

Paediatric Intravenous Fluid Guidelines

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19 th Nov 2020	Document extended for 1 year	Paediatric QIM/Dr J West
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Introduction

This guideline has been produced following Patient Safety Alert no 22, by the National Patient Safety Agency (NPSA) in March 2007.

Hyponatraemia has been documented in otherwise healthy children on intravenous fluids and can be due to too little sodium in extracellular fluid. Most commonly it indicates an expanded extracellular fluid volume and is rarely caused by sodium (or salt) depletion. The infusion of hypotonic fluids together with the non-osmotic secretion of ADH may result in hyponatraemia. Non-osmotic secretion of ADH can be induced in a variety of clinical situations, including pain, anxiety, the post-operative state, nausea, vomiting, certain drugs, pyrexia, sepsis, reduced circulating volume, respiratory disorders, CNS infection, and metabolic and endocrine disorders.

Since 2000 there have been four child deaths (and one near-miss) following neurological injury from hospital-acquired hyponatraemia reported in the UK. International literature cites more than 50 cases of serious injury or child death from the same cause, and associated with the administration of hypotonic infusions.

Whilst there is evidence of harm associated with the use of hypotonic solutions, there is an absence of definitive evidence for clinicians that can help them when choosing a solution. The Patient Safety Alert attempts to address this, and states that clinical guidelines must be disseminated that give clear recommendations for fluid selection, and clinical and laboratory monitoring.

References

Patient Safety Alert No 22, 28 March 2007, National Patient Safety Agency

For previously well children aged one month to 16 years (excluding renal, cardiac, diabetic ketoacidosis and acute burns patients)



National Patient Safety Agency

Hyponatraemia may develop as a complication of any fluid regime.

If shock is present administer 20ml/kg sodium chloride 0.9% (10ml/kg in the setting of trauma). Repeat if necessary and call for senior help immediately.

Check plasma electrolytes.

Consider the replacement of any pre-existing fluid deficit, the requirement for maintenance fluids and the replacement of any ongoing losses.

Fluid deficit
Estimate any fluid deficit and replace as sodium chloride 0.9% with glucose 5% or sodium chloride 0.9% over a minimum of 24 hours

Ongoing fluid losses
Reassess ongoing fluid losses every four hours. Fluids used to replace ongoing fluid losses should ideally reflect the electrolyte composition of the fluid being lost. Sodium chloride 0.9% is appropriate in most cases

Those requiring maintenance fluids and replacement of ongoing losses should receive a single isotonic fluid such as sodium chloride 0.9% or sodium chloride 0.9% with glucose 5%.

Monitoring
Check plasma electrolytes before commencing the infusion, except prior to the majority of elective surgery. Monitor plasma glucose if glucose-free solutions are used during surgery.
Check plasma electrolytes every 24 hours whilst intravenous fluids are being administered. If plasma electrolytes are abnormal, consider rechecking every four to six hours, but definitely if plasma sodium concentration is below 130mmol/L.
Check plasma electrolytes if clinical features suggestive of hyponatraemia develop; these features include nausea, vomiting, headache, irritability, altered level of consciousness, seizure and apnoea. Where possible, all children on intravenous fluids should be weighed prior to the commencement of therapy and be weighed again each day.
Document accurate fluid balance daily. Assess urine output – oliguria may be due to inadequate fluid, renal failure, obstruction or the effect of ADH.

Symptomatic hyponatraemia is a medical emergency.

Maintenance fluids
Type of intravenous fluid

The majority of children may be safely administered sodium chloride 0.45% with glucose 5% or sodium chloride 0.45% with glucose 2.5% – although there is little evidence to support the choice of a particular strength of glucose.

In some circumstances, children should only ever be administered isotonic fluids such as sodium chloride 0.9% with glucose 5%, sodium chloride 0.9%, Hartmann's solution/Ringer-Lactate solution. Solution choice should be tailored to the patient's needs.

- These circumstances include:
- serum sodium at the lower normal reference range and definitely if less than 135mmol/L;
 - intravascular volume depletion;
 - peri- and post-operative patients;
 - hypotension;
 - CNS infection;
 - head injury;
 - bronchiolitis;
 - sepsis;
 - excessive gastric or diarrhoeal losses;
 - salt-wasting syndromes and chronic conditions such as diabetes, cystic fibrosis and pituitary deficits, and those requiring replacement of ongoing losses.

Children with a plasma sodium in excess of 160mmol/L should receive isotonic solutions to reduce the risk of neurological injury associated with a rapid fall in plasma sodium.

Volume of intravenous fluid

- **Less than 10kg:** 100ml/kg/day or 4ml/kg/hour;
- **10-20kg:** 1000ml plus 50ml/kg/day for each kg over 10kg or 40ml/hour plus 2ml/kg/hr for each kg over 10kg;
- **Over 20kg:** 1500ml plus 20ml/kg/day for each kg over 20kg or 60ml/hour plus 1ml/kg/hour for each kg over 20kg;

Up to a maximum of 2500ml/day in males and 2000ml/day in females.

Consider adding potassium chloride, up to 40mmol/L, to maintenance fluids once plasma potassium concentration is known.

Some acutely ill children with increased ADH secretion may benefit from restriction of maintenance fluids to two-thirds of normal recommended volume.