



Physiology of the Pediatric Surgical Patient

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Physiology

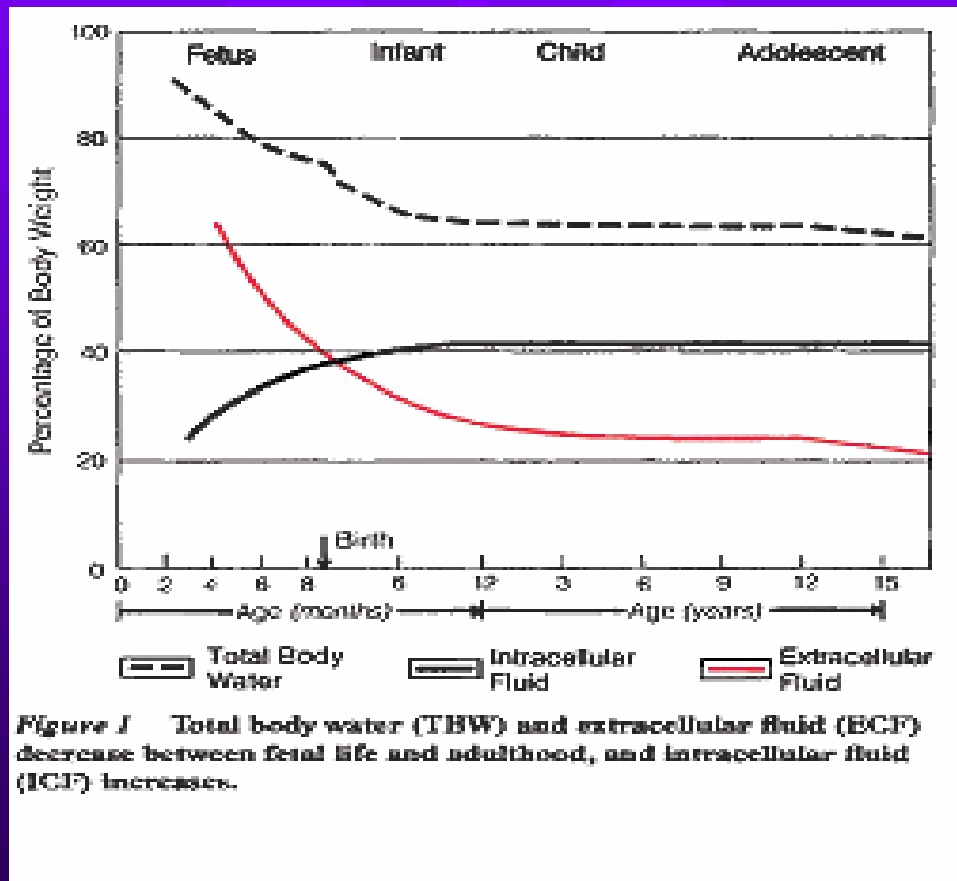
- Children are not just small adults!



Homeostasis

- TBW = 75% of weight
- Large “bags of water”
- Obligate diuresis (60% by first year)
- Reduced glomerular filtration rate
- Urine output – 2 cc/kg/hr
- High TBSA/weight – insensible loss

Physiology of the Pediatric Surgical Patient



Fluids & Electrolytes

- 4-2-1 rule
- 70 mls/kg/24 hrs.
- Surgery babies > 100 mls/kg/24 hrs.
- Higher for premature patients
 - Transcutaneous loss
 - Lower gfr

Fluids & Electrolytes

- Na = 2 mEq/kg/24 hrs
- K = 1-2 mEq/kg/24 hrs
 - Only after urine output established
- D10 + 0.2% saline + Ca @ 100cc/kg/day
- Monitor Response! (chess game)

Acid – Base Status

- Metabolic Alkalosis
 - Loss of Cl
 - Prolonged NGT suction or vomiting
 - Poorly tolerated
 - Replace electrolytes
- Metabolic Acidosis
 - Gap vs. Non Gap
 - Treat underlying cause

Temperature

- Infants with higher BSA to weight ratio
- Convection, conduction
- Insensible loss thru skin
- Incubator
- Radiant warmer
- Warmed fluids/ gases

Nutrition

- Higher weight adjusted caloric requirements
- Increased with trauma or stress
- 50% carbohydrate, 35% fat, 15% protein
- Histidine essential in infants
- More vitamin and mineral requirement
- Calcium & Phosphorus

Enteral Nutrition

- Preferred route of administration
- Breast milk – IgA, may prevent NEC
- Elemental feeds
- Prevent cholestasis
- Weight gain = 20 gms/day in full term infants

Postoperative Feeding

- Lack of suck/swallow – gavage feeds
- After resolution of ileus
 - Nonbilious NGT aspirate
 - Flatus, ostomy output
 - Presence of Bowel sounds unreliable
- Volume before concentration, continuous before bolus
 - Handle osmolarity poorly
- FLAP diet

Parenteral Nutrition

- Dudrick – 1968
- Only when GI tract unavailable
- Requires central line (PICC, UAC, UVC)
- Expensive
- More complications
- Biliary Stasis
- Sepsis

Parenteral Nutrition

- Monitor weight, glucose, triglycerides, LFTs, Albumin, BUN, Calcium, Magnesium, Phosphorus
- Supplemental trophic feeding
- Careful attention to aseptic technique

Nutrition

Table 2 Daily Kilocalorie and Protein Requirements for Infants and Children

Age (yr)	Kilocalorie Requirements* (kcal/kg)	Protein Requirements (g/kg)
0-1	90-120	2.0-3.5
1-7	75-90	2.0-2.5
7-12	60-75	2.0
12-18	30-60	1.5
18+	25-30	1.0

*These numbers represent volume administered when 1 kcal/ml solutions are used. Growth can be maintained with 10% to 20% fewer calories if parenteral nutrition is employed.

Parenteral Nutrition



Shock

- Normal Vital Signs
- Pediatric population rate dependant for cardiac output
 - $CO = HR \times SV$
- Bradycardia vs. Tachycardia
- GNR most common cause of sepsis

Shock

Table 3 Normal Values for Vital Signs in Children¹⁴²

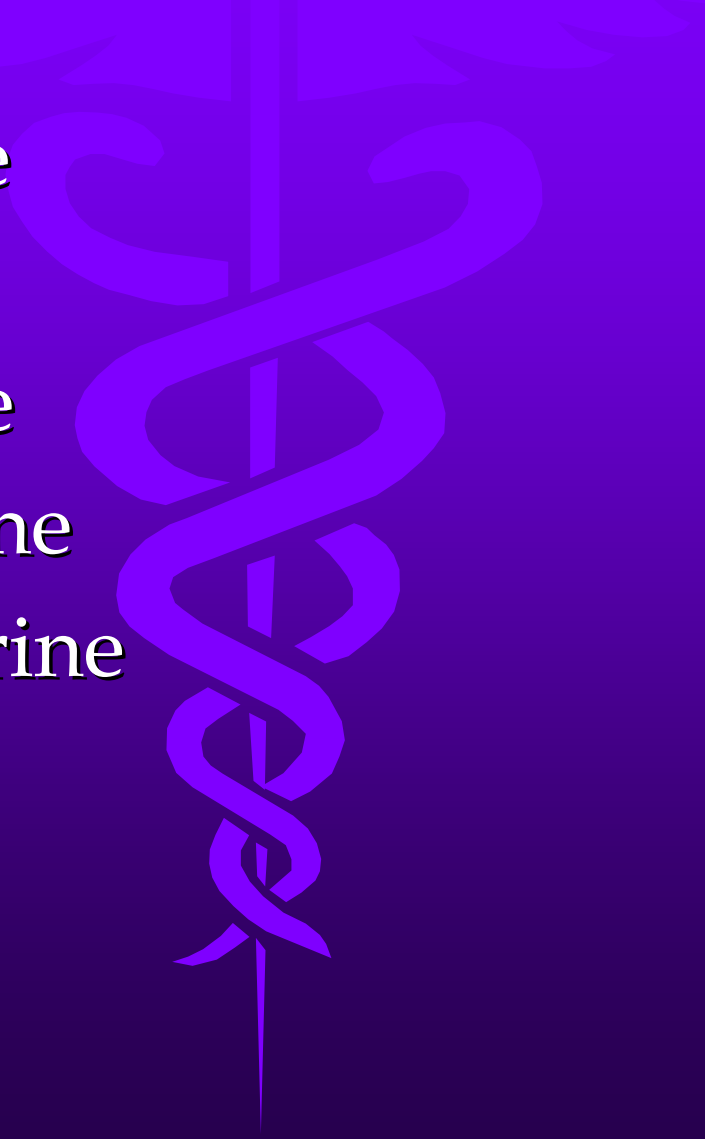
Age (yr)	Pulse Rate (beats/min)	Systolic BP (mm Hg)	Respirations (breaths/min)	Urinary Output (ml/kg/hr)
0-1	< 160	> 60	< 60	2.0
1-3	< 150	> 70	< 40	1.5
3-5	< 140	> 75	< 35	1.0
6-12	< 120	> 80	< 30	1.0
> 12	< 100	> 90	< 30	0.5

Shock

- Treatment
 - ABCs
 - Ensure full tank
 - Hct > 45%
 - Tend to become hypernatremic from free water loss
 - 10 cc/ kg bolus
 - Broad Spectrum IV antibiotics early
 - Monitor CVP
 - ICH

Shock

- Epinephrine
- Dopamine
- Dobutamine
- Phenyephrine
- Neosynephrine



Questions

