# Most Common & Relevant Clinical Lab Values w/Significance to Patient Care:


## I. Blood Chemistries

### Sodium: Hyponatremia

- **Patho**: *Most abundant cation in extracellular fluid*
  - *Maintains osmotic pressure of extracellular fluid*
  - *Regulates renal retention & excretion of water*
  - *Responsible for stimulation of neuromuscular reactions & maintains SBP*

- **Normal Range**: Serum below 135 mEq/L…critical <120

- **Causes**: *Excess sodium loss through N-V-D, skin and kidneys*
  - *Excess diuretic dosage*
  - *Liver Failure*
  - *CHF*
  - *Increased hypotonic IV fluids*

- **Treatments**: *Sodium containing fluids*
  - *Isotonic Ringers*
  - *NS 0.9% or 3%*

- **Nsg Considerations**: THINK VOLUME
  - *Monitor electrolytes*
  - *Monitor vital signs*
  - *Monitor neurological responses*
  - *Mental Status*
  - *Headaches*
  - *Monitor fluids/I&O for overload*
  - *Weight*
  - *Cardiac overload-CHF*
  - *Monitor musculoskeletal-
    *Monitoring fluids/I&O for overload*
  - *Weakness-Tremor*

### Sodium: Hypernatremia

- **Patho**: Serum above 145 mEq/L…critical >160

- **Causes**: *Dehydration-fluid loss through N-V-D (water loss in excess of salt loss) or excessive sweating*
  - *Diabetes-DKA*
  - *Fever*

- **Treatments**: *Replace fluids *D5%W*
  - *Diuretics- Excrete excess volume and excrete*

- **Nsg Considerations**: THINK VOLUME
  - *Monitor electrolytes*
  - *Monitor vital signs*
  - *Mental Status*
  - *Weight/I&O*
  - *Monitor for seizures*

### Potassium: Hypokalemia

- **Patho**: *Most abundant intracellular cation and is essential for transmission of electrical impulses in cardiac and skeletal muscle*
  - *Helps maintain acid-base balance and has inverse relationship to metabolic pH…decrease in pH of 0.1 (acidosis) increases K+ by 0.6 mEq/L*
  - *80-90% K+ filtered through the kidney*

- **Normal Range**: Serum below 3.5 mEq/L…critical <2.5

- **Causes**: *Inadequate intake of K+*
  - *ETOH abuse*
  - *CHF/HTN*
  - *GI Loss-V&D*
  - *Renal Loss*
  - *Diuretics-Loop (Lasix/Bumex)*

- **Treatments**: *Oral or Parenteral Potassium*
  - *Diet high in potassium*
  - *Balanced electrolyte solutions*
  - *Pedialyte*
  - *Sports drinks*

- **Nsg Considerations**: THINK ELECTRICITY
  - *Monitor electrolytes*
  - *Monitor vital signs-low BP*
  - *Monitor cardiac responses*
  - *Irregular heart rate and rhythm for increased ectopy-PVC’s/VT*
### Potassium: Hyperkalemia
- **Normal Range**: Serum above 5.0 mEq/L...**critical >6**
- **Causes**:
  - Metabolic acidosis
  - Dehydration
  - Excess Potassium intake
  - Potassium Sparing Diuretics
  - Tissue damage= *Burns (K goes out of cell)
  - Renal Failure
- **Treatments**:
  - Insulin- Moves K into the cell
  - D50- Prevents hypoglycemia caused by the infusion of Insulin
  - IV Calcium Gluconate = ER measure to counteract cardiac effects of Potassium
  - Sodium Bicarbonate- Treats the acidosis caused when K moves into the cell and pushes hydrogen ion into the serum
- **Nsg Considerations**
  - THINK ELECTRICITY
    - Monitor electrolytes
    - Monitor cardiac responses
    - Monitor musculoskeletal cramps, weakness, parathesias
    - Peaked T wave/ wide QRS
    - Monitor Neurological responses, mental status, headache
    - Irregular heart rate and rhythm for increased ectopy-PVC’s/VT

### Magnesium: Hypomagnesemia
- **Normal Range**: Serum below 1.8 mEq/L...**critical <1.2**
- **Causes**:
  - Chronic Alcoholism
  - GI Loss-V&D
  - Impaired absorption
  - Renal Disease
  - Pancreatitis
- **Treatments**:
  - Treat underlying cause
  - GI Loss
  - Give Magnesium replacement
- **Nsg Considerations**
  - THINK NEUROMUSCULAR TRANSMISSION
    - Monitor electrolytes
    - Monitor vital signs
    - Tachycardia
    - Increased PVC’s
    - VTach
    - Hypertension
    - Tremors, tetany, paresthesias
    - Muscle weakness

### Magnesium: Hypermagnesemia
- **Normal Range**: Serum above 2.6 mEq/L...**critical >6.1**
- **Causes**:
  - Dehydration
  - Severe metabolic acidosis
  - Renal Failure
  - Tissue trauma
- **Treatments**:
  - Treat underlying cause
  - Renal patients treat with dialysis
  - Monitor cardiac effects of magnesium-increased PVC’s-VT
  - Give Calcium Gluconate
- **Nsg Considerations**
  - THINK NEUROMUSCULAR TRANSMISSION
    - Monitor electrolytes
    - Monitor vital signs
    - Bradycardia
    - Hypotension
    - Muscle weakness
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<th>Pathophysiology</th>
<th>Normal Range</th>
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</table>
| Calcium: Hypocalcemia | Serum below 8.5 mEq/L…critical <7 | *ETOH abuse  
*Pancreatitis  
*Chronic renal failure  
*Decreased Vitamin D (Sunshine)  
*Lack of weight bearing  
*Loop Diuretics  
*Hypomagnesemia | Oral Calcium carbonate/gluconate Calcium chloride (more irritating to the vein) Watch for extravasate into subcutaneous tissue | THINK MUSCLE RESPONSE  
*Monitor electrolytes  
*Monitor vital signs  
*Cardiac Output decreased  
*Hypotension  
*Dysrhythmias  
*Monitor neuromuscular responses: seizures, tetany, paresthesias, muscle spasms |
| Calcium: Hypercalcemia | Serum above 10.5 mEq/L…critical >12 | *Prolonged immobilization  
*Dehydration  
*Cancer  
*Excess Antacid Intake | *Eliminate Calcium through kidneys through IV fluids  
*Loop diuretic to promote elimination of calcium | THINK MUSCLE RESPONSE  
*Monitor electrolytes  
*Monitor vital signs  
*Hypertension  
*Monitor GI: N&V-anorexia  
*Dysrhythmias |
| Creatinine | Decreased in:  
Decreased skeletal muscle  
Inadequate protein intake  
Increased in:  
CHF  
Dehydration  
Acute & chronic renal failure  
Shock | Correct underlying problem  
Fluid resuscitation to keep SBP>90  
Dialysis | THINK FLUID BALANCE  
*Assess I&O closely  
*Fluid restriction  
*Assess for signs of fluid retention/edema |
| *Most abundant cation in body and necessary for almost all vital processes  
*Half of total body calcium circulates as free ions that participate in coagulation, neuromuscular conduction, intracellular regulation, control of skeletal and cardiac muscle contractility  
*98-99% calcium reserves stored in teeth and skeleton | *End product of creatine metabolism which is performed in skeletal muscle  
*Small amount of creatine is converted to creatinine which is then secreted by kidneys  
*Amount of creatinine generated proportional to mass of skeletal muscle | 0.5-1.3 mg/dl  
*Gold standard for kidney function because creatinine is produced in consistent quantity and rate of clearance reflects glomerular filtration | |
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<td><strong>Blood Urea Nitrogen (BUN)</strong></td>
<td>10-20 mg/dl ...critical &gt;100</td>
<td>Decreased in: Poor protein intake/malnutrition, Liver disease, Malabsorption syndromes</td>
<td>*Fluid resuscitation-HIGH *Dialysis-HIGH *Improve nutritional intake/Failure to thrive-LOW</td>
<td>THINK FLUID BALANCE</td>
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<td>Increased in: Acute renal failure, CHF, Hypovolemia-dehydration, Pyelonephritis, Hyperalimentation/TPN</td>
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<td>*Assess I&amp;O closely *Fluid restriction *Assess for signs of fluid retention/edema *Assess for agitation, confusion, fatigue, *N&amp;V-HIGH *Assess liver profile labs for correlating liver damage</td>
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<td><strong>Hemoglobin-HGB</strong></td>
<td>Adult 13-17 g/dl...critical &lt;6 or &gt;18</td>
<td>Decreased in: Anemia, Cancer, Fluid retention/overload, Hemorrhage</td>
<td>*Correct underlying problem *Blood transfusions if symptomatic</td>
<td>THINK BLOOD LOSS/ANEMIA</td>
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<td>Increased in: COPD, CHF, Dehydration, Polycythemia</td>
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<td>*Identify early signs of blood loss: tachycardia, then hypotension *Transfuse as needed-assess closely in first 30&quot; for transfusion reactions *Assess for signs of tissue hypoxia (see above)</td>
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**Range of Anemias:**
- **Mild:** Hgb 10-12 g/dl- asymptomatic
- **Moderate:** Hgb 6-10 g/dl weakness, fatigue, palpitations, SOB, decreased tol to activity-orthostatic hypotension
- **Severe:** Hgb < 6 g/dl Hypoxia: confusion, SOB, skin pallor-MM/nailbeds, dizziness, weakness, tachycardia
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<td><strong>White Blood Cell</strong></td>
<td><em>WBC represent primary defense against invading infections</em></td>
<td>4,500-11,000 mm$^3$…<strong>critical &lt;2500 or &gt;15,000</strong></td>
<td>Decreased in: ETOH abuse Anemia Bone marrow depression Viral infections</td>
<td><em>Identify infectious process</em> <em>Confirm bone marrow depression in chemo/radiation therapy</em></td>
<td><strong>THINK INFECTION</strong> <em>Low or elevated WBC can represent sepsis</em> <em>Assess closely for hypotension with known infection (septic shock)</em> <em>Assess closely for any change in temperature trend-hypothermia or febrile can both represent sepsis especially in elderly</em></td>
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<td><strong>Count (WBC)</strong></td>
<td><em>This is a total count of all 5 leukocytes: neutrophils, lymphocytes, eosinophils, basophils, and monocytes</em> <em>Indicates overall degree of body’s response to pathology, but must be evaluated and correlated through differential count</em> <em>Elevated WBC due to significant increase in one differential-usually the neutrophil</em> <em>Physiologic stress or steroids will increase WBC</em></td>
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<td><strong>Increased in:</strong> Infection Anemia Inflammatory disorders Steroid use (acute or chronic)</td>
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<td><strong>Critical or clinical concern &gt;80%</strong></td>
<td><strong>Increased in:</strong> Infection Acute hemorrhage Physical stress Tissue necrosis/injury</td>
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<td><strong>Decreased in:</strong> Bone marrow depression (chemo/radiation therapy) Viral infection (due to increased lymphocytes)</td>
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<td><strong>Neutrophils</strong></td>
<td><em>Most predominant differential WBC- comprise 50-70% of all WBC’s</em></td>
<td>50-70% of differential…<strong>critical or clinical concern &gt;80%</strong></td>
<td><strong>Increased in:</strong> Infection Acute hemorrhage Physical stress Tissue necrosis/injury</td>
<td><em>Identify infectious process</em> <em>Confirm bone marrow depression in chemo/radiation therapy</em></td>
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<td><em>First line of defense against bacterial infection through phagocytosis (think pacman)</em> <em>BANDS- if present on differential-correlate with overwhelming sepsis. Immature neutrophils body is kicking into circulation before they are ready because of the severity of infection/sepsis</em></td>
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### III. Cardiac

**Troponin**

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<td><em>Contractile protein found in cardiac muscle that will be released into systemic circulation with cardiac ischemia or acute MI</em>&lt;br&gt;<em>Levels will rise 2-6 hours after injury-peak 16-24 hours and then remain elevated for several days</em>&lt;br&gt;<em>If acute onset CP to r/o MI they will be done every 6 hours x3 to determine pattern of abnormal elevation</em></td>
<td>&lt;0.05 ng/ml&lt;br&gt;This may vary depending on each hospital lab&lt;br&gt;If elevated this establishes diagnosis of acute MI&lt;br&gt;*If positive MI, the degree of elevation provides general barometer of degree of heart muscle damage</td>
<td>Increased in:&lt;br&gt;Acute MI&lt;br&gt;Unstable angina&lt;br&gt;Minor myocardial damage after CABG or PTCA/stent placement</td>
<td><em>Standards of cardiac care include continuous telemetry, b-blockers to decrease cardiac workload, heparin or nitroglycerin gtt.</em>&lt;br&gt;<em>Definitive treatment of MI includes PTCA/stent or CABG</em></td>
<td><strong>THINK CARDIAC-MI</strong>&lt;br&gt;<em>Assess closely for recurrent or new onset of chest pain</em>&lt;br&gt;<em>Assess cardiac rhythm for any changes such as PVC’s, VT or atrial fibrillation</em>&lt;br&gt;<em>Assess HR and SBP carefully to promote decreased cardiac workload (maintain heart rate &lt;80 and SBP &lt;140)</em>&lt;br&gt;<em>Assess tolerance to activity closely</em></td>
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<th>Brain Natriuretic Peptide (BNP)</th>
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<td><em>Hormone that is stored in the ventricle of the heart</em>&lt;br&gt;<em>When left ventricle is distended and stretched due to CHF exacerbation BNP is released into circulation Inhibits the release of renin by kidneys which promotes water and sodium loss as well as increases glomerular filtration rate (Body’s own ACE inhibitor!)</em></td>
<td>&lt;100 normal&lt;br&gt;100-500 abnormal but not critical for ventricular strain (mild)&lt;br&gt;500 critical for positive correlation of CHF exacerbation</td>
<td><em>CHF exacerbation</em>&lt;br&gt;<em>Ventricular hypertrophy (cardiomyopathy)</em>&lt;br&gt;<em>Severe hypertension</em></td>
<td><em>Aggressive diuresis for fluid overload</em>&lt;br&gt;<em>May be on NTG gtt or po Nitrates to decrease preload which decreases workload of heart</em></td>
<td><strong>THINK CARDIAC-CHF</strong>&lt;br&gt;<em>Assess respiratory status for tachypnea and breath sounds closely for basilar or scattered crackles</em>&lt;br&gt;<em>Assess HR and SBP carefully to promote decreased cardiac workload (heart rate &lt;80 and SBP &lt;140)</em>&lt;br&gt;<em>Assess tolerance to activity closely</em>&lt;br&gt;<em>Assess I&amp;O closely</em>&lt;br&gt;<em>Assess K+ closely with loop diuretics</em></td>
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