

PAEDIATRIC INTENSIVE CARE – CLINICAL PRACTICE GUIDELINE

Fluid Therapy

Introduction

Critically ill patients usually are admitted with already electrolyte imbalance or conditions where fluid therapy can improve their outcome. Poor fluid management can result in very devastating results, even death.

Aim

To provide a clear guideline on fluid management for the critically ill children in the Paediatric ICU:

1. On the type of fluid to be used
2. How to calculate the amount needed
3. Medical conditions that require adjustment of fluid therapy.

Note however that alterations are to be made according to each individual patient and the comorbidities that are present.

Parameters of the Guideline

For all children that are admitted in Paediatric ICU who are nil by mouth and are unable to tolerate enteral feeding. Excluded from the guidelines are fluids for conditions such as Burns, Malnutrition, Neonates and Renal Failure. For these conditions, refer to their specific guidelines.

Definitions of Terms

- **Hypernatraemia** – serum sodium >150mmol/L
- **Hyponatraemia** – serum sodium < 135 mmol/l
- **ORS** – Oral Rehydration Solutions

Management

- **Fluid Boluses** – Ensure a good size(as large as possible) cannular is in place. Boluses should always be provided as either Normal saline or Hartmans solution at 20 ml/kg fast(10 – 20 minutes). May need to repeat twice if remains in shock(total boluses 60 ml/kg). Consider use of blood products and inotropes after 40 ml/kg boluses.

- **Maintenance Fluid-** Use Drug and Fluid Calculator for electronic guideline. Follow the link. [Tools\PICU drugs and fluids calculator.xls](#)
 - Type of IV Fluid: 2 options
 - **Dextrose 5% + 0.45% Normal Saline**
 - (50 ml Dextrose 10% + 50ml Normal Saline)
 - OR
 - **Dextrose 5% + Normal Saline**
 - (10 ml Dextrose 50% + 90 ml Normal Saline)
 - Additions: may need to add potassium chloride 2mmol/kg/day if expected to be nil by mouth for 72 hrs.
 - Amount:
 - 0 – 10 kg 100 ml/kg/day or
 - 4 ml/kg/hr
 - 11 – 20 kg 1000 ml + 50 ml/kg/day for each kg above 10 kg or
 - 40 ml/hr + 2ml/kg/hr
 - Above 20 kg 1500 ml + 20 ml/kg/day for each kg above 20kg or
 - 60 ml/hr + 1ml/kg/hr
 - Examples:
 - 7 kg child requires $7 \times 100 = 700$ ml/24 hr
 - $7 \times 4 = 28$ ml/hr
 - 12kg child requires $1000 + (2 \times 50) = 1100$ ml/24 hr
 - $40 + (2 \times 2) = 44$ ml/hr
 - 25 kg child requires $1500 + (5 \times 20) = 1600$ ml/hr
 - $60 + (5 \times 1) = 65$ ml/hr

Conditions needing adjustment of maintenance fluids

- All patients with bronchiolitis, pneumonia with severe respiratory disease should have fluid restricted to 70% of normal maintenance
- Children with meningitis, cerebral infections or raised intracranial pressure should be restricted to 70% maintenance
- Fluid restriction in cardiac failure may be required in severe cases but care should be taken to maximize the caloric intake
- **Young Infants** - Infants over 6 weeks should be treated as children and the normal maintenance apply.
- **Replacement of deficits** – rate depends on serum sodium [Tools\PICU drugs and fluids calculator.xls](#). For patients with Hyponatraemia or hypernatraemia, the key is slow correction of sodium. Extreme care should be exercised to prevent central pontine myelinolysis (osmotic demyelination syndrome) from rapid correction of serum sodium (hyponatraemia) and cerebral oedema in rapid reduction of sodium (hypernatraemia). Aim for sodium correction rate of 0.5mmol/hr (maximum)

- **Replacement of ongoing losses –**
 - for acute gastroenteritis, prefer ORS if oral fluids not contraindicated otherwise replace with estimated equal volumes of normal saline or Hartman's solutions IV over a period of time dependent on the patient's clinical condition. May need to reassess frequently 1- 2 hours.
 - For gastric aspirate losses: give equal amounts of normal saline with 13.4 mEq of potassium added per litre

Other Recommendations

- Fluids should be given by infusion pumps and strict fluid balance kept throughout the PICU stay
- For ease of preparations in older children with higher flow rates dextrose may be added to one litre bags of crystalloid
- All patients with sodium outside the normal range should have their fluids discussed with the on-call consultant
- Monitor electrolytes at least twice daily to assess progress during rehydration
- Maximum concentration of dextrose to be given peripherally should be 12.5% due to problems with vein sclerosis and risk of extravasation injury.

Reference:

- (1) Finfer S, Bellomo R, Boyce N, French J, Myburgh J, Norton R A Comparison of Saline and Albumin for Resuscitation in the Intensive Care Unit: Results of the SAFE Study. *NEJM* 2004;350; 2247-56
- (2) Murase, T et al Mechanisms and Therapy of Osmotic Demyelination. *The American Journal of Medicine* 2006; 119; s69-s73.
- (3) Schwaderer, AL and Schwartz GJ Treating Hypernatremic Dehydration. *Paediatrics In Review* 2005; 26(4): 148-9
- (4) Shann F and Henning R. *Paediatric Intensive Care Guidelines, PICU RCH Melbourne* 2nd edition 2003.
- (5) Hussain et al, *Malaysian Protocol* 2nd edition, 2008
- (6) Fredrick et al, *Fluid And Electrolyte in Paediatrics*, 2009.
- (7) Lautoka Hospital PICU Protocol 2008
- (8) *Paediatrics for Doctors in Papua New Guinea, Second Edition* 2003

Scope and Application	This CPG is intended for use by all health care workers in their daily care of paediatric patients
Effective Date	2010
Supersedes Policy Number	Not applicable
Review Responsibilities	The Chairperson of the Paediatric CSN will initiate the review of this guidelines every 3 years from the date of issue or as required.
Further Information	Paediatric CSN Chairperson
<p>RESPONSIBILITY: CPG Owner: National Paediatric CSN</p> <p>CPG Writer: Ministry of Health Date: 2010</p>	
<p>Endorsed: National Medicines & Therapeutic Committee, MOH Date: 23 November 2010</p>	
<p>Endorsed: National Health Executive Committee, MOH Date: 25 November 2010</p>	