

Fluid Management

Total body water

Total body water (70kg male)
(60% of body weight)
42 litre

Intracellular water
($\frac{2}{3}$ of total body water)
28 litre

Extracellular Water
($\frac{1}{3}$ of total body water)
14 litre

Extravascular water (ISF)
($\frac{3}{4}$ of extra cellular water)
10.5 litre

Intravascular water
($\frac{1}{4}$ of extracellular water)
3.5 litre

□ Body water composition in health as a percentage of TBW

	TBW (%)	ICF (%)	ECF (%)
Neonate	75	40	35
Infant	70	40	30
Adult Male	60	40	20
Adult Female	55	35	20

The normal requirement of water sodium and balance:- total body water is 55-75% of the body weight

Lower range – obesity, female, elderly

Higher range – children

Water loss – 70kg male loss approximately 2500ml/day

Urine – 1500ml

Feces – 1000ml

Sweat – 500 ml

Lungs – 400ml

Water gain-

- Ingested fluid – 1300ml**
- Food – 800ml**
- Metabolism – 400ml**

Differences in fluid dynamics

	Infant	Adult
1. TBW		
2. Drug Distribution		
3. Drug Requirement		
4. Blood volume		
5. Maintenance fluid		
6. Renal output		
7. Blood replaced		

Fluid:

Crystalloids-

Colloids-

Difference between crystalloid and colloid-

Fluid Therapy-

Indication-

Hypovolaemia

Major surgery

Where fluid is being lost

Anticipated hypotension eg. Spinal anaesthesia

Fluid dynamics

Rule-1: all infused Na remain in the ECF. It cannot enter to the ICF due to the Na⁺ pump.

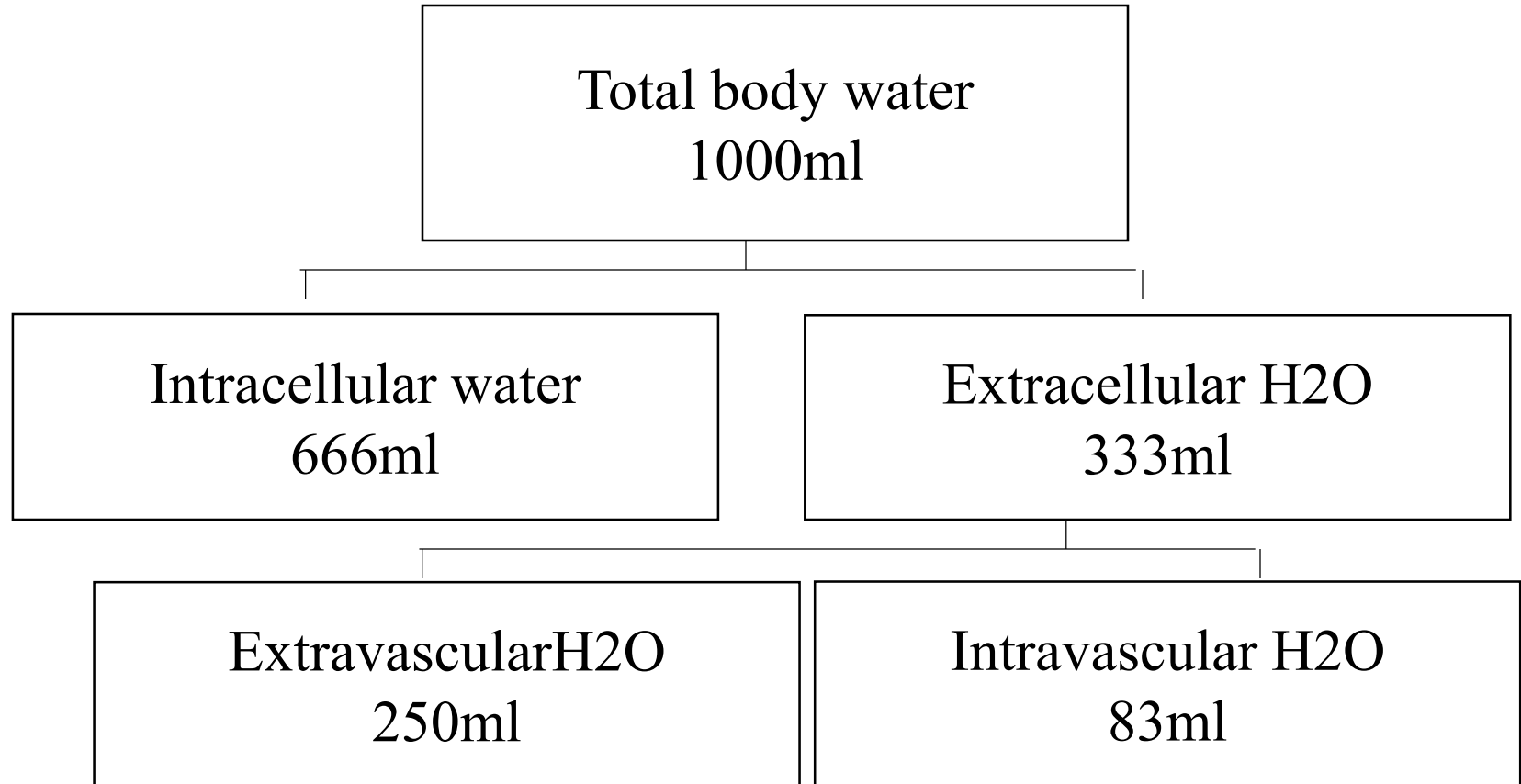
- If this solute is isotonic (.9%NaCl) no water exchange occur

- If this solution is hypotonic (.45%NaCl) osmolarity decreased and water enter into the ICF.

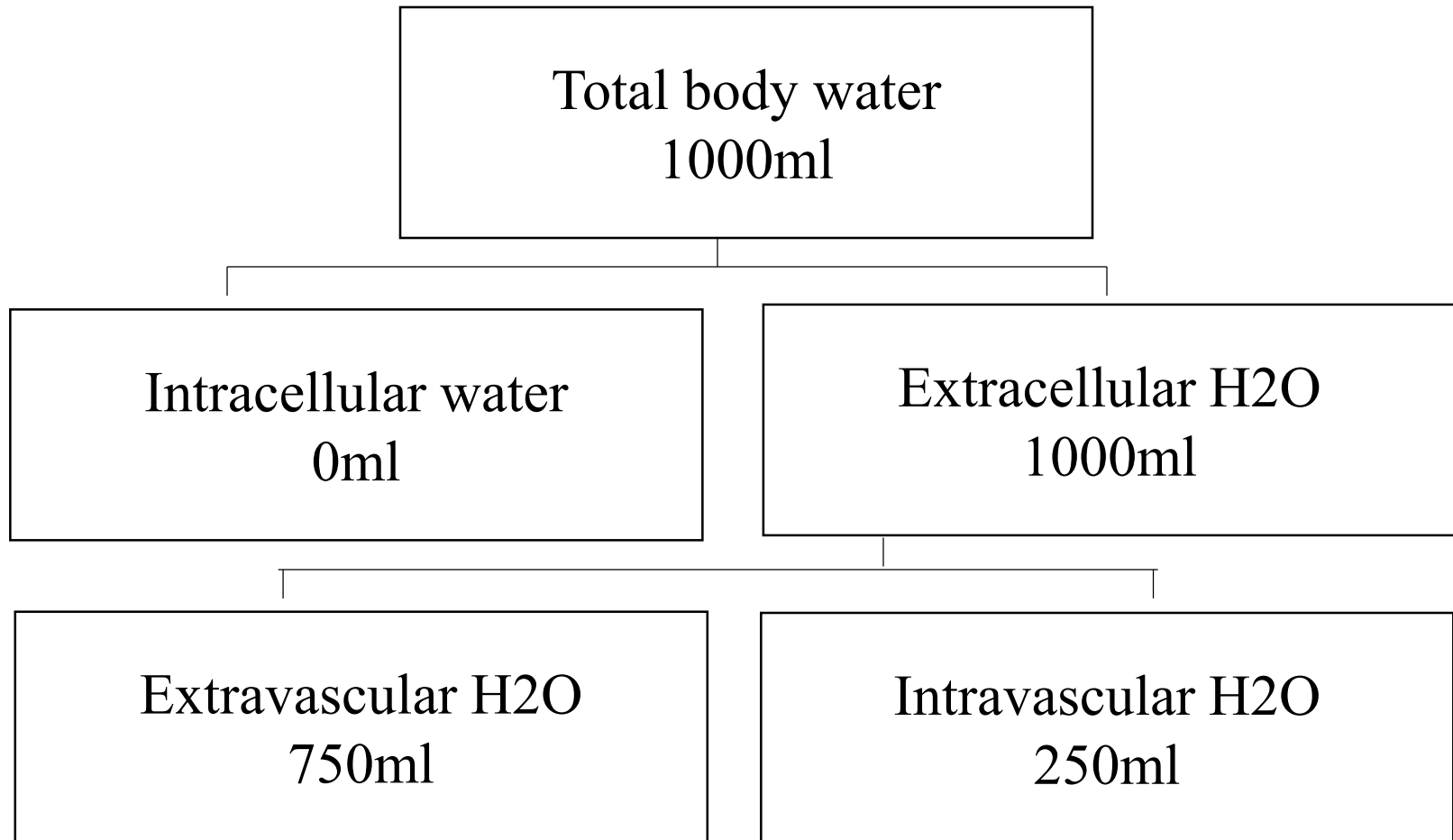
- If this solution is hypertonic (1.8%NaCl) osmolarity increased and it draws water from the cell.

Rule-2: after infused glucose, it enter into the cell and metabolised then water without Na enter both ICF & ECF in proportion in initial volume.

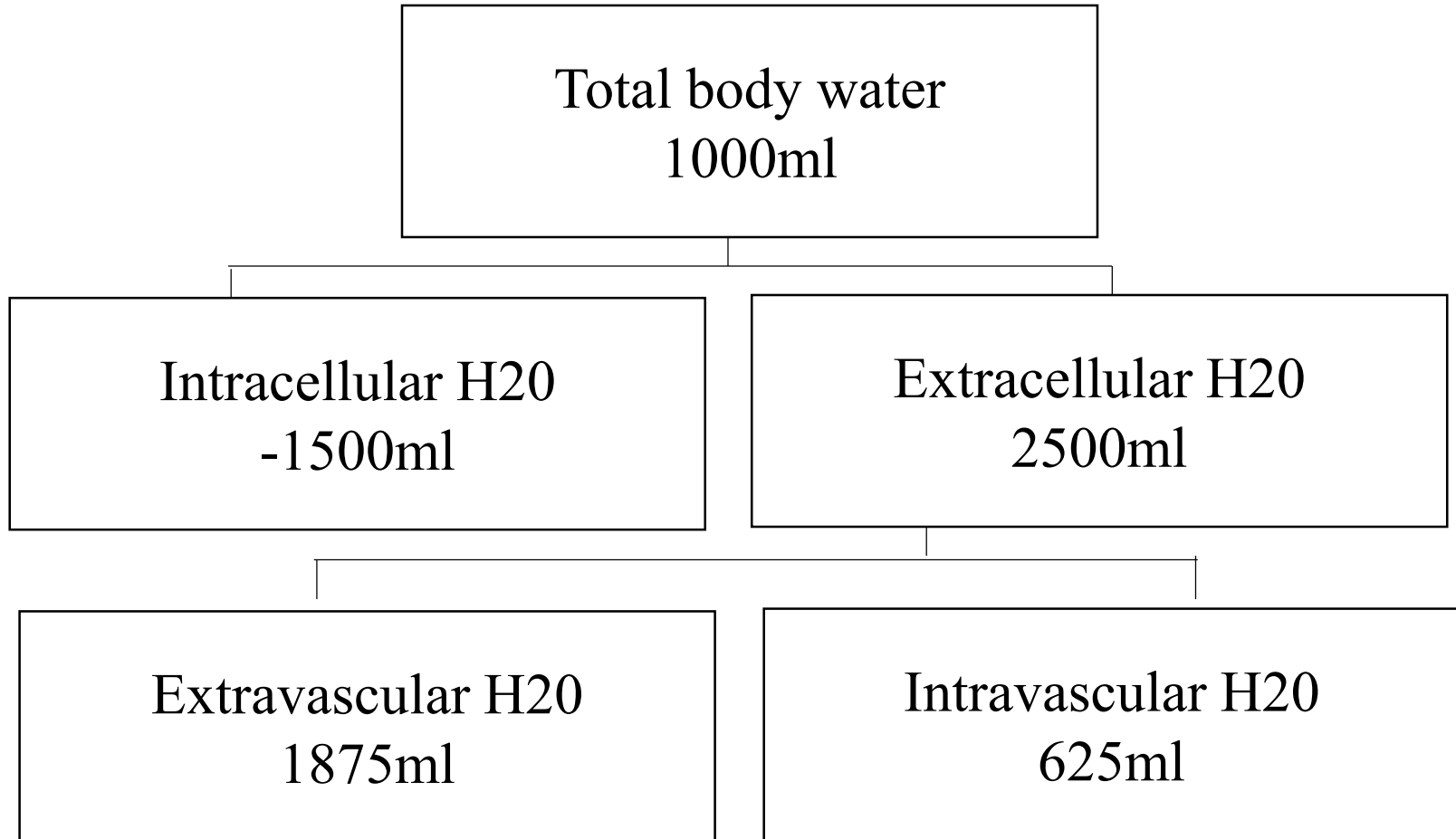
1000ml D5 Water



1000ml balanced salt solution



1000ml 3%NaCl



Estimating maintenance fluid requirement

Body weight	Rate
First 10kg	4ml/kg/hr
Next 10 – 20 kg	Add 2 ml/kg/hr
For each kg above 20kg	Add 1 ml/kg/hr

Requirement of water

Normal req + pre-existing deficit + abnormal loss

Normal requirement directly & metabolic rate

1 kcal of energy metabolism consumes 1.2 ml of H₂O

1 kcal of energy metabolism produce. 2 ml of H₂O

So 1 kcal of energy metabolism requires 1 ml of H₂O

Evaluation of intravascular volume

History

Physical examination

Laboratory evaluation

Hemodynamic measurement

	Hypo volamic	Hyper volamic
HR	↑	↑↓
BP	↓	↑↓
CVP	↓	↑
PCWP	↓	↑

Estimate blood volume

	Volume (ml/kg)
Infant	90
Child	80
Adult male	70
Adult Female	60

Sign & symptom of acute blood loss

Blood volume loss	Sign & symptom
10%	Thirst, vasoconstriction-vein
20%	Sweating, ↑tachycardia (mild to moderate) ↓BP, (Mild), ↓Urine output
30%	↑tachycardic (120 bpm) ↓BP, (moderate), cool clammy & pale, high degree of vasoconstriction
40%	↑tachycardia (severe) ↓BP, (severe) mental confusion
50%	Coma---near death





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