Introduction of IV Fluid and Blood transfusion

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Outline

- DISTRIBUTION of Body Fluid Compartments
- Normal values in extracellular space
- Normal maintenance need
- Osmolality, Osmolarity, and Tonicity
WATER

- Building material
- Solvent ...(Q: types of solution and solutes )
- Reaction medium and reactant
- Carrier for nutrient and waste products
- Thermoregulation
- Lubricant and shock absorber
Distribution of Body Water

- Total Body Water (TBW) equals to 60% of total body weight in **adult males** *(WHY?)*
- In **females**, the percentage is around 55%, while in **infants** is around 75%
- Obese individuals have **less** TBW per weight than non-obese individuals
- Using a **70 Kg** male as an example, TBW is **42 Liters**
Body Fluid Compartments

**TBW:** 55-60% of the BW in men and 45-50% in young women

Total Body Water (TBW)
(70Kg man)
42 litres

Extracellular Fluid Volume (ECF)
1/3 of Total Body Weight = 14 Litres

- **Interstitial Fluid**
  3/4 of ECF = 10.5 Litres
- **Plasma**
  1/4 of ECF = 3 Litres
- **Transcellular Fluid**
  0.5 Litre

- **TBW** = 0.6 x Body weight
Fluid Compartments are divided by water-permeable membranes.....(Q).

Intracellular space is separated from the extracellular space by the cell membrane.

*The capillary membrane* separates the components of the extracellular space.

*Transcellular fluid*: Transcellular fluid is the portion of TBW contained within epithelial lined spaces. It is the smallest component of extracellular fluid, e.g. cerebrospinal fluid, and ocular fluid, joint fluid.
Body Fluid Compartments

Fig. 25.1 Summary of body fluid regulation, including the major body fluid compartments.

WATER BALANCE?

??
INPUT, OUTPUT

• **Input:** Oral, Enteral, Intravenous

• **Output:** ‘**Sensible**’: that it is easily seen and measured e.g. urine output and loses from the gastrointestinal tract.

• ‘**Insensible**’: not seen and not easy to quantify e.g. sweat, and water vapor in exhaled gases.
<table>
<thead>
<tr>
<th>Fluid Input (intake)</th>
<th>Fluid Output (losses)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source</strong></td>
<td><strong>Volume (L)</strong></td>
</tr>
<tr>
<td>Drinking</td>
<td>1.5</td>
</tr>
<tr>
<td>Food</td>
<td>0.5</td>
</tr>
<tr>
<td>Metabolic</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td></td>
<td><strong>2.5</strong></td>
</tr>
</tbody>
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**SWEATING** ....1 H=1 L  
**URINE = Na(90ml) ....K(60-100ML)**
The main extracellular electrolyte is Na and the main intracellular electrolyte is K.

<table>
<thead>
<tr>
<th>Extracellular Fluid</th>
<th>Intracellular Fluid</th>
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</thead>
<tbody>
<tr>
<td><strong>Na</strong>⁺</td>
<td>142 mEq/L</td>
</tr>
<tr>
<td><strong>K</strong>⁺</td>
<td>4 mEq/L</td>
</tr>
<tr>
<td><strong>Ca</strong>++</td>
<td>5 mEq/L</td>
</tr>
<tr>
<td><strong>Mg</strong>++</td>
<td>3 mEq/L</td>
</tr>
<tr>
<td><strong>Cl</strong>⁻</td>
<td>103 mEq/L</td>
</tr>
<tr>
<td><strong>HCO₃</strong>⁻</td>
<td>28 mEq/L</td>
</tr>
<tr>
<td><strong>Phosphates</strong></td>
<td>4 mEq/L</td>
</tr>
<tr>
<td><strong>SO₄</strong>⁻</td>
<td>1 mEq/L</td>
</tr>
<tr>
<td><strong>Osmolality</strong></td>
<td>281 mOsm/L</td>
</tr>
</tbody>
</table>
Osmolarity and Osmolality

- **Osmola(R)ity**: No. of osmoles of solute particles per unit **VOLUME** of solution and has units osmoles\ liter.  

- **Osmola(L)ity**: No. of osmoles of solute particles per unit **WEIGHT** of solvent and has units osmoles \ kilogram
Tonicity

- A way of describing the relative solute concentration of two solutions which are separated by selectively-permeable membrane (often called a semi-permeable membrane)
In clinical practice the tonicity ....
fluid administered IV relative to the tonicity of internal environment of RBCs