Dissolving Mysteries, Myths and Legends of Peri-Operative Fluid Management

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Distribution of water throughout the body.

Total Body Water distribution in a 70 Kg person

100%

- 3.5 liters is INTRAVASCULAR (8.4% of total fluid volume)
- 10.5 liters is INTERSTITIAL (25% of total fluid volume)
- 28 liters is INTRACELLULAR (66.7% of total fluid volume)

Fallick C et al. Circ Heart Fail. 2011;4:669-675
Two to two-and-a-half liters of water per day are generally sufficient for adults; Most of this minimum intake is usually derived from the water content of food (~1000 mL) and the water of oxidation (~300 mL), therefore only approximately 700-1200ml of water needs be imbibed given normal diet and no increased losses.
Hypovolemia

Restricted vs Liberal
“WATER” REPLACEMENT THERAPY vs MAINTENANCE THERAPY

CLASSIC [LIBERAL] APPROACH

• Correct pre-operative deficits*
  • 4/2/1 Rule
    \[\text{[Weight (in kg) + 40]} \times \text{hours NPO}\]
    \[\text{[70 + 40]} \times 12 = 1,320 \text{ mL}\]

• Calculate Maintenance Requirements
  • 4/2/1 Rule = 110 mL/hr

• Correct ongoing losses
  • Colloids, Crystalloids, Blood

“WATER” REPLACEMENT THERAPY vs MAINTENANCE THERAPY

• GOAL DIRECTED [RESTRICTED] APPROACH
  “Management of fluids to optimize stroke volume is an extremely well-validated approach and has been shown repeatedly to reduce morbidity.”

  Gurgel ST, Nascimento P. Anesth Analg 112: 1384, 2011
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- Replace Pre-op Deficit using 4/2/1 Rule x NPO hrs
- Maintain using 4/2/1 with T/E Monitoring, CVP, U/O
  - Give small bolus, see how the patient responds
  - A change in U/O should occur 10-15 min.

- Replace Blood loss
  - 1 mL of washed RBC volume for every mL blood loss
  - 1 mL of a colloid for every mL blood loss
  - 3 mL LR for every mL blood loss

- Hospitalized Patient vs Acute Care Patient
- “Surgeon Factor”
• Replace Pre-op Deficit x NPO hrs (“at least 1 liter”)
• Maintain hourly requirement
  – Third-spacing of 4-6 mL/kg/hour in “big operations”
  – Other insensible losses + blood loss
• Albumin used for blood loss
• ALL ROADS LEAD TO LOOKING FOR A HEMODYNAMIC RESPONSE
  – PCWP and SVR best indicators when balancing giving fluids versus vasopressors
• Restricted vs. Liberal Fluid Management
• “Goal Directed” using hemodynamic monitoring
  [Fluids are given as targeted boluses when they are expected to lead to a hemodynamic improvement]
• FloTrac® and Echo
• Restricts initial volume to 1000 mL LR
• Blood Loss Replacement
  • Washed Red Cells
  • Albumin if RBC’s not readily available
• “Trying not to dilute too much, but we ‘have to’ due to the meds we give.”