

Lab Values Interpretation Guide

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Reference ranges are for **adult patients** and may vary slightly by laboratory. Values outside the normal range are flagged **H** (high) or **L** (low) on lab reports. Critical values require immediate clinical action. Always correlate with patient history.

Complete Blood Count (CBC)

Test Name	Abbrev.	Normal Range	↓ Low Indicates...	↑ High Indicates...	Critical Values
White Blood Cells	<i>WBC</i>	4,500–11,000 / μ L	Leukopenia: bone marrow failure, chemotherapy, viral infection, aplastic anemia	Leukocytosis: bacterial infection, leukemia, inflammation, steroids, stress response	< 2,000 or > 30,000 / μ L
Red Blood Cells	<i>RBC</i>	M: 4.7–6.1 M/ μ L F: 4.2–5.4 M/ μ L	Anemia: blood loss, hemolysis, iron/B12/folate deficiency, chronic disease	Polycythemia: dehydration, COPD compensation, polycythemia vera	< 2.0 M/ μ L
Hemoglobin	<i>Hgb / Hb</i>	M: 13.8–17.2 g/dL F: 12.1–15.1 g/dL	Anemia: fatigue, pallor, SOB; may require transfusion	Polycythemia, dehydration, COPD; increased clot risk	< 7.0 g/dL or > 20 g/dL
Hematocrit	<i>Hct</i>	M: 40.7–50.3% F: 36.1–44.3%	Anemia, blood loss, overhydration	Dehydration, polycythemia vera, high altitude	< 21% or > 60%
Mean Corpuscular Volume	<i>MCV</i>	80–100 fL	Microcytic anemia: iron deficiency, thalassemia	Macrocytic anemia: B12/folate deficiency, alcohol, hypothyroid	< 50 or > 130 fL
Platelets	<i>Plt</i>	150,000–400,000 / μ L	Thrombocytopenia: bleeding risk; ITP, heparin, DIC, leukemia	Thrombocytosis: clot risk; infection, iron deficiency, splenectomy	< 50,000 or > 1,000,000 / μ L
Neutrophils	<i>Neut / ANC</i>	1,800–7,700 / μ L (50–70% of WBC)	Neutropenia: infection susceptibility; chemo, aplastic anemia, B12 deficiency	Neutrophilia: bacterial infection, stress, steroids, MI	ANC < 500 / μ L (severe neutropenia)
Lymphocytes	<i>Lymphs</i>	1,000–4,800 / μ L (20–40% of WBC)	Lymphopenia: HIV, steroid use, radiation, immunodeficiency	Lymphocytosis: viral infection (mono, EBV), CLL, pertussis	< 500 / μ L
Eosinophils	<i>Eos</i>	0–500 / μ L (< 5%)	Rare; may reflect eosinopenia from acute infection or steroid use	Eosinophilia: allergies, asthma, parasitic infection, drug reaction	> 5,000 / μ L (hypereosinophilia)

Basic & Comprehensive Metabolic Panel (BMP / CMP)

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Test Name	Abbrev.	Normal Range	↓ Low Indicates...	↑ High Indicates...	Critical Values
Sodium	Na ⁺	136–145 mEq/L	Hyponatremia: excess water, SIADH, CHF, vomiting/diarrhea, Addison's	Hypernatremia: dehydration, diabetes insipidus, excess sodium intake	< 120 or > 160 mEq/L
Potassium	K ⁺	3.5–5.0 mEq/L	Hypokalemia: arrhythmia risk, muscle weakness; diuretics, vomiting, diarrhea	Hyperkalemia: renal failure, ACE inhibitors, Addison's; fatal arrhythmia risk	< 2.5 or > 6.5 mEq/L
Chloride	Cl ⁻	96–106 mEq/L	Metabolic alkalosis, vomiting, diuretic use	Metabolic acidosis, dehydration, Cushing's syndrome	< 70 or > 120 mEq/L
Bicarbonate (CO ₂)	HCO ₃ ⁻	22–29 mEq/L	Metabolic acidosis: DKA, renal failure, diarrhea	Metabolic alkalosis: vomiting, diuretics, hyperaldosteronism	< 10 or > 40 mEq/L
Blood Urea Nitrogen	BUN	7–20 mg/dL	Liver failure (low urea synthesis), malnutrition, overhydration	Renal failure, dehydration, GI bleed, high-protein diet	BUN > 100 mg/dL
Creatinine	Cr / SCr	M: 0.7–1.2 mg/dL F: 0.5–1.1 mg/dL	Low muscle mass, severe liver disease, pregnancy	Renal failure, rhabdomyolysis, dehydration, nephrotoxic drugs	> 10 mg/dL (or rapid rise ≥ 0.5/day)
Glucose (fasting)	FBG / FBS	70–99 mg/dL	Hypoglycemia: insulin overdose, insulinoma, Addison's; diaphoresis, confusion	Hyperglycemia: diabetes, steroids, pancreatitis, stress	< 40 or > 500 mg/dL
Calcium	Ca ²⁺	8.5–10.2 mg/dL	Hypocalcemia: tetany, seizures; hypoparathyroidism, vitamin D deficiency	Hypercalcemia: 'bones, stones, groans, moans'; hyperparathyroidism, malignancy	< 6.5 or > 13.0 mg/dL
Magnesium	Mg ²⁺	1.7–2.2 mg/dL	Hypomagnesemia: arrhythmias, seizures; malnutrition, alcoholism, diuretics	Hypermagnesemia: renal failure, excess supplementation; neuromuscular depression	< 1.0 or > 4.7 mg/dL
ALT (liver)	ALT	7–56 U/L	Rare (low not clinically significant)	Hepatocellular damage: hepatitis, fatty liver, drug toxicity, ischemia	> 3× ULN = significant hepatic injury
AST (liver/cardiac)	AST	10–40 U/L	Not clinically significant	Liver disease, MI, muscle injury, hemolysis; less specific than ALT	> 3× ULN
Total Bilirubin	T. Bili	0.2–1.2 mg/dL	Not clinically significant	Jaundice (> 2–3 mg/dL), liver disease, hemolysis, bile duct obstruction	> 15 mg/dL (or any in neonates)

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Test Name	Abbr v.	Normal Range	↓ Low Indicates...	↑ High Indicates...	Critical Values
Albumin	<i>Alb</i>	3.5–5.0 g/dL	Malnutrition, liver disease, nephrotic syndrome, chronic illness, inflammation	Rare; dehydration	< 2.0 g/dL

Coagulation Studies

Test Name	Abbr v.	Normal Range	↓ Low Indicates...	↑ High Indicates...	Critical Values
Prothrombin Time	<i>PT</i>	11–13.5 seconds	Rare; may indicate factor excess or shortened clotting	Liver disease, warfarin use, vitamin K deficiency, DIC, factor deficiencies	> 30 seconds
INR (Standardized PT)	<i>INR</i>	0.8–1.1 (normal) 2.0–3.0 (therapeutic on warfarin)	Hypercoagulable state (risk of clotting)	Bleeding risk increases; > 3.0 = supratherapeutic on warfarin	> 4.0 (high bleeding risk)
aPTT / PTT	<i>aPTT</i>	25–35 seconds	Not clinically significant when low	Heparin therapy, hemophilia A/B, DIC, factor deficiencies, antiphospholipid syndrome	> 70–100 seconds
D-Dimer	<i>D-Dim</i>	< 0.5 mg/L (500 ng/mL)	Not clinically significant	DVT, PE, DIC, infection, surgery, malignancy; negative result rules out clot	> 4x normal in DIC
Fibrinogen	<i>Fibr</i>	200–400 mg/dL	DIC (consumption), severe liver disease; bleeding risk	Acute phase reactant: infection, inflammation, pregnancy, malignancy	< 100 mg/dL

Cardiac Biomarkers

Test Name	Abbr v.	Normal Range	↓ Low Indicates...	↑ High Indicates...	Critical Values
Troponin I	<i>cTnI</i>	< 0.04 ng/mL (lab-specific)	Not clinically significant	Myocardial injury: MI, myocarditis, PE, sepsis, renal failure; MOST specific cardiac marker	Any detectable rise + symptoms = rule in ACS
Troponin T	<i>cTnT</i>	< 0.01 ng/mL (high-sensitivity)	Not clinically significant	MI, heart failure, PE; highly sensitive — rises within 1–3 h of MI	Serial rise > 20% = acute MI
CK-MB	<i>CK-MB</i>	< 6.3 ng/mL	Not clinically significant	MI (peaks 12–24h), cardiac surgery, myocarditis; less specific than troponin	> 10 ng/mL + CK-MB index > 5%

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Test Name	Abbr v.	Normal Range	↓ Low Indicates...	↑ High Indicates...	Critical Values
BNP / NT-proBNP	<i>BNP</i>	< 100 pg/mL	Lower risk of heart failure	Heart failure, LV dysfunction, fluid overload; rises with cardiac wall stress	> 500 pg/mL = high likelihood HF
Myoglobin	<i>Mb</i>	M: 19–92 µg/L F: 12–76 µg/L	Not clinically significant	Earliest MI marker (1–4 h); also rhabdomyolysis, muscle injury; not cardiac-specific	Not typically critical-valued alone

Thyroid & Endocrine

Test Name	Abbr v.	Normal Range	↓ Low Indicates...	↑ High Indicates...	Critical Values
TSH (Thyroid Stimulating H.)	<i>TSH</i>	0.4–4.0 mIU/L	Hyperthyroidism (pituitary suppressed by excess T4/T3)	Hypothyroidism (pituitary compensating for low thyroid output)	< 0.01 or > 10 mIU/L
Free T4	<i>FT4</i>	0.8–1.8 ng/dL	Hypothyroidism, pituitary failure (secondary hypothyroid)	Hyperthyroidism, exogenous thyroid hormone	< 0.4 or > 3.5 ng/dL
HbA1c (Glycated Hgb)	<i>HbA1c</i>	< 5.7% (normal) 5.7–6.4% (prediabetes) ≥ 6.5% (diabetes)	Hemolytic anemia (false low), recent blood transfusion	Poorly controlled diabetes; reflects avg glucose over 3 months	≥ 9% = poorly controlled DM
Cortisol (AM)	<i>Cort</i>	6–23 µg/dL	Adrenal insufficiency (Addison's disease), pituitary failure	Cushing's syndrome, stress response, steroid use	< 3 µg/dL (adrenal crisis)
Fasting Glucose	<i>FBG</i>	70–99 mg/dL (see BMP above)	Hypoglycemia: < 70 mg/dL = symptomatic threshold	≥ 126 mg/dL fasting = DM; 100–125 = prediabetes	< 40 or > 500 mg/dL

Urinalysis (UA) — Dipstick & Microscopy

Component	Normal	Abnormal Finding	Clinical Significance
Color	Pale to dark yellow	Red/brown, cloudy, orange	Red = hematuria or myoglobinuria; cloudy = infection; orange = bilirubin
pH	4.5–8.0	< 4.5 (acid) or > 8.0 (alkaline)	Alkaline: UTI (urease bugs), renal tubular acidosis; Acidic: DKA, high protein
Specific Gravity	1.005–1.030	< 1.005 or > 1.030	Low: diabetes insipidus, overhydration; High: dehydration, SIADH
Glucose	Negative	Positive (glycosuria)	DM (glucose > renal threshold ~180 mg/dL), Fanconi syndrome
Protein	Negative (< 150 mg/day)	Trace to 4+	Proteinuria: nephrotic syndrome, DM nephropathy, hypertension, UTI
Blood / Hematuria	Negative	Positive	UTI, kidney stone, glomerulonephritis, trauma, malignancy
Leukocyte Esterase	Negative	Positive	WBCs present → UTI, pyelonephritis, interstitial nephritis
Nitrites	Negative	Positive	Gram-negative bacteria (E. coli, Klebsiella); suggests UTI

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Component	Normal	Abnormal Finding	Clinical Significance
Ketones	Negative	Positive	DKA, starvation, high-fat diet, alcoholic ketoacidosis
Bilirubin	Negative	Positive	Liver disease, bile duct obstruction, hemolysis
WBCs (micro)	0–5 /hpf	> 5 /hpf (pyuria)	UTI, pyelonephritis, sexually transmitted infection
RBCs (micro)	0–2 /hpf	> 2 /hpf	Kidney stone, glomerulonephritis, trauma, malignancy
Casts	Hyaline casts only	Granular, RBC, WBC, waxy casts	RBC casts = glomerulonephritis; WBC = pyelonephritis; granular = ATN
Bacteria	None	Present	UTI if accompanied by pyuria and symptoms; contamination if WBC negative

Lab Report Abbreviation Key

Abbrev.	Meaning
H / HH	High / Critical high value
L / LL	Low / Critical low value
ULN	Upper limit of normal
LLN	Lower limit of normal
hpf	High-power field (microscopy)
mEq/L	Milliequivalents per liter (electrolytes)
mg/dL	Milligrams per deciliter (glucose, BUN, Ca)
g/dL	Grams per deciliter (hemoglobin, albumin)
μL / μg	Microliter / microgram
pg/mL	Picograms per milliliter (hormones, BNP)
ng/mL	Nanograms per milliliter (troponin, PSA)
U/L	Units per liter (enzyme activity)
mIU/L	Milli-international units per liter (TSH)
fL	Femtoliter (MCV — cell volume)
M/μL	Millions per microliter (RBC count)
r/o	Rule out (consider this diagnosis)
WNL	Within normal limits
STAT	Immediately (urgent result)
POC	Point of care (bedside testing)