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Take5: 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	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
Calcium (Ca^{2+})	8.6-10.2 mg/dL	• If a patient has severe ***hypocalcemia,*** take seizure precautions and assess the airway; and take safety precautions if confusion is present. Also, monitor for tetany, tingling sensations in the tips of the fingers, around the mouth, and in the feet. Spasms of the muscles of the extremities and face may occur. Monitor for hyperactive deep tendon reflexes as well. Also, be alert for ECG changes including a prolonged QT interval. • If a patient has ***hypercalcemia,*** increase mobilization as appropriate and encourage sufficient oral intake. Take safety precautions if confusion is present and be alert for signs of digitalis toxicity. Also, monitor the patient's cardiac rate and rhythm.
Chloride (Cl^-)	97-107 mEq/L	• Monitor the patient with ***hypochloremia*** for muscle spasms, alkalosis, and depressed respirations. • Monitor the patient with ***hyperchloremia*** for acidosis.
Magnesium (Mg^{2+})	1.3-2.3 mEq/L	• ***Hypomagnesemia*** can predispose a patient to digitalis toxicity or cardiac arrhthymias. Take seizure precautions if necessary and monitor for laryngeal stridor. • If ***hypermagnesemia*** is present, be alert for hypotension and shallow respirations, lethargy, drowsiness, and coma. Don't give magnesium-containing medications to patient with renal failure or compromised renal function. Check deep tendon reflexes frequently.
Phosphate (PO_4^-)	2.5-4.5 mg/dL	• Patients with severe ***hypophosphatemia*** are at greater risk for infection. Administer IV phosphate products cautiously and give total parenteral nutrition cautiously in patients who are malnourished. Monitor for diarrhea when taking oral supplements. A sudden increase in serum phosphate level can cause hypocalcemia. • With ***hyperphosphatemia,*** monitor for signs of tetany. Soft tissue calcification can be a long-term complication of chronically elevated serum phosphate levels.

SERUM ELECTROLYTES	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
Potassium (K^+)	3.8-5 mEq/L	• ***Hypokalemia*** can be life-threatening. For patients taking digoxin, assess for hypokalemia, which potentiates the action of digitalis. Patients with hypokalemia are at risk of cardiac arrhythmias. Monitor patients for muscle cramps and weakness, paresthesias, fatigue, anorexia, decreased bowel motility, and an irregular heartbeat. To prevent hypokalemia, educate patients about abuse of laxatives and diuretics. Follow your facility policy with regards to I.V. potassium administration. • ***Hyperkalemia*** can be life-threatening. Monitor patients for arrhythmias, irritability, paresthesias, and anxiety, as well as GI symptoms such as nausea and intestinal colic. Prevent hyperkalemia by administering potassium correctly, according to the policy of your facility. Also, avoid giving patients with renal insufficiency potassium-saving diuretics, potassium supplements, or salt substitutes. Patients on ACE inhibitors should avoid potassium supplements.
Sodium (Na^+)	135-145 mEq/L	• For patients with ***hyponatremia,*** monitor fluid losses and gains, monitor for GI symptoms (anorexia, nausea, vomiting, abdominal cramping) and CNS symptoms (lethargy, confusion, muscle twitching, seizures), and check urine specific gravity. Avoid giving large water supplements to patients receiving isotonic tube feedings. Take seizure precautions when hyponatremia is severe. • When ***hypernatremia*** is present, monitor fluid losses and gains, and monitor for changes in behavior such as restlessness, lethargy, and disorientation. Look for excessive thirst and elevated body temperature, and check urine specific gravity. Give sufficient water with tube feedings to keep serum Na^+ and BUN at normal limits.

ACID-BASE STATUS (arterial blood gas studies)	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
pH	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.
$PaCO_2$	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.
HCO_3^-	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	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
Blood urea nitrogen (BUN)	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	0.7-1.4 mg/100 mL	Increased creatinine levels can be found with impaired renal function, heart failure, shock, and dehydration.

COMPLETE BLOOD COUNT (CBC)	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
Hemoglobin		***Increased*** hemoglobin levels can be found in hemoconcentration of the blood. ***Decreased*** levels of hemoglobin are found in anemia states, severe hemorrhage, and after a hemolytic reaction.
Males	13-18 g/dL	
Females	12-16 g/dL	
Hematocrit		***Increased*** hematocrit values are seen in severe fluid volume deficit and shock (when hemoconcentration rises considerably). ***Decreased*** hematocrit values are seen with acute, massive blood loss; hemolytic reaction after transfusion of incompatible blood; or with fluid overload.
Males	42-50%	
Females	40-48%	
Platelet count	100,000-400,000/mm^3	An infusion of platelets may be indicated to prevent or treat bleeding associated with deficiencies in the number or function of a patient's platelets.

COAGULATION TESTS	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
Prothrombin time (PT)	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)	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 **INR, patients taking warfarin sodium**	1.0 2-3.5	The INR is used to monitor the effectiveness of warfarin therapy. The therapeutic range for INR is 2–3.5, although specific ranges vary based on diagnosis.

PROTEIN	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
Total protein	6-8 g/100 mL	Proteins influence the colloid osmotic pressure.
Albumin	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	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
Osmolality	280-300 mOsm/L water	• Factors that ***increase*** serum osmolality include severe dehydration, free water loss, diabetes insipidus, hypernatremia, hyperglycemia, stroke or head injury, renal tubular necrosis, or ingestion of methanol or ethylene glycol (antifreeze). • Factors that ***decrease*** serum osmolality include fluid volume excess, SIADH, renal failure, diuretic use, adrenal insufficiency, hyponatremia, overhydration, paraneoplastic syndrome associated with lung cancer.

URINE TESTS	REFERENCE RANGE (conventional units)	NURSING IMPLICATIONS
pH (urine)	4.6-8.2	***Lower*** than normal urinary pH can occur with metabolic acidosis, diabetic ketoacidosis, and diarrhea. ***Higher*** than normal urinary pH can occur with respiratory alkalosis, potassium depletion, and chronic renal failure.
Specific gravity (urine)	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. ***Increased*** urine specific gravity can occur with dehydration, vomiting, diarrhea, and heart failure. ***Decreased*** urine specific gravity can occur with renal damage.

References:
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