Dr.Sarmistha

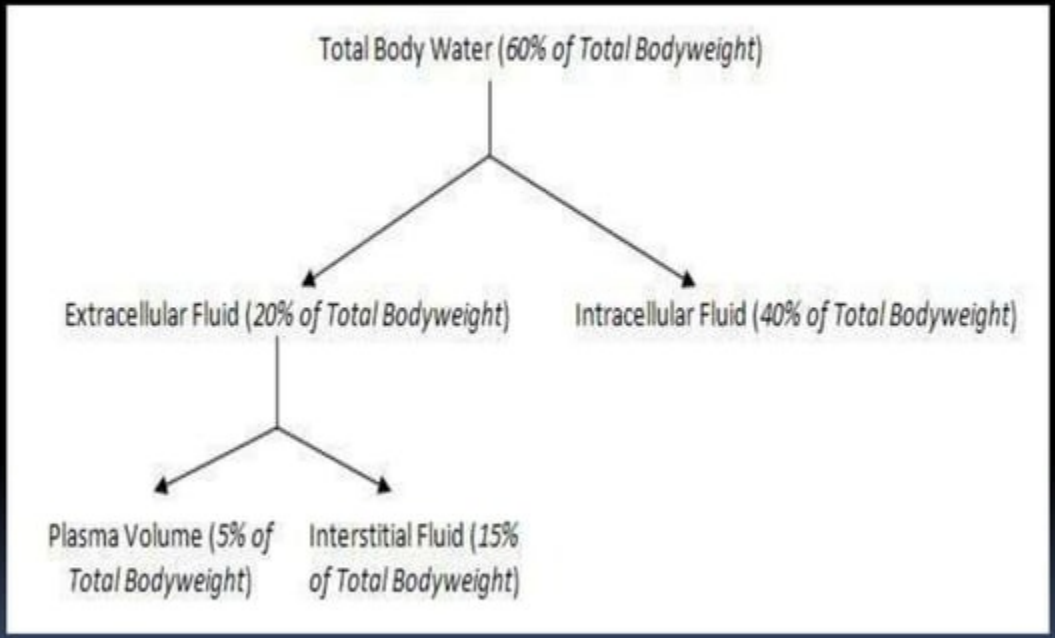
PERIOPERATIVE FLUID MANAGEMENT

- Perioperative fluid therapy includes replacement of normal losses of preexisting fluid deficits, and of surgical wound losses including blood loss

Why do we need fluids?

- To maintain cellular function and energy production
- O_2 delivery/perfusion
- O_2 utilization
- Metabolism and excretion of waste
- Maintain distribution of electrolytes

Total body water distribution



Starling-Landis equation

$$\text{Fluid movement } (J_v) = K_f [(P_c - P_i) - \sigma(\pi_c - \pi_i)]$$

- *Pc is the capillary hydrostatic pressure*
- *Pi is the interstitial hydrostatic pressure*
- *πc is the capillary oncotic pressure*
- *πi is the interstitial oncotic pressure*
- *Kf is the filtration coefficient – a proportionality constant*
- *σ is the reflection coefficient*

Why not enough fluid?

- Less oral intake prior to fasting
- Prolonged pre-op fasting
- Intra-op fluid and blood loss-

i. Direct blood loss
ii. Exposure of large internal surfaces
iii. Dry gases while intubated

How much to give and when to give?

- Individualized rational fluid therapy
- Type of patient
- Type of surgery
- Amount of trauma
- Acute injury Vs elective
- positioning

Preoperative Evaluation of Fluid Status

- Factors to Assess:
  - h/o intake and output
  - blood pressure: supine *and* standing
  - heart rate
  - skin
  - Urinary output
  - mental status

Perioperative fluid strategy

- Compensatory intravascular volume expansion
- Deficits
- Maintenance
- Blood loss
- **Compensatory intravascular volume expansion-**
- Intravascular fluid vol must usually be supplemented to compensate for venodilation and cardiac depression caused by anesthesia(normally,5-7ml/kg of balanced salt solution is used)

- **Deficits:**
- Preop npo (hrly maintenance x duration)
- Preop blood loss (trauma) or fluid loss(burns)
- Typically replaced over 1st 2-4 hrs

- **Maintenance:**
- (4-2-1 rule)
- 4ml/kg/hr for 1st 10kg of body wt
- 2ml/kg/hr for 2nd 10kg of body wt
- 1ml/kg/hr for each kg of b wt above 20kg
- Based on water loss from burning calories- from Holiday and Segar

- **Replace blood loss:**
- 2-10ml/kg/hr
- 3:1 of crystalloid
- 1:1 of blood or colloid

Risks of excess fluids:

- Interstitial edema
- Impaired cellular metabolism
- Poor wound healing
- Decreased pulmonary compliance
- Heart failure-overload
- Delayed return of bowel function
- Hemodilution

Fluid therapy in children(per day)

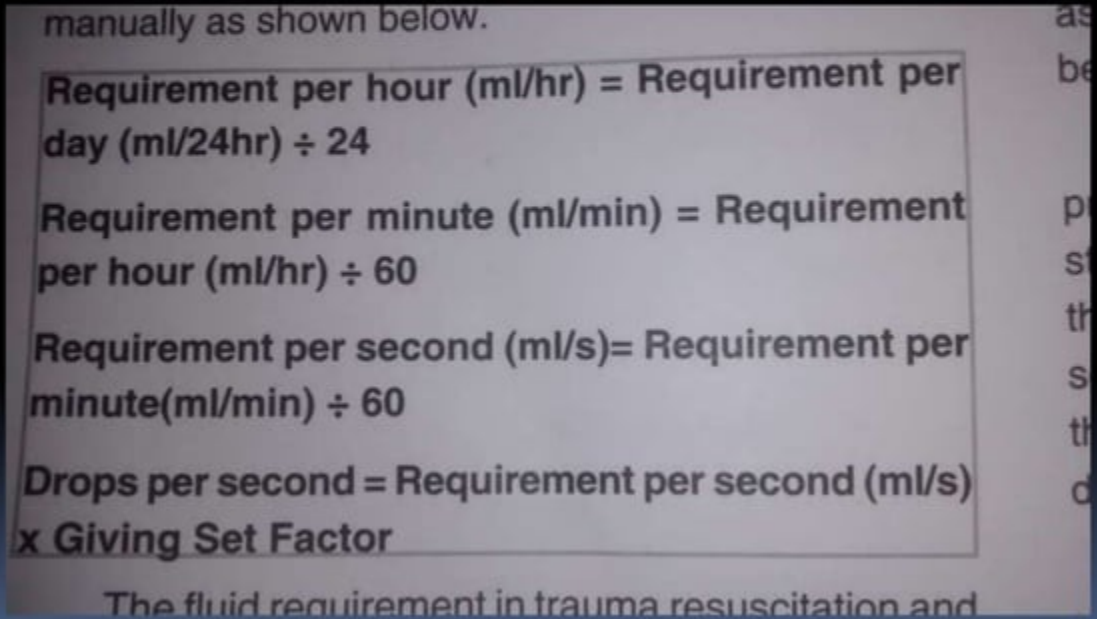
- New born(FT) day 1- 70ml/kg
- day2-80ml/kg
- day3-90ml/kg
- Day 4 to upto 10kg 100ml/kg- 100ml/kg
- 11-20kg -1000ml+50ml/kg
- >20kg -1500ml+20ml/kg

Maintenance per hr

- 0–10 -4ml/kg/hr
- 10-20 -40 ml + 2 ml kg/hr
- >20 -60 ml + 1 ml kg/hr

Age	Blood Volume
Neonates	
Premature	95 mL/kg
Full-term	85 mL/kg
Infants	80 mL/kg
Adults	
Men	75 mL/kg
Women	65 mL/kg

The calculated fluid should be given as follows



manually as shown below.

Requirement per hour (ml/hr) = Requirement per day (ml/24hr) ÷ 24

Requirement per minute (ml/min) = Requirement per hour (ml/hr) ÷ 60

Requirement per second (ml/s)= Requirement per minute(ml/min) ÷ 60

Drops per second = Requirement per second (ml/s) x Giving Set Factor

The fluid requirement in trauma resuscitation and

Choice of fluids

- Crystalloids
- Colloids
- Blood/blood products and blood substitutes

Crystalloids vs colloids

crystalloids

- Low mol wt
- Iso/hypo/hypertonic
- Inc hydrostatic pressure
- Expands interstitial vol
- T1/2-30 minutes
- Replacement ratio-3:1
- Allergic reaction-rare
- cheap

colloids

- High mol wt
- hypertonic
- Inc oncotic pressure
- Expands plasma vol
- T1/2-2hrs
- 1:1
- Common
- Expensive

crystalloids

advantages	disadvantages
Balanced electrolyte solution	Poor plasma volume support
-Easy to administer	-Large quantities needed
-No risk of adverse reactions	-Risk of Hypothermia
-No disturbance of hemostasis	-Reduced plasma oncotic pressure
-Promote diuresis	
-Inexpensive	-Risk of edema

colloids

advantages

-Prolonged plasma volume support

-Moderate volume needed

-minimal risk of tissue edema

-enhances microvascular flow

disadvantages

-Risk of volume overload

- Adverse effect on haemostasis

- Anaphylactic reaction

- Expensive

Composition

Fluid	Osmo-lality	Na	Cl	K
D5W	253	0	0	0
0.9NS	308	154	154	0
LR	273	130	109	*4.0*
Plasma-lyte	294	140	98	*5.0*
Hespan	310	154	154	0
5% Albumin	308	145	145	0
3%Saline	1027	513	513	0

Clinical Evaluation of Fluid Replacement

1. Urine Output: at least 1.0 ml/kg/hour
2. Vital Signs: Blood pressure and heart rate
3. Physical Assessment: texture of skin and mucous membranes; thirst in an awake patient
4. Laboratory tests: periodic monitoring of hemoglobin and hematocrit

Measures of intravascular volume

Static measures

- Central venous pressure
- Pulm artery occlusion pressure
- Lt ventricular end diastolic area
- Ivc diameter

Dynamic measures

- Pulse pressure variation
- Stroke volume variation
- Dynamic changes in aortic flow velocity/sv assessed by echo
- Positive pressure ventilation changes in vena caval diameter

Thank you