Appendix A: Point-of-Care Document

Complete Blood Count (CBC)

White Blood Cells REFERENCE VALUES: 5.0-10.0 10^9/L

	Causes		Presentation		Clinical Implications
Trending Upward *(leukocytosis)* > 11.0 10^9/L	Infection Leukemia Neoplasm Trauma/surgery	Obesity Inflammation Connective tissue disease	Fever Malaise Lethargy Dizziness	Bleeding Bruising Weight loss	Symptoms-based approach when determining appropriateness for activity, especially in the presence of fever. Consider timing of therapy session due to early-morning low level and late-afternoon high peak. Neutropenic precautions (dependent on facility guidelines).
Trending Downward *(leukopenia)* < 4.0 10^9/L	Infections Chemotherapy Aplastic anemia	Autoimmune disease Hepatitis	Anemia Weakness Fatigue	Headache Dyspnea Fever	
Trending Down *(neutropenia)* < 1.5 10^9/L	Stem cell disorder	Viral/bacterial infection Radiation	Fever Skin abscesses	Sore mouth Pneumonia symptoms	

Platelets REFERENCE VALUE: 140-400 k/uL

	Causes		Presentation		Clinical Implications
Trending Upward *(thrombocytosis/thrombocythemia)* > 450 k/uL	Splenectomy Inflammation Cancer Stress	Iron deficiency Infection Hemorrhage	Weakness Headache Dizziness	Chest pain Tingling in hands/feet	Symptoms-based approach when determining appropriateness for activity; monitor symptoms; collaborate with interprofessional team. Elevated levels can lead to venous thromboembolism. In presence of severe thrombocytopenia (< 20 k/uL): Symptoms-based approach when determining appropriateness for activity; collaborate with interprofessional team (regarding possible need for/timing of transfusion prior to mobilization). Fall risk awareness (risk of spontaneous hemorrhage).
Trending Downward *(thrombocytopenia)* < 150 k/uL	Infection Leukemia Radiation/ chemotherapy	Malignancy Liver disease Aplastic anemia	Petechiae Ecchymosis Fatigue Risk for bleeding	Jaundice Splenomegaly	

Hemoglobin

REFERENCE VALUES: Men: 14-17.4 g/dL Women: 12-16 g/dL CRITICAL VALUES: < 5-7 g/dL or > 20 g/dL

***NOTE:** Values are slightly decreased in elderly.*

	Causes		Presentation		Clinical Implications
Trending Upward *(polycythemia)*	Congenital heart disease Dehydration	CHF Severe burns COPD	Orthostasis Dizziness Arrhythmias	Seizure TIA-symptoms Chest pain	Low critical values (< 5-7 g/dL) can lead to heart failure or death. High critical values (> 20 g/dL) can lead to clogging of capillaries as a result of hemoconcentration. Symptoms-based approach when determining appropriateness for activity, monitor symptoms, collaborate interprofessional team. Monitor vitals including SpO2 to predict tissue perfusion. May present with tachycardia and/or orthostatic hypotension. Medical team might monitor patients with pre-existing cerebrovascular, cardiac, or renal conditions for ineffective tissue perfusion related to decreased hemoglobin. < 8 g/dL: Symptoms-based approach when determining appropriateness for activity; collaborate with interprofessional team (regarding possible need for/timing of transfusion prior to mobilization). Consultation with the interprofessional team as while as monitoring of signs and symptoms is imperative since hemoglobin levels and blood transfusions is individualized. • hospitalized patients who are hemodynamically stable and asymptomatic may transfuse at 7 g/dL • post-surgical cardiac or orthopedic patients and those with underlying cardiovascular disease may transfuse at 8 g/dL. • patients with hematological disorders, oncological disorders and severe thrombocytopenia ,or chronic transfusion-dependent anemia: no transfusion threshold recommendation is available.
Trending Downward *(anemia)*	Anemia/blood loss Nutrition Neoplasia Lymphoma Systemic lupus erythematosus Splenomegaly	Sarcoidosis Kidney disease Sickle cell anemia Stress to bone marrow RBC destruction	Anemia Decreased endurance	Pallor Tachycardia Decreased activity	

Hematocrit

REFERENCE VALUES: Men: 42-52% Women: 37-47% Critical Values: < 15-20% or > 60%

***NOTE:** Values are slightly decreased in elderly.*

	Causes		Presentation		Clinical Implications
Trending Upward *(polycythemia)*	COPD Burns Eclampsia	CHF High altitude Dehydration	Fever Headache Dizziness	Weakness Fatigue Bruising/bleeding	Low critical value (< 15-20%): cardiac failure or death. High critical value (> 60%): spontaneous blood clotting. Symptoms-based approach when determining appropriateness for activity; monitor symptoms; collaborate with interprofessional team. Patient might have impaired endurance; progress slowly with activity. Monitor vitals including SpO2 to predict tissue perfusion. Might present with tachycardia and/or orthostatic hypotension. Medical team might monitor patients with pre-existing cerebrovascular, cardiac, or renal conditions for ineffective tissue perfusion related to decreased hematocrit. < 25%: Symptoms-based approach when determining appropriateness for activity; collaborate with interprofessional team (regarding possible need for/timing of transfusion prior to mobilization).
Trending Downward *(anemia)*	Leukemia Multiple myeloma Pregnancy High altitude	Hyperthyroid Cirrhosis Rheumatoid Arthritis Hemorrhage	Pale skin Headache Dizziness	Chest pain Arrhythmia Dyspnea	

Electrolyte Reference Values

Sodium (Na)

REFERENCE VALUES: 134-142 mEq/L

	Causes		Presentation		Clinical Implications
Trending Upward *(hypernatremia)*	Increased sodium intake Severe vomiting CHF	Renal insufficiency Cushing's syndrome Diabetes	Irritability Agitation Seizure Coma	Hypotension Tachycardia Decreased urinary output	Impaired cognitive status. Seizure precautions for patient with past medical history.
Trending Downward *(hyponatremia)* Sodium level < 130 mEq/L	Diuretic use GI loss Burns/wounds	Hypotonic IV use Cirrhosis	Headache Lethargic Decreased reflexes Nausea and diarrhea	Seizure Coma Orthostatic hypotension Pitting edema	Impaired cognitive status. Monitor vitals secondary to risk for orthostatic hypotension.

Potassium (K)

REFERENCE VALUES: 3.7-5.1 mEq/L

	Causes		Presentation		Clinical Implications
Trending Upward *(hyperkalemia)*	Renal failure Metabolic acidosis DKA	Addison's disease Excess potassium supplements Blood transfusion	Muscle weakness/paralysis Paresthesia Bradycardia	Heart block V-fib Cardiac arrest	> 5 mEq/L: Patient at risk for cardiac issues Use symptoms-based approach when determining appropriateness for activity. Might exhibit muscle weakness during intervention.
Trending Downward *(hypokalemia)*	Diarrhea/vomiting Diuretics Cushing's syndrome	Malnutrition Restrictive diet ETOH abuse	Extremity weakness Decreased reflexes Paresthesia Leg cramps	EKG changes Cardiac arrest Hypotension Constipation	Symptoms-based approach when determining appropriateness for activity. Severe hypokalemia < 2.5 mEq/L: Collaborate with interprofessional team.

Calcium (Ca)

REFERENCE VALUES: Adult: 8.6-10.3 mg/dL

	Causes		Presentation		Clinical Implications
Trending Upward *(hypercalcemia)*	Excessive calcium supplements Antacids Bone destruction Tumor	Excessive vitamin D Cancer Renal failure Immobilization Fracture Renal failure	Ventricular dysrhythmias Heart block Asystole Coma	Decreased DTR Constipation N/V Lethargy Muscle weakness	Symptoms-based approach, when determining appropriateness for activity.
Trending Downward *(hypocalcemia)*	ETOH abuse Poor dietary intake	Pancreatitis Laxative use Limited GI absorption	Anxiety/confusion Agitation Seizure EKG changes	Fatigue Numb/tingling Hyperreflexia Muscle cramps	May have impaired cognitive abilities. Symptoms-based approach when determining appropriateness for activity.

Chloride (Cl)

REFERENCE VALUES: 98-108 mEq/L

	Causes		Presentation		Clinical Implications
Trending Upward *(hyperchloremia)*	High salt, low water diet Hypertonic IV	Metabolic acidosis Renal failure	Lethargy Decreased level of consciousness Tachycardia	Weakness Edema Tachypnea HTN	Determine if appropriate for treatment if exhibiting decreased level of consciousness.
Trending Downward *(hypochloremia)*	Low salt diet Water intoxication Diuresis	Excessive diarrhea/vomiting	Agitation Irritability Hypertonicity	Increased reflexes Cramping Twitching	Monitor level of consciousness and motor function.

Phosphate (PO_4)

REFERENCE VALUES: 2.3-4.1 mg/dL

	Causes		Presentation		Clinical Implications
Trending Upward *(hyperphosphatemia)*	Bone destruction Tumor Immobilization Fracture	Excessive vitamin D Cancer Renal failure	Ventricular Dysrhythmia Heart block Asystole Coma	Muscle weakness Decreased reflexes Constipation N/V Lethargy	Symptoms-based approach when determining appropriateness of activity.

Phosphate (PO_4) (cont.)

REFERENCE VALUES: 2.3-4.1 mg/dL

	Causes		Presentation		Clinical Implications
Trending Downward *(hypophosphatemia)*	Poor dietary intake Poor GI absorption	Pancreatitis Laxative use ETOH abuse	Anxiety/confusion Agitation Seizure EKG changes	Fatigue Numb/tingling Increased reflexes Muscle cramps	Might have impaired cognitive abilities. Symptoms-based approach when determining appropriateness for activity.

Magnesium (Mg)

REFERENCE VALUES: 1.2-1.9 mEq/L

	Causes		Presentation		Clinical Implications
Trending Upward *(hypermagnesemia)*	Increased intake in antacids/magnesium citrate	Renal failure Leukemia Dehydration	Diaphoresis N/V Drowsiness Lethargy Weakness	Flaccidity Decreased reflexes Hypotension Heart block	Symptoms-based approach when determining appropriateness for activity.
Trending Downward *(hypomagnesemia)*	ETOH abuse Eating disorders	Diuresis DKA Medications	Increased reflexes Tremors Spasticity Seizures	EKG changes (premature ventricular contraction [PVC] → v-tach →v-fib) Emotional lability	Symptoms-based approach when determining appropriateness for activity.

Serum Viscosity	
INTERNATIONAL NORMALIZED RATIO (INR) NORMAL RANGE: 0.8-1.2	
Therapeutic Range (VTE, PE, patients with atrial fibrillation)	2.0 to 3.0
Therapeutic Range for Stroke Prophylaxis	2.0-2.5
Therapeutic Range for Patients at Higher Risk (prosthetic heart valves)	2.5-3.5
Therapeutic Range for Patients with Lupus Anticoagulant	3.0-3.5
Patient at Higher Risk for Bleeding	> 3.6
activated Partial Thromboplastin Time aPTT (Heparin)	
Normal Range	21-35 seconds > 70 seconds increased risk of spontaneous bleeding
Therapeutic for Effectiveness of Anticoagulant	2-2.5 times normal range (60-109 seconds) Variability in reagents
Prothrombin Time (Coumadin)	
Normal Range	11-13 sec
High Risk for Bleeding into Tissue, Utilize Caution and Discuss with Interprofessional team	> 25 sec
Anti-Factor Xa Assay (Unfractionated Heparin [UH] and Low Molecular Weight Heparin [LMWH])	
Therapeutic ranges of: LMWH UH	 0.5-1.2 IU/mL 0.3-0.7 IU/mL
Prophylactic ranges of: LMWH UH	 0.25-0.5 IU/mL 0.1-0.4 IU/mL

Troponin Normal <0.03 ng/mL

Trend is most important in decision to provide physical therapy.

B-Type Natriuretic Peptide (BNP)

BNP Level	NYHA Classification	Treatment Implications
< 100 pg/mL	Indicates no heart failure.	
100–300 pg/mL	Class I – Cardiac disease, but no symptoms and no limitation in ordinary physical activity, e.g. no shortness of breath when walking, climbing stairs etc.	Symptoms-based approach when determining appropriateness for activity.
> 300 pg/mL	Class II – Mild symptoms (mild shortness of breath and/or angina) and slight limitation during ordinary activity.	
> 600 pg/mL	Class III – Marked limitation in activity due to symptoms, even during less-than-ordinary activity, e.g. walking short distances (20–100 m). Comfortable only at rest.	
> 900 pg/mL	Class IV – Severe limitations. Experiences symptoms even while at rest.	

Creatinine Kinase (CK)

REFERENCE VALUES: Normal = 30-170 U/L Males: 52-336 U/L Females: 38-176 U/L

CK Isoenzymes	Treatment Implications
CK1-BB Brain Tissue	Rarely present but described as a marker for adenocarcinoma of the prostate, breast, ovary, colon, and gastrointestinal tract, and for small-cell anaplastic carcinoma of lung. BB has been reported with severe shock and/or hypothermia, infarction of bowel, brain injury, and stroke.
CK2-MB Cardiac Muscle	Commonly elevated in myocardial infarction within 3-6 hours of cardiac injury and then returns to normal within 2-3 days (peaks 18-24 hours). Useful for diagnosing re-infarction. Might be elevated in cases of carbon monoxide poisoning, pulmonary embolism, hypothyroidism, crush injuries, and muscular dystrophy. Sensitivity and specificity are not as high as troponin levels.
CK3-MM Skeletal Muscle	> 15 and 20K following strenuous exercise but not considered rhabdomyolysis[51,52]. Intramuscular injection can increase.

Acid-Base Disorders

REFERENCE VALUES: Normal = pH: 7.35-7.45 PaO_2: 80-95 mmHg $PaCO_2$: 37-43 mmHg HCO_3:20-30 mmol/L

	Cause		Symptoms		Implications
Respiratory Alkalosis pH >7.45 $PaCO_2$ <35mmHg	Sedatives COPD Pain Anxiety Fever	CHF CVA PE Meningitis Psychosis	Dizziness Paresthesia Chest pain	Confusion Seizure	May need to coordinate treatments around ventilation. Expect somnolence and fatigue.
Respiratory Acidosis pH <7.35 $PaCO_2$ >45mmHg	Dec ventilation Depression of central respiratory center (drugs vs. cerebral disease)	Neuromuscular disease (ALS, GBS, MD) Asthma/chronic obstructive pulmonary disease (COPD)	Confusion Fatigue/lethargy	SOB Somnolence	May need to coordinate treatments around ventilation. Expect somnolence and fatigue.
Metabolic Alkalosis pH >7.45 HCO_3 >30mmol/L	Severe vomiting Diarrhea Severe dehydration (diuretics) Retention of bicarbonate	Decreasing ventilation Causing increasing hypercapnia Cystic fibrosis Chloride-resistant	CO2 retention Decreasing ventilation		May need to coordinate treatments around ventilation. Expect somnolence and fatigue.
Metabolic Acidosis pH <7.35 HCO_3 <24mmol/L	Increased acid production Decreased renal acid excretion	Laxative abuse Thiazide diuretics Massive diuresis	Lactic acidosis Ketoacidosis Kidney disease Cardiac Arrhythmia W/ pH <7.1	Diarrhea or other intestinal losses Anxiety related to hypoxia	May need to coordinate mobility around dialysis (CVVHD vs HD). Expect increased fatigue levels/somnolence. Consider risk of arrhythmias with mobility.

Liver Function/Hepatic Panel

Serum Albumin (Half-Life of 21 Days) & Serum Pre-Albumin (Half-Life of 2 Days)

REFERENCE VALUES:
Serum Albumin = 3.5-5.2g/dL Serum Pre-Albumin = 19-39 mg/dL

	Causes		Presentation	Clinical Implications
Trending Upward	Severe infections Congenital disorders Severe dehydration Chronic inflammation	Tuberculosis Overdose of cortisone meds CHF Renal disease Cancer Hepatitis	Clinical features are dependent on the cause (i.e. renal, cardiac, TB, etc.)[21]	Assess integumentary daily. Collaborate with the interprofessional team regarding nutrition.
Trending Downward	Nutritional compromise Infection Inflammation Liver disease Crohn's disease	Burns Malnutrition Thyroid disease	Peripheral edema Non-healing wound Hypotension	Assess integumentary daily. Collaborate with the interprofessional team regarding nutrition. Low levels occur with prolonged hospital stay. Serum Albumin: < 3.0 g/dL nutritionally compromised; < 2.8 g/dL generalized symmetrical peripheral edema, poor wound healing, potential drug toxicity Serum Pre-Albumin: < 10 g/dL significant nutritional risk, poor wound healing, generalized edema

Serum Bilirubin (Total Bilirubin)

REFERENCE VALUES: 0.3-1.0 mg/dL CRITICAL VALUE: > 12 mg/dL[13]

	Causes		Presentation	Clinical Implications
Trending Upward	Cirrhosis Hepatitis Hemolytic Anemia Jaundice	Transfusion reaction Bile duct occlusion Chemotherapy	Patients with severe disease might have fatigue, anorexia, nausea, fever, and, occasionally, vomiting. Might have loose fatty stools.	Symptoms-based approach when determining appropriateness for activity. Adapt education if decreased cognition. Patients with advanced disease are at risk for osteoporosis and bleeding due to deficiencies of fat soluble vitamins.

Kidney Function Reference Values

Blood Urea Nitrogen (BUN)

REFERENCE VALUES: 6-25 mg/dL

	Causes		Presentation		Clinical Implications
Trending Upward	High protein diet Renal failure Decreasing volume CHF	GL Bleed Fever Increased protein Catabolism	HTN Fluid retention Fatigue Poor appetite Nausea/vomiting	Itchy/dry skin Decreasing cognition Dyspnea Bone pain	Decreased tolerance to activity. Symptoms-based approach when determining appropriateness for activity.
Trending Downward	Hepatic disease Malnutrition		Uncommon; usually not a concern.		

Serum Creatinine

REFERENCE VALUES: Male: 0.7-1.3 mg/dL Female: 0.4-1.1 mg/dL

	Causes		Presentation		Clinical Implications
Trending Upward	Renal disease Muscular dystrophy Rhabdomyolysis Dehydration		Decreasing urine output Dark colored urine Edema Back pain Dyspnea	Fatigue Low fever Loss of appetite Headache Confusion	Decreased tolerance to activity. Symptoms-based approach when determining appropriateness for activity.
Trending Downward	Age Low muscle mass	Liver disease Low protein diet Pregnancy	Fatigue; this is uncommon can be precursor to autoimmune disease.		

Glucose **REFERENCE VALUES: 70-100 mg/dL HEALTHY OLDER ADULTS: FASTING PLASMA GLUCOSE (FPG) 90–130 mg/dL**					
	Causes		**Presentation**		**Clinical Implications**
Trending Upward *(hyperglycemic)* **> 200 mg/dL** **Criteria for the Diagnosis of Diabetes FPG > 126 mg/dL *OR* 2-Hour Plasma Glucose > 200 mg/dL**	Diabetes mellitus[21] Sepsis Brain tumors	Certain medication IV glucose After a meal Pancreatitis	DKA Severe Fatigue		Decreased tolerance to activity Symptoms-based approach to appropriateness of activity.[21]
Trending Downward *(hypoglycemic)* *< 70 mg/dL*	Excess insulin Brain injury Pituitary deficiency	Malignancy Addison's disease	Lethargy Irritability Shaking	Extremity weakness Loss of consciousness	May not tolerate therapy until glucose level increased. A glucose target between 140-180 mg/dL is recommended for most patients in noncritical care units while hospitalized.
Hgb A1C **REFERENCE VALUES: Normal = <5.7%**					
Pre-Diabetes Mellitus: 5.7 - 6.4% **With Diabetes Mellitus: > 6.5%** *(poor glucose control)*	Diabetes mellitus		Eye disease Heart disease Kidney disease Nerve damage	Stroke Gum disease Non-traumatic amputations[24]	Monitor vitals if poorly controlled diabetes. Educate importance of exercise for blood sugar control. Consider for wound care management.

Thyroid Function Reference Values

		Presentation		Clinical Implications
Thyroxine (T4) **REFERENCE VALUES:** **Total: 4.5-11.5 µg/dL** **Triiodothyronine (T3)** **REFERENCE VALUES:** **80-200 ng/dL** **Thyroid-Stimulating Hormone (TSH)** **REFERENCE VALUES:** **0.3-3.0 U/mL** ***Note: <u>Increased</u> TSH <u>AND decreased</u> T4 = thyroid disease*** ***<u>Decreased</u> TSH = pituitary disease***	Hyperthyroidism Increased T3 and/or T4	Tremors Nervousness/lability Weakness/muscle atrophy Increased reflexes Fatigue Tachycardia Increased cardiac output	Arrhythmias (a-fib) Hypotension Chronic periarthritis Proximal weakness Also affects: integumentary, gastrointestinal and genitourinary systems	Decreased exercise tolerance – both strength and capacity. Monitor heart rate and blood pressure. Patient at risk for arrhythmias during exercise. Patient in hypermetabolic state will deplete nutrients quickly with exercise.
	Hypothyroidism Increased TSH Decreased T3 and/or T4	Slow speech/hoarseness Slow mental function Ataxia Proximal muscle weakness Carpal tunnel syndrome Prolonged reflexes Paresthesia	Muscular/joint edema Back pain Bradycardia CHF Poor peripheral circulation Hyperlipidemia Hypertension Also affects: integumentary, gastrointestinal and genitourinary systems	Hypothyroidism – frequently accompanied by myalgia and CK elevation. More prone to skin tears. Activity intolerance – should improve with treatment of hypothyroidism. Rhabdomyolysis, although rare, can appear in the presence of heavy exercise, alcohol, or medications. Monitor heart rate – bradycardia.