

## Maintenance Fluids (4-2-1 Rule)

Weight	Rate
0-10 kg	4 mL/kg/hr
11-20 kg	2 mL/kg/hr
>20 kg	1 mL/kg/hr

Example (70 kg): 40 + 20 + 50 = 110 mL/hr

## NPO Deficit

$$\text{NPO Deficit} = \text{Maintenance Rate} \times \text{Fasting Hours}$$

Example (70 kg, NPO 8 hr): 110 x 8 = 880 mL

Hour	Maintenance	NPO Replacement	Third Space
1st	M	50% of deficit	T
2nd	M	25% of deficit	T
3rd	M	25% of deficit	T
4th+	M	-	T

## Third Space Losses (Surgical Trauma)

Surgery type	Rate
Superficial (orofacial)	1-2 mL/kg/hr
Minimal (herniorrhaphy)	2-4 mL/kg/hr
Moderate (lap abdominal)	4-6 mL/kg/hr
Severe (open abdominal)	6-8 mL/kg/hr

## Estimated Blood Volume

Population	EBV
Adults	70 mL/kg
Neonates (term)	80-90 mL/kg
Preterm neonates	90-100 mL/kg

## MABL (Maximum Allowable Blood Loss)

$$\text{MABL} = \text{EBV} \times (\text{Initial Hct} - \text{Lowest Acceptable Hct}) / \text{Initial Hct}$$

Use the initial Hct in the denominator.

Example (70 kg, Hct 42% to 21%): EBV = 70 x 70 = 4,900 mL  
 MABL = 4,900 x (42 - 21) / 42 = 2,450 mL

## Blood Loss Replacement

Replace with	Ratio
Crystalloid	3:1
Colloid or blood	1:1

## Obesity Adjustments (BMI > 30)

Calculation	Weight to use
Maintenance + third space	IBW (not TBW)
EBV	LBW + 20% (LBW ≈ IBW x 1.3)

## Normal Hgb / Hct

	Hgb	Hct
Men	15 g/dL	45%
Women	13 g/dL	39%

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Sources: Trinooson & Patel (2023), Fluids, electrolytes, and goal-directed therapy (Ch. 21); Wilson (2023), Blood and blood component therapy (Ch. 22); Krogh (2023), Obesity and anesthesia practice (Ch. 48); Heiner (2023), Respiratory anatomy, physiology, pathophysiology, and anesthesia management (Ch. 29). All in Elisha, Heiner, & Nagelhout (Eds.), Nurse anesthesia (7th ed.). Elsevier.

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