

	Patho	Ranges	Causes	Treatments	Nsg. Considerations
I. Blood Chemistries Sodium: Hyponatremia Normal: 135-145 mEq/L	*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	Serum below 135mEq/L Critical RED FLAG: <120	*Excess sodium loss through N-V-D, skin and kidneys *Excess diuretic dosage *Liver Failure *CHF *Increased hypotonic IV fluids	*Sodium containing IV fluids *Lactated Ringers *NS 0.9% or 3%	THINK VOLUME *Monitor electrolytes *Monitor vital signs *Monitor neurological responses *Mental Status *Headaches *Monitor fluids/I&O for overload *Weights daily *Cardiac overload-CHF *Monitor musculoskeletal-cramps/weakness/tremor
Sodium: Hypernatremia Normal: 135-145 mEq/L		Serum above 145 mEq/L Critical RED FLAG: >160	*Dehydration-fluid loss through N-V-D (water loss in excess of salt loss) or excessive sweating *Diabetes-DKA *Fever	*Replace fluids *D5% *Diuretics- Excrete excess volume and excrete (sodium is then concentrated with fluid volume deficit)	THINK VOLUME *Monitor electrolytes *Monitor vital signs *Mental Status *Weight/I&O *Monitor for seizures
Potassium: Hypokalemia Normal: 3.5-5.2 mEq/L	*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	Serum below 3.5 mEq/L Critical RED FLAG: <2.5	*Inadequate intake of K+ *ETOH abuse *CHF/HTN *GI Loss-V&D *Renal Loss *Diuretics-Loop: Furosemide (Lasix) Bumetadine (Bumex)	*Oral or Parenteral Potassium *Diet high in potassium *Balanced electrolyte solutions *Pedialyte *Sports drinks	THINK ELECTRICITY *Monitor electrolytes *Monitor vital signs-low BP *Monitor cardiac responses *Irregular heart rate and rhythm for increased ectopy-PVC's/VTach

Potassium: Hyperkalemia Normal: 3.5-5.0 mEq/L		<u>Ranges</u> Serum above 5.0 mEq/ Critical RED FLAG: >6	<u>Causes</u> *Metabolic acidosis *Dehydration *Excess potassium intake *Potassium sparing diuretics *Tissue damage-Burns (K+ goes out of cell) *Renal Failure	<u>Treatments</u> *Insulin- Moves K+ into the cell *D50- Prevents hypoglycemia caused by the infusion of Insulin *IV Calcium Gluconate also given at the same time to counteract cardiac effects of potassium *Sodium Bicarbonate- treats the acidosis caused when K+ moves into the cell and pushes hydrogen ions into the serum	<u>Nsg Considerations</u> 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/Vtach
Magnesium: Hypomagnesemia Normal: 1.6-2.6 mg/dL	*Second most abundant intracellular cation *Required for transmission of nerve impulses and muscle relaxation *Controls absorption of sodium, potassium, calcium, and phosphorus *Magnesium.Potassium and Calcium all go low or high together!	Serum below 1.6 mg/dL Critical RED FLAG: <1.2	*Chronic Alcoholism *GI Loss-V&D *Impaired absorption *Renal Disease *Pancreatitis	*Treat underlying cause *GI Loss *Give Magnesium replacement	THINK NEUROMUSCULAR TRANSMISSION THINK CARDIAC RESPONSE *Monitor electrolytes *Monitor vital signs *Tachycardia *Hypertension *Tremors, tetany, paresthesias *Muscle weakness
Magnesium: Hypermagnesemia Normal: 1.6-2.6 mg/dL		Serum above 2.6 mg/dL Critical RED FLAG: >6.1	*Dehydration *Severe metabolic acidosis *Renal Failure *Tissue trauma	*Treat underlying cause *Renal patients treat with dialysis *Monitor cardiac effects of magnesium-increased PVC's-VT *Give Calcium Gluconate	THINK NEUROMUSCULAR TRANSMISSION THINK CARDIAC RESPONSE *Monitor electrolytes *Monitor vital signs *Bradycardia *Hypotension *Muscle weakness

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Calcium: Hypocalcemia Normal: 8.2-10.6 mg/dL	*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	Serum below 8.2 mg/dL Critical RED FLAG: <7	*ETOH abuse *Pancreatitis *Chronic renal failure Inadequate intake *Decreased Vitamin D (Sunshine) *Lack of weight bearing *Loop Diuretics *Hypomagnesemia 1q`	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 Normal: 8.2-10.6 mg/dL		Serum above 10.6 mg/dL Critical RED FLAG: >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 Normal: 0.5-1.2 mg/dl	*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	Serum above 1.2 mg/dl *Gold standard for kidney function because creatinine is produced in consistent quantity and rate of clearance reflects glomerular filtration	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

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Blood Urea Nitrogen (BUN) Normal: 10-20 mg/dl	Urea represents end product of protein metabolism performed in the liver Urea diffuses freely in intra/extracellular fluid and then excreted by kidneys BUN reflects balance between production and excretion of urea Ratio to creatinine is 15-24:1 (if creatine 1.0 expected BUN should be 15-24) Is indirect measurement of renal function but does not reflect glomerular filtration	Critical RED FLAG: >100	Decreased in: Poor protein intake/malnutrition Liver disease Malabsorption syndromes Increased in: Acute renal failure CHF Hypovolemia-dehydration Pyelonephritis Hyperalimentation/TPN	*Fluid resuscitation-HIGH *Dialysis-HIGH *Improve nutritional intake/Failure to thrive-LOW	THINK FLUID BALANCE *Assess I&O closely *Fluid restriction *Assess for signs of fluid retention/edema *Assess for agitation, confusion, fatigue, *N&V-HIGH *Assess liver profile labs for correlating liver damage
II.Hematology Hemoglobin-HGB Normal: Adult- 13-17 g/dl	*Primary protein of erythrocytes that is composed of heme (iron) and globin (protein) *Carries O ₂ to cells and CO ₂ back to lungs *Parallels Hematocrit which is the % of RBC in proportion to total plasma volume *GOLD Standard for evaluating blood/RBC adequacy (anemia, blood loss)	Critical RED FLAG: <6 or >18 <i>Range of Anemias:</i> 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- and MM and nailbeds, dizziness, weakness, tachycardia	Clinical Uses: Detect blood loss, anemia and response to treatment Detect any possible blood disorder Decreased in: Anemia Cancer Fluid retention/overload Hemorrhage Increased in: COPD CHF Dehydration Polycythemia	*Correct underlying problem *Blood transfusions if symptomatic	THINK BLOOD LOSS/ANEMIA *Identify early signs of blood loss: tachycardia, then hypotension *Transfuse as needed- assess closely in first 30" for transfusion reactions *Assess for signs of tissue hypoxia (see above)

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White Blood Cell Count (WBC) Normal: 4,500-11,000 mm ³	*WBC represent primary defense against invading infections *This is a total count of all 5 leukocytes: neutrophils, lymphocytes, eosinophils, basophils, and monocytes *Indicates overall degree of bodies response to pathology, but must be evaluated and correlated through differential count *Elevated WBC due to significant increase in one differential-usually the neutrophil *Physiologic stress or steroids will increase WBC	Critical RED FLAG: <2500 or >15,000	Decreased in: ETOH abuse Anemia Bone marrow depression Viral infections Increased in: Infection Anemia Inflammatory disorders Steroid use (acute or chronic)	*Identify infectious process *Confirm bone marrow depression in chemo/radiation therapy	THINK INFECTION *Low or elevated WBC can represent sepsis *Assess closely for hypotension with known infection (septic shock) *Assess closely for any change in temperature trend-hypothermia or febrile can both represent sepsis especially in elderly
Neutrophils Normal: 50-70% of differential	*Most predominant differential WBC-comprise 50-70% of all WBC's *First line of defense against bacterial infection through phagocytosis (think pacman) * 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	Critical RED FLAG: >80%	Increased in: Infection Acute hemorrhage Physical stress Tissue necrosis/injury Decreased in: Bone marrow depression (chemo/radiation therapy) Viral infection (due to increased lymphocytes)	*Identify infectious process *Confirm bone marrow depression in chemo/radiation therapy	THINK INFECTION *Low or elevated WBC can represent sepsis *Assess closely for hypotension with known infection (septic shock) *Assess closely for any change in temperature trend-hypothermia or febrile can both represent sepsis especially in elderly

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III. Cardiac Troponin Normal: <0.05 ng/ml This may vary depending on each hospital lab	*Contractile protein found in cardiac muscle that will be released into systemic circulation with cardiac ischemia or acute MI *Levels will rise 2-6 hours after injury-peak 16-24 hours and then remain elevated for several days *If acute onset CP to r/o MI they will be done every 6 hours x3 to determine pattern of abnormal elevation	Critical RED FLAG: ANY ELEVATION If elevated this establishes diagnosis of acute MI *If positive MI, the degree of elevation provides general barometer of degree of heart muscle damage	Increased in: Acute MI Unstable angina Minor myocardial damage after CABG or PTCA/stent placement	*Standards of cardiac care include continuous telemetry, b-blockers to decrease cardiac workload, heparin or nitroglycerin gtt. *Definitive treatment of MI includes PTCA/stent or CABG	THINK CARDIAC-MI *Assess closely for recurrent or new onset of chest pain *Assess cardiac rhythm for any changes such as PVC's, VTach or atrial fibrillation *Assess HR and SBP carefully to promote decreased cardiac workload (maintain heart rate <80 and SBP <140) *Assess tolerance to activity closely
Brain Natriuretic Peptide (BNP) Normal: <100 ng/L	*Hormone that is stored in the ventricle of the heart *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!)	100-500 ng/L abnormal but not critical for ventricular strain (mild) Critical RED FLAG: >500 critical for positive correlation of HF exacerbation	*CHF exacerbation *Ventricular hypertrophy (cardiomyopathy) *Severe hypertension	*Aggressive diuresis for fluid overload *May be on NTG gtt or po Nitrates to decrease preload which decreases workload of heart	THINK CARDIAC-HF *Assess respiratory status for tachypnea and breath sounds closely for basilar or scattered crackles *Assess HR and SBP carefully to promote decreased cardiac workload (heart rate <80 and SBP <140) *Assess tolerance to activity closely *Assess I&O closely *Assess K+ closely with loop diuretics

References

1. Van Leeuwen, A. & Poelhuis-Leth, D.J. (2009). *Davis's comprehensive handbook of laboratory and diagnostic tests with nursing implications*. Third ed. Philadelphia, PA: F.A. Davis Company.