

## CALCULATION OF FLUID REQUIREMENT FOR CHILDREN



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### INTRODUCTION:

The integrity of organism depends on a stable internal environment which is constituted in a large measure by water and electrolytes which are maintained within normal limits by a delicate manner.

### Pediatric Fluid And Output Calculation

#### A. BODY WEIGHT METHOD (Remember to convert lbs. to kgs.)

##### 1. Daily Maintenance Fluid Requirement Formula:

- 0-10 kg - 100 mL/kg/day (100 x kg)
- 11-20 kg - 1000 mL (for first 10 kg) + 50 mL/kg/day for each additional kg between 10-20 kg
- Over 20 kg - 1500 mL (for first 20 kg) + 20 mL/kg/day for each additional kg Over 20 kg

##### 2. Hourly Maintenance Fluid Requirements:

Divide daily volume by 24 (hours/day)

##### Examples:

Calculate the daily and hourly maintenance fluid requirements for a child weighing 5 kg.

$$100 \text{ mL} \times 5 \text{ kg} = 500 \text{ mL} / \text{day}$$

$$500 \text{ mL} \div 24 \text{ hours} = 20.8 \text{ mL} / \text{hr}$$

#### B. BODY SURFACE AREA (BSA) METHOD.

Fluid requirement formula in burn cases is depend on the total body surface area (TBSA) burnt and body weight of the child.

1. Use a nomogram to find the body surface area (BSA) in meters Squared (M2). Plot height and weight in appropriate columns, draw imaginary line between, intersection point is M<sup>2</sup>

2. Maintenance Fluids = 1500- 2000 mL/ M2/day

Fluid Restriction = 1200 – 1500 mL/ M2/day.

**Examples:** Calculate the maintenance fluid requirements for a child whose BSA is 0.8 M<sup>2</sup>.

$$1500 \text{ mL} \times 0.8 = 1200 \text{ mL/day} \quad 1200 \div 24 = 50 \text{ mL} / \text{hr}$$

$$2000 \text{ mL} \times 0.8 = 1600 \text{ mL/day} \quad 1600 \div 24 = 66 \text{ mL} / \text{hr}$$

**Parkland** formula is commonly used for fluid replacement in case of burn patient:

##### a) For first 24 hours:

Total amount of fluid requirement = 4ml of Ringer's lactate X weight in kg X percentage of TBSA

- One half of the fluid should be given in 1st 8 hrs, start from the time of accident.

- Remaining half of fluid is give in next 16 hours.

##### b) For next 24 hours:

Total amount of fluid requirement = 2ml of Ringer's lactate X weight in kg X percentage of burns. This formula is used when the burn is 15-20% of TBSA.

#### C. OUTPUT CALCULATION

1. Convert grams to mL (1 gram = 1 mL)
2. Normal output: 1-3 cc/kg/hr,
3. Divide total output volume by weight and hours.

##### Example:

Calculate the cc/kg/hr for a 5-kg infant who had the following output over the past 8 hours: 33g, 27g and 30 g diapers. Scale zeroed with dry diaper.

$$33 + 27 + 30 = 90 \text{ mL total} \quad 90 \text{ mL} \div 8 \text{ hours} = 11.25 \text{ mL/hr}$$

$$11.25 \div 5 \text{ kg} = 2.25 \text{ mL/kg/hr}$$

**Oral rehydration**

- ❖ Pick a fluid (more later)
- ❖ Mild dehydration- 50 mL/kg within 4 hr
- ❖ Moderate dehydration- 100 mL/kg over 4 hr
- ❖ Additional fluids as per clinical condition

**Maintenance Fluids- Calculations**

- ❖ 100/50/20” rule
  - 100 ml/kg for up to the 1st 10 kg of body weight
  - 50 ml/kg for up to the 2nd 10 kg of body weight
  - 20 ml/kg for up to the 3rd 10 kg of body weight
- ❖ Max total fluid/day usually 2-2.5L cc

**Maintenance- Rate**

- ❖ 4/2/1” Rule
  - 0–10 kg: 4 mL/kg/hr
  - 10–20 kg: 40 mL/hr + 2 mL/kg/hr × (wt-10 kg)
  - >20 kg: 60 mL/hr + 1 mL/kg/hr × (wt-20 kg)

**CALCULATION OF 24-HOUR FLUID REQUIREMENT AT DIFFERENT LEVELS OF DEHYDRATION**

% Dehydration	Rehydration Needs(a) (ml/kg/day)	Maintenance Needs(b) (ml/kg/day)	Total Requirement(c) (ml/kg/day)	Multiplication Factor (d) (x Maintenance)
1	10	60	70	1.2
2	20	60	80	1.3
3	30	60	90	1.5
4	40	60	100	1.7
5	50	60	110	1.8
6	60	60	120	2.0
7	70	60	130	2.2
8	80	60	140	2.3
9	90	60	150	2.5
10	100	60	160	2.7
11	110	60	170	2.8
12	120	60	180	3.0

- A. Fixed relationship of 10 ml/kg/day required for each percentage point of dehydration.
- B. Average maintenance requirement assuming no additional contemporary losses of fluid. This amount may need to be adjusted upward to account for contemporary losses, such as vomiting, diarrhea, and polyuria.
- C. Total requirement equals sum of rehydration and maintenance needs.
- D. Alternative method of calculation of total fluid

requirement multiplies this arithmetic factor times the maintenance requirement of 60 ml/kg/day; thus, most dehydrated cats will require two times (moderate or 6 percent dehydration) to three times (severe or 12 percent dehydration) maintenance volume.

**Note:** Water intake from food and drinking must be taken into consideration while calculating the fluid requirement. One, 5.5 oz can of cat food that contains 75% moisture contains 143 ml of water.

**CALCULATION OF IV FLUIDS**

**In case of macro drip IV set:** This is used for older children.

$$\text{Drops/minutes} = \frac{\text{Total volume of infusion} \times 15 \text{ drops}}{\text{Total number of hours} \times \text{minutes} (60)}$$

**Incase of micro drip IV set:**

**This Is Used For Young Infants**

$$\text{Drops/minutes} = \frac{\text{Total volume of infusion} \times 60 \text{ drops}}{\text{Total number of hours} \times \text{minutes} (60)}$$

**Note:**

- One macro drip = 4 micro drip
- 15 macro drip = 60 micro drip = 1 ml

**CONCLUSION:**

Fluid requirement is very essential for dehydration. Fluid plan and calculation are important intervention of nursing.

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