# Quick Guide to Laboratory Values

Use this handy cheat-sheet to help you monitor laboratory values related to fluid and electrolyte status. Remember, normal values may vary according to techniques used in different laboratories.

| SERUM ELECTROLYTES | NURSING IMPLICATIONS |
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| **Calcium ($Ca^{2+}$)**<br>**8.6-10.2 mg/dL** | ***Hypocalcemia***<br>• Take seizure precautions and manage the patient's airway.<br>• Monitor for tetany, tingling sensations of the fingers, mouth, and feet; spasms of the muscles of the extremities and face; increased DTRs.<br>• Be alert for ECG changes such as prolonged QT interval.<br><br>***Hypercalcemia***<br>• Increase mobilization and encourage oral intake.<br>• Watch for confusion and digitalis toxicity.<br>• Monitor cardiac rate and rhythm. |
| **Chloride ($Cl^-$)**<br>**97-107 mEq/L** | ***Hypochloremia***<br>• Monitor for muscle spasms, alkalosis, and depressed respirations.<br><br>***Hyperchloremia***<br>• Monitor for acidosis. |
| **Magnesium ($Mg^{2+}$)**<br>**1.3-2.3 mEq/L** | ***Hypomagnesemia***<br>• Monitor for digitalis toxicity, cardiac arrhythmias, and laryngeal stridor.<br>• Take seizure precautions.<br><br>***Hypermagnesemia***<br>• Be alert for hypotension, shallow respirations, lethargy, drowsiness, and coma.<br>• Don't give magnesium-containing medications to patient with renal failure or compromised renal function.<br>• Check DTRs frequently. |
| **Phosphate ($PO_4^-$)**<br>**2.5-4.5 mg/dL** | ***Hypophosphatemia***<br>• Be alert for infection, hypocalcemia, and diarrhea (with oral supplements).<br>• Administer IV phosphate products and TPN cautiously in malnourished patients.<br><br>***Hyperphosphatemia***<br>• Monitor for signs of tetany. |

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| | • Soft tissue calcification can be a long-term complication of chronically elevated serum phosphate levels. |
| **Potassium ($K^+$)**<br>**3.8-5 mEq/L** | ***Hypokalemia***<br>• Assess for cardiac arrhythmias.<br>• Monitor patients for muscle cramps and weakness, paresthesias, fatigue, anorexia, decreased bowel motility, and an irregular heartbeat.<br>• For patients taking digoxin, assess for hypokalemia, which potentiates the action of digitalis.<br>• For prevention, educate patients about use and abuse of laxatives and diuretics.<br><br>***Hyperkalemia***<br>• Monitor for arrhythmias, irritability, paresthesias, anxiety, and GI symptoms such as nausea and intestinal colic.<br>• Avoid potassium-saving diuretics, potassium supplements, or salt substitutes in patients with high renal insufficiency. |
| **Sodium ($Na^+$)**<br>**135-145 mEq/L** | ***Hyponatremia***<br>• Monitor fluid losses and gains.<br>• Monitor for GI symptoms (anorexia, nausea, vomiting, abdominal cramping) and CNS symptoms (lethargy, confusion, muscle twitching, seizures), and check urine specific gravity.<br>• Avoid giving large water supplements to patients receiving isotonic tube feedings.<br>• Take seizure precautions when hyponatremia is severe.<br><br>***Hypernatremia***<br>• Monitor fluid losses and gains, and check urine specific gravity.<br>• Monitor for excessive thirst, elevated body temperature, and changes in behavior such as restlessness, lethargy, and disorientation.<br>• Give sufficient water with tube feedings to keep serum $Na^+$ and BUN at normal limits. |
| **ACID-BASE STATUS** | |
| **pH**<br>**(7.35-7.45)** | Identification of the specific acid–base imbalance is important in identifying the underlying cause of the disorder and determining appropriate treatment. A pH less than 7.35 indicates acidosis and a pH greater than 7.45 indicates alkalosis. |

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| PaCO2<br>**35-45 mm Hg** | The $PaCO_2$ is influenced almost entirely by respiratory activity. When the $PaCO_2$ is low, carbonic acid leaves the body in excessive amounts; when the $PaCO_2$ is high, there are excessive amounts of carbonic acid in the body. |
| $HCO3^-$<br>**22-26 mEq/L** | The bicarbonate level of the ABG reflects the bicarbonate level of the body. The kidneys are involved in either reabsorbing bicarbonate or excreting bicarbonate, depending upon what is needed to maintain acid-base balance. |
| **RENAL FUNCTION** | |
| **Blood urea nitrogen (BUN)**<br>**10-20 mg/100 mL** | ***Increased BUN*** is found with impaired renal function (such as associated with shock, heart failure, and salt and water depletion), diabetic ketoacidosis, and burns. |
| **Creatinine**<br>**0.7-1.4 mg/100 mL** | ***Increased creatinine levels*** can be found with impaired renal function, heart failure, shock, and dehydration. |
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| **Hemoglobin**<br>**Males: 13-18 g/dL**<br>**Females: 12-16 g/dL** | ***Increased hemoglobin levels*** can be found in hemoconcentration of the blood.<br>***Decreased levels of hemoglobin*** are found in anemia states, severe hemorrhage, and after a hemolytic reaction. |
| **Hematocrit**<br>**Males: 42-50%**<br>**Females: 40-48%** | ***Increased hematocrit values*** are seen in severe fluid volume deficit and shock (when hemoconcentration rises considerably).<br>***Decreased hematocrit values*** are seen with acute, massive blood loss; hemolytic reaction after transfusion of incompatible blood; or with fluid overload. |
| Platelet count<br>**100,000-400,000/$mm^3$** | ***Increased platelet levels,*** called thrombocythemia or thrombocytosis, can be caused by a bone marrow disorder or malignancy, infection or inflammation, anemia, splenectomy, or certain medications.<br><br>***Decreased platelet levels,*** called thrombocytopenia can result from bone marrow suppression, sequestration from an enlarged spleen, increased platelet destruction (seen with autoimmune syndromes or drug-induced reactions), and decreased platelet production (related to infections or malignancy). Liver disease, renal disorders, and pregnancy can also cause thrombocytopenia. |
| **TESTS** | |

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| Prothrombin time (PT)<br>**9.5-12 seconds** | The PT measures the activity of the extrinsic pathway of the clotting cascade and can be used to monitor the level of anticoagulation. |
| Partial thromboplastin time (activated) (PTT)<br>**20-45 seconds** | The PTT is a measure of the activity of the intrinsic pathway of the clotting cascade; it's used to assess the effects of unfractionated heparin. |
| INR<br>**1.0**<br><br>INR, patients taking warfarin sodium<br>**2-3.5** | The INR is used to monitor the effectiveness of warfarin therapy.<br><br>The therapeutic range for INR is 2–3.5, although specific ranges vary based on diagnosis. |
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| **Total protein**<br>**6-8 g/100 mL** | Proteins influence the colloid osmotic pressure. |
| **Albumin**<br>**3.5-5 g/100 mL** | Changes in serum albumin affect total serum calcium. Very low levels of albumin can lead to edema, ascites, and pulmonary edema. |
| **SERUM OSMOLALITY** | |
| **Osmolality**<br>**280-300 mOsm/L water** | ***Increased osmolality*** caused by severe dehydration, free water loss, diabetes insipidus, high hypernatremia, hyperglycemia, stroke or head injury, renal tubular necrosis, or ingestion of methanol or ethylene glycol (antifreeze).<br>***Decreased osmolality*** caused by volume excess, SIADH, renal failure, diuretic use, adrenal insufficiency, hyponatremia, overhydration, or paraneoplastic syndrome associated with lung cancer. |
| **URINE TESTS** | |
| **pH (urine)**<br>**4.6-8.2** | ***Decreased pH*** caused by metabolic acidosis, diabetic ketoacidosis, and diarrhea.<br>***Increased pH*** caused by respiratory alkalosis, potassium depletion, and chronic renal failure. |
| **Specific gravity (urine)**<br>**1.005-1.030** | The urine specific gravity range depends on the patient's state of hydration and varies with urine volume and the load of solutes to be excreted. |

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| | ***Increased urine specific gravity*** seen with dehydration, vomiting, diarrhea, and heart failure.<br>***Decreased urine specific gravity*** can occur with renal damage. |

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