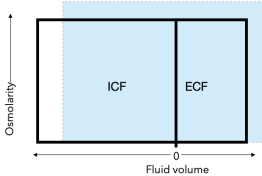
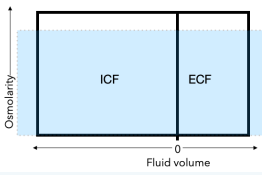


# IV CRYSTALLOID FLUIDS

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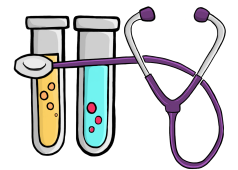
Crystalloid	Solution	Effect on fluid compartments	Indications	Risks
<b>Isotonic</b>  Normal Electrolyte Composition  Sodium (Na <sup>+</sup> ) 136-145 mEq/L  Chloride (Cl <sup>-</sup> ) 95-105 mEq/L  Potassium (K <sup>+</sup> ) 3.5-5 mEq/L  Calcium (Ca <sup>2+</sup> ) 8.4-105 mEq/L	Normal saline (0.9% NaCl)  Na <sup>+</sup> 154 Cl <sup>-</sup> 154	↑ Na <sup>+</sup> ↑↑ Cl <sup>-</sup> ↓ Albumin ↓ pH  • Water flow: none • ↔ Intracellular volume • ↑ Extracellular volume	• Fluid resuscitation • Maintenance fluid therapy • Mild hyponatremia • Co-administration of blood products	• Hyperchloremic acidosis
	Ringers lactate  Na <sup>+</sup> 130 Cl <sup>-</sup> 109 K <sup>+</sup> 4 Ca <sup>2+</sup> 2.6 Lactate 28	↓ Na <sup>+</sup> ↑ Cl <sup>-</sup> ↓ Albumin ↔ pH  • Water flow: none • ↔ Intracellular volume • ↑ Extracellular volume • Buffer counters acidosis	• Fluid resuscitation - Burn injuries - GI fluid losses - Surgical patients • Maintenance fluid therapy	• Lactic acidosis in patients with liver failure • Co-administration with blood products → RBC clumping
	D <sub>5</sub> W (5% dextrose)	• Water flow: none • ↑ Intracellular volume • ↑ Extracellular volume  <i>Sodium-free water is evenly distributed among both fluid compartments</i>	• Maintenance fluid therapy • Replacing free water deficit • Total parental nutrition	• Hyperglycemia in diabetic patients • Co-administration with blood products → RBC hemolysis
<b>Hypertonic</b>	3% NaCl	 <ul style="list-style-type: none"> <li>• Water flow: ICF → ECF</li> <li>• ↑ Osmolarity</li> <li>• ↓ Intracellular volume</li> <li>• ↑ Extracellular volume</li> </ul>	• Acute severe hyponatremia	• Osmotic myelinolysis • Fluid overload & pulmonary edema
<b>Hypotonic</b>	½ normal saline (0.45% NaCl)	 <ul style="list-style-type: none"> <li>• Water flow: ECF → ICF</li> <li>• ↓ Osmolarity</li> <li>• ↑ Intracellular volume</li> <li>• ↑ Extracellular volume</li> </ul>	• Replacing free water deficit • Maintenance fluid therapy	• Cerebral edema • Pulmonary edema

Signs and symptoms of hypovolemia: Urine output < 0.5 mL/kg/hour, hypotension, tachycardia, poor skin turgor, weak thready pulse

### 4/2/1 Therapy of Maintenance Therapy

- 4 mL/kg/hr for the first 10 kg (= 40 mL/hr)
- 2 mL/kg/hr for the next 10 kg (= 20 mL/hr)
- 1 mL/kg/hr for each kg over

$$\text{Maintenance IV fluid rate (mL/hour)} = \text{Weight (kg)} + 40$$



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