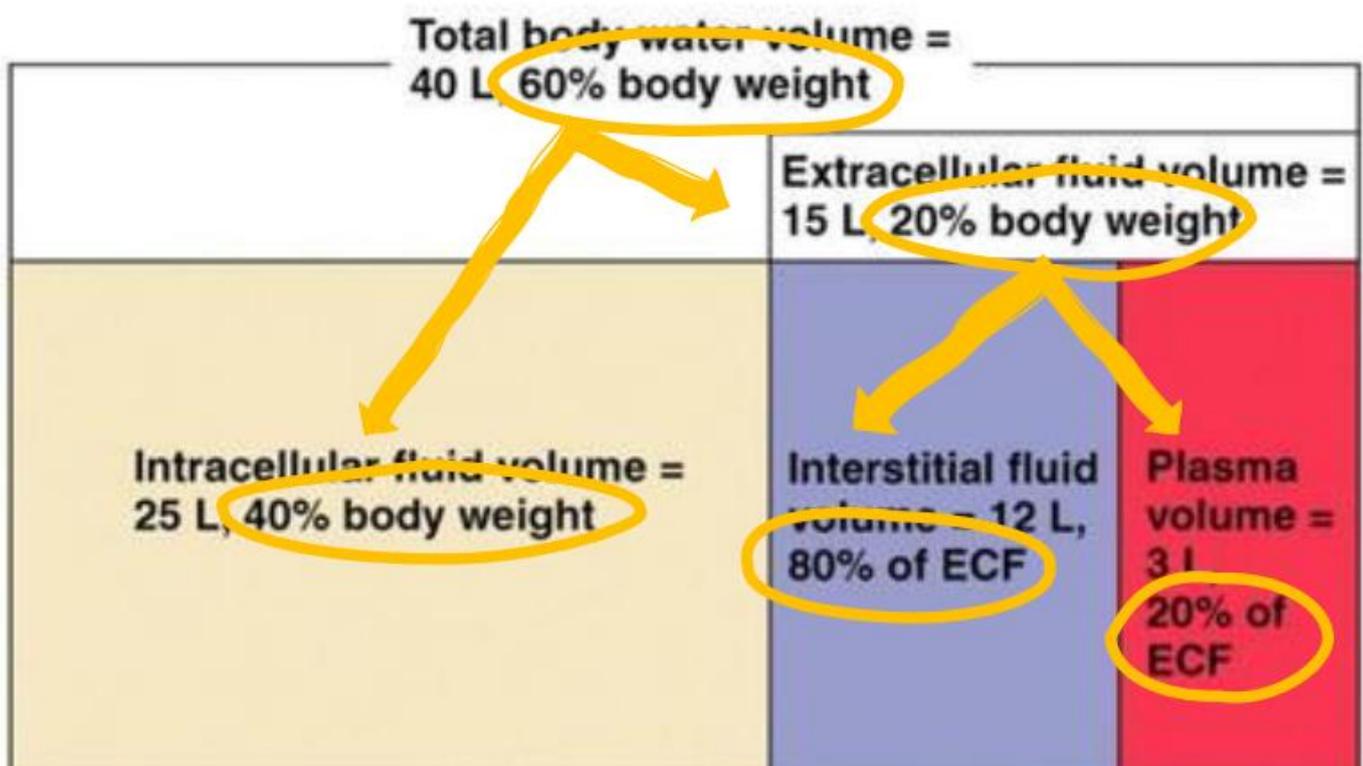


Fluid Therapy (IV fluid)

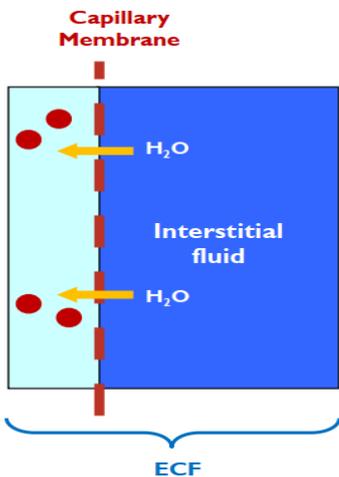
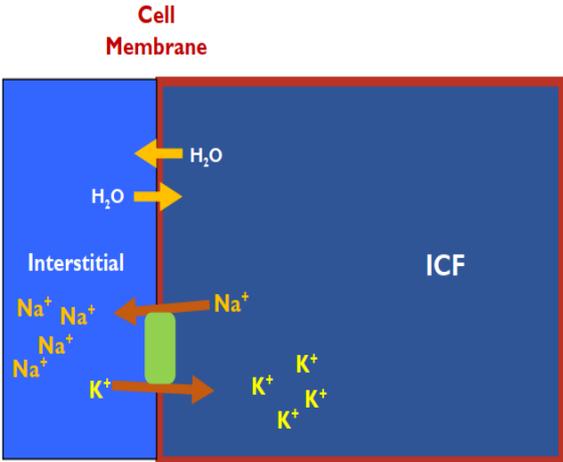
<p>Definition:</p>	<ul style="list-style-type: none"> • Administration of fluids (solutions, medications, blood, or blood products) directly into the general circulation through venipuncture. • Whenever possible, fluids should be provided orally, as IV fluid therapy exposes patients to risks such as fluid overload (giving too much fluid).
<p>Required when:</p>	<ol style="list-style-type: none"> 1) Oral intake is insufficient (e.g., when a patient is “nil by mouth” or has reduced absorption). 2) To replace large fluid losses. 3) When very rapid replacement is necessary.
<p>Causes of Fluid Loss:</p>	<ul style="list-style-type: none"> • The GIT tract (vomiting or diarrhea) • The urinary tract (polyuria) • Blood loss (trauma or surgery) • Fever or severe burns • Inflammatory conditions (e.g., sepsis) → VD & “leakage” of vascular endothelial walls → accumulate into interstitial tissue & serous spaces (the peritoneal or pleural cavities).
<p>Indications of IV fluid therapy (Why to give iv fluids):</p>	<ol style="list-style-type: none"> 1) Correct hypovolemia → restore vital organ perfusion: <ul style="list-style-type: none"> ➤ Heart → Maintain COP ➤ Optimize O₂ delivery to tissues. ➤ Kidney → Maintain urine output. 2) Replace electrolytes & correct acid-base imbalance. 3) Administer blood and blood products 4) Administer medication 5) Provide parenteral nutrition

Total body water:

- Water is occupying the intracellular and extracellular fluid compartments.
- Extracellular fluid mainly comprises **plasma and interstitial fluid**.
- **Water constitutes of the total body weight:**
 - 60% in the average adult **man**.
 - 50% in the average **woman**.
- **It is divided into two major fluid compartments:**
 - **Intracellular fluid** (ICF = 40% total body weight)
 - **Extracellular fluid** (ECF = 20% total body weight).
- **ECF is further subdivided into:**
 - The interstitial (15% total body weight)
 - Intravascular components (5% total body weight), which are separated by the capillary membrane.



▪ **Water movement:**

Water movement between the plasma and interstitial spaces	Water movement between the interstitial and intracellular spaces
<ul style="list-style-type: none"> • Capillary membrane is freely permeable to water and electrolytes but not to large molecules such as proteins (albumin). • The albumin on the plasma side gives rise to a colloid osmotic pressure gradient 	<ul style="list-style-type: none"> • Cell membrane is freely permeable to H₂O but not Na and K → move via pumps across this membrane to maintain a gradient!
 <p>The diagram shows a vertical dashed line representing the capillary membrane. To the left is the plasma (light blue) containing red dots representing albumin. To the right is the interstitial fluid (dark blue). Yellow arrows labeled 'H₂O' point from the interstitial fluid towards the plasma. A bracket at the bottom labels the entire area as 'ECF'.</p>	 <p>The diagram shows a vertical solid line representing the cell membrane. To the left is the interstitial space (light blue) and to the right is the intracellular space (ICF, dark blue). Yellow arrows labeled 'H₂O' show bidirectional movement across the membrane. A green channel represents a pump moving Na⁺ ions from the ICF to the interstitial space and K⁺ ions from the interstitial space to the ICF.</p>

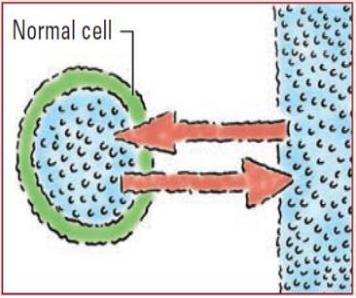
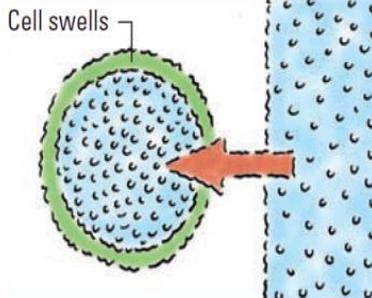
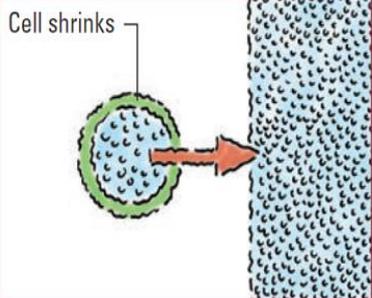
Types of IV fluids:

Crystalloids	Colloids
<ul style="list-style-type: none"> • <u>Solutions of water containing:</u> <ul style="list-style-type: none"> ➢ Ions (such as Na, Cl , K) or ➢ Sugars (such as glucose) or ➢ both. 	<ul style="list-style-type: none"> • Large molecular weight substances typically dissolved in crystalloid solutions such as 0.9% saline. • <u>Classified into two major groups:</u> <ul style="list-style-type: none"> ➢ The semisynthetic (starche, gelatins, and dextrans) ➢ Plasma derivatives (such as albumin)

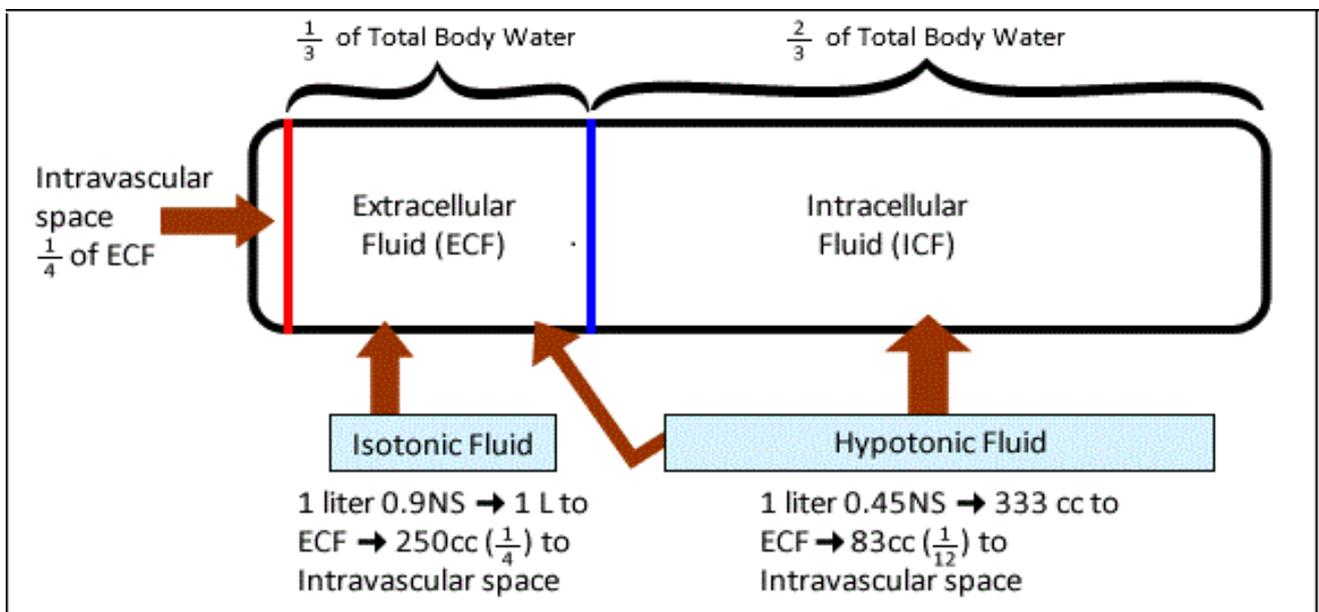
1) Crystalloids

Crystalloids (types): ~~4~~

	Isotonic solutions	Hypotonic solutions	Hypertonic solutions
Def:	<ul style="list-style-type: none"> Has the same concentration of dissolved particles as ICF 	<ul style="list-style-type: none"> Has lower concentration of dissolved particles compared to ICF 	<ul style="list-style-type: none"> Has higher concentration of dissolved particles compared to ICF
Example:	<ul style="list-style-type: none"> 0.9% NaCl sol. (normal saline) Lactated ringer sol. 5% glucose sol. 	<ul style="list-style-type: none"> 0.45% sodium chloride sol. 2.5% glucose sol. 	<ul style="list-style-type: none"> 3% sodium chloride sol. 50% glucose sol.
Osmolality:	<ul style="list-style-type: none"> Have an osmolality (concentration) between 240 and 340 mOsm/kg 	<ul style="list-style-type: none"> Have an osmolality <240 mOsm/kg. 	<ul style="list-style-type: none"> Have an osmolality >340 mOsm/kg
Distribution between body compartments	<ul style="list-style-type: none"> Distribute evenly through ECF → only 1/4 will remain in the intravascular space and 3/4 will be in the interstitial space. 	<ul style="list-style-type: none"> Distribute evenly across all three body compartments. So only 1/3 will remain in ECF (and of this only 1/4 in the intravascular compartment) and 2/3 will enter the cells. 	<ul style="list-style-type: none"> Draws water out of the cells into the more highly concentrated ECF.

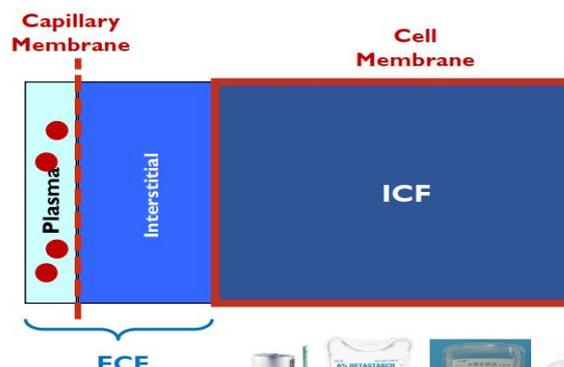
Effect on cell size	No change in cell size	Cell swells	Cell shrinks
			

▪ **Distribution of crystalloids between body compartments:**



2) Colloid:

- Colloids do not easily cross the capillary membrane → **retained intravascularly** → explains their extensive use in rapid management of hypovolemia.



NB:

- Compared to crystalloids, colloids are **expensive** and are associated with **adverse reactions** such as renal failure, coagulation disturbances, and anaphylaxis.
- Currently, there is **no evidence** to support the use of colloids for blood volume expansion, and their use in **critically ill patients** is likely to be harmful.

Complications of IV fluid therapy

1) Complications related to ↑ volume of fluid administered (volume overload):

- Hypertension
- Edema (Peripheral & pulmonary)
- Heart failure
- Electrolyte imbalance:

a. Hyperchloremic metabolic acidosis:	• Excessive infusion of large volumes of 0.9% NaCl sol. → its Cl content is higher than in plasma
b. Metabolic alkalosis:	• Excessive administration of balanced solutions (contain lactate which is metabolized to HCO_3^-).
c. Severe hyponatremia:	• Excessive use of 5% glucose .

2) Complications related to IV route of administration:

- Infection.
- Infiltration (fluid injected outside vein).
- **Phlebitis & thrombophlebitis** (inflammation of vein).

3) Complications related to the iv fluid itself:

- **Anaphylaxis, Renal failure & Coagulopathy** → with colloids **MCC**