paralytic ileus (paralyzed intestine) <b>Priority*</b> risk for SBO  <b>Causes:</b> Fluid loss, electrolyte loss "Where fluids flow, electrolytes goooo!" <b>D</b> iarrhea, <b>D</b> iuretics, <b>D</b> iet, <b>D</b> KA, <b>A</b> ldosterone

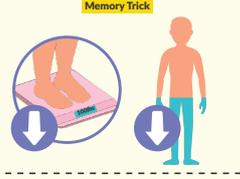
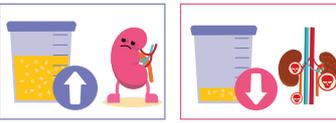
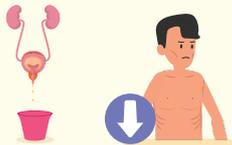
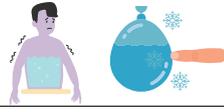
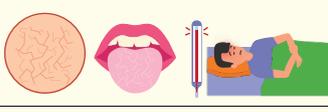
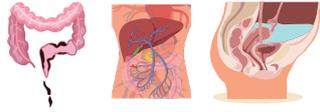
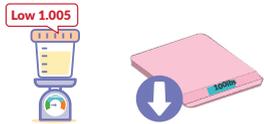
Electrolytes	Function	Hyper HIGH	HypO LOW
<b>Sodium Na+</b> <b>135 - 145</b>  	  Maintains: • Blood pressure • Blood volume • pH balance	<b>HYPERnatremia</b> (over 145)  <b>Manifestations (S/S)</b> <b>Body = Big &amp; bloated</b> 1 - <b>Edema</b> (swollen body) 2 - Flushed "red & rosey" skin 3 - <b>Increased muscle tone</b> 4 - Swollen dry tongue 5 - Nausea & vomiting  <b>Causes:</b> -Low ADH (antidiuretic hormone) <b>DI: Diabetes Insipidus</b> <b>Think Dry Inside</b> -Rapid respirations - Watery diarrhea -Loss of thirst	<b>HYPONatremia</b> (below 135)  <b>Manifestations (S/S)</b> <b>Brain = Low &amp; slow</b> 1 - <b>Headache = Cerebral edema</b> 2 - Mental status changes 3 - Seizures & coma <b>Muscular = Low &amp; slow</b> - Fatigue & muscle cramps <b>Respiratory = Low &amp; slow</b> - <b>Respiratory Arrest</b>  <b>Causes:</b> - Sweating - Excess water intake (running in the extreme heat) <b>TEST TIP</b> - SIADH (Excess ADH) - Vomiting & diarrhea, - Diuretics & diuresis - Diet low in salt - Low aldosterone

Electrolytes	Function	Hyper HIGH	HypO LOW
<b>Chloride Cl-</b> <b>97 - 107</b>  	Related to sodium Maintains: • Blood pressure • Blood Volume • pH balance  	<b>HYPERchloremia</b> (Over 107)  <b>NEARLY SAME AS HIGH SODIUM</b>  1 - Swollen dry tongue 2 - Nausea & vomiting Metabolic Alkalosis - vomiting  	<b>HYPochloremia</b> (Below 97)  <b>NEARLY SAME AS low SODIUM</b>  1 - Fatigue & muscle cramps 2 - Fever (only difference)  

# Fluid & Electrolyte Basics

## Fundamentals of Nursing

### Manifestations - Signs & Symptoms

Fluid Volume Overload	Fluid Volume Deficit	Fluid Volume Overload	Fluid Volume Deficit
<p><b>Hypervolemia</b>  <b>HIGH</b> fluid volume                      Big Bulging Body</p>	<p><b>HYP</b>ovolemia  <b>LO</b>w fluid volume                      LOw &amp; Little Body</p>	<p><b>Hypervolemia</b>  <b>HIGH</b> fluid volume                      Big Bulging Body</p>	<p><b>HYP</b>ovolemia  <b>LO</b>w fluid volume                      Low &amp; Little Body</p>
<p><b>BIG &amp; Bulging Body</b>  <b>BIG</b> fluid volume</p> 	<p><b>LOW &amp; Little Body</b>  <b>LOW</b> fluid volume</p> 	<p><b>Weight Gain = Water Gain</b>  <b>Key Numbers</b></p> <ul style="list-style-type: none"> <li>• 2 - 3 lbs in 1 day</li> <li>• 5 lbs in 7 days</li> </ul> 	<p><b>Weight Loss = Water Loss</b></p> <p><b>Memory Trick</b></p> 
<p><b>Cardiovascular</b></p> <ul style="list-style-type: none"> <li>• High blood pressure <b>DEADLY</b>                      Hypertension (140 systolic) <b>HITS C/F/B/S</b>                      (180 systolic) Stroke Risk Increased</li> <li>• central venous pressure CVP</li> <li>• Bounding pulses</li> <li>• Big distended veins</li> <li>• Jugular vein distention (JVD)</li> </ul>	<p><b>Cardiovascular</b></p> <ul style="list-style-type: none"> <li>• Low blood pressure <b>DEADLY</b>                      Orthostatic hypotension <b>TEST TIP</b>                      (light-headed &amp; dizziness upon standing)</li> <li>• Decreased central venous pressure CVP</li> <li>• Weak, thready pulses</li> <li>• Flat neck &amp; hand veins</li> <li>• Tachycardia (pulse over 100) <b>TEST TIP</b></li> </ul>	<p><b>Renal &amp; Urinary</b></p> <ul style="list-style-type: none"> <li>• Increased urine output Decreased</li> <li>• urine output (renal issues)</li> </ul> 	<p><b>Renal &amp; Urinary</b></p> <ul style="list-style-type: none"> <li>• Increased urine output initially &amp; Decreased urine output (at end)</li> </ul> 
<p><b>Integumentary (skin)</b></p> <ul style="list-style-type: none"> <li>• Periorbital <b>edema</b></li> <li>• Pitting <b>edema</b> (think water bed skin) from hydrostatic pressure</li> <li>• Pale <b>cool skin</b></li> </ul> 	<p><b>Integumentary (skin)</b></p> <ul style="list-style-type: none"> <li>• Sunken eyes</li> <li>• Dry skin (Poor turgor &amp; tenting)</li> <li>• Dry mucous membranes (MM)</li> <li>• Increased body temp</li> </ul> 	<p><b>Respiratory</b></p> <ul style="list-style-type: none"> <li>• Rapid <b>shallow</b> respiratory rate</li> <li>• <b>Rales</b> (Moist crackles) - fluid in lungs</li> <li>• Pulmonary edema</li> </ul> 	<p><b>Respiratory</b></p> <ul style="list-style-type: none"> <li>• Rapid <b>DEEP</b> respiratory rate</li> </ul> 
<p><b>Neuromuscular</b></p> <ul style="list-style-type: none"> <li>• ALOC - altered level of consciousness                      "Mental status changes"</li> <li>• <b>Headache</b></li> <li>• Weakness &amp; paresthesias</li> </ul> 	<p><b>Neuromuscular</b></p> <ul style="list-style-type: none"> <li>• Lethargy to coma</li> <li>• Weakness</li> </ul> 	<p><b>Gastrointestinal</b></p> <ul style="list-style-type: none"> <li>• Increased motility - Diarrhea</li> <li>• Hepatomegaly (enlarged liver)</li> <li>• Ascites (abdominal fluid)</li> </ul> 	<p><b>Gastrointestinal</b></p> <ul style="list-style-type: none"> <li>• Decreased motility - Constipation</li> <li>• Diminished bowel sounds</li> </ul> 
<p><b>Urine</b> (Low when Liquidy)</p> <ul style="list-style-type: none"> <li>• <b>Decreased</b> urine specific gravity</li> <li>• Low 1.005 (Normal 1.005 - 1.030)</li> <li>• Low gravity = Low Weight</li> </ul> 	<p><b>Urine</b> (High when Dry)</p> <ul style="list-style-type: none"> <li>• <b>Increased</b> urine specific gravity</li> <li>• High 1.005 (Normal 1.005 - 1.030)</li> <li>• High gravity = High Weight</li> </ul> 	<p><b>Lab Values</b> (Low when Liquidy)</p> <ul style="list-style-type: none"> <li>• <b>Decreased</b> Osmolality</li> <li>• <b>Decreased</b> Hematocrit (Hct)</li> <li>• <b>Decreased</b> Blood Urea Nitro (BUN)</li> <li>• <b>Decreased</b> Electrolytes</li> <li>• Low Sodium Na+</li> <li>• <b>Hyponatremia</b> (below 135 mEq/L)</li> <li>• Risk for brain damage</li> </ul>	<p><b>Lab Values</b> (Appear High when Dry)</p> <ul style="list-style-type: none"> <li>• <b>Increased</b> Osmolality</li> <li>• <b>Increased</b> Hematocrit (Hct)</li> <li>• <b>Increased</b> Blood Urea Nitro (BUN)</li> <li>• <b>Increased</b> Electrolytes</li> <li>• High Sodium Na+ <b>Hypernatremia</b> (over 145 mEq/L)</li> <li>• Risk for brain bleeding</li> </ul>

### Notes

# Top 5 Toxic Drug Levels

1. Lithium **1.5 +**
2. Digoxin **2.0 +**
3. Theophylline **20 +**
4. Phenytoin **20 +**  
(brand: Dilantin)
5. Kidney Killers:

**Creatinine Over 1.3** = dead kidney

- CT contrast
- Antibiotics: Vancomycin & Gentamicin

## NCLEX TIP

**HIGHEST** risk for toxicity  
Decreased **renal** function  
Creatinine **Over 1.3** = Bad Kidney

- Renal Failure
- Older Age



## Lithium: **1.5 +**

### Top Signs leading to toxicity

1. Extreme thirst
2. Excessive urination
3. Vomiting / diarrhea



## Digoxin **2.0 +**

### Top Signs of toxicity

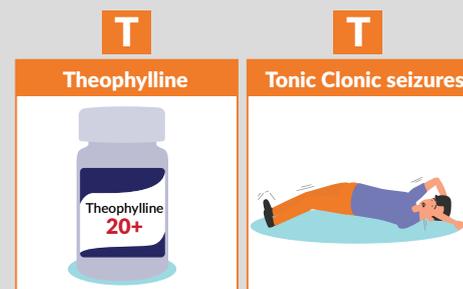
- Nausea & Vomiting
  - **Vision** changes  
"difficulty reading"
- D - Digoxin  
D - Difficulty reading



## Theophylline **20+**

### Top Signs of toxicity

- Seizures
- T - Theophylline  
T - Tonic Clonic seizures



## Phenytoin **2.0 +**

### Top Signs of toxicity

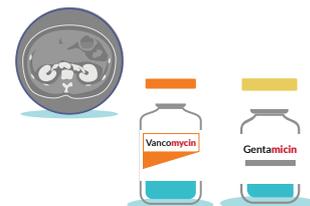
1. Ataxia - unsteady gait
2. Hand tremors
3. Slurred speech



## Kidney Killers

(creatinine over 1.3 = bad kidney)

- CT Contrast
- Mycin Antibiotics



Notes