
Clinical Guidance

Paediatric Critical Care: Hypertonic Sodium Chloride

Summary

This guideline is for the use of hypertonic sodium chloride. It gives advice on the indications for use, preparation, advantages of use and risks. If available always use "ready-made" hypertonic sodium chloride solutions (i.e. 2.7%) in preference to mixing 3%, they can be used interchangeably.

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<p>This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.</p> <p>This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.</p>	

Change History		
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Paediatric Critical Care

Hypertonic Sodium Chloride

Indication for use of hypertonic sodium chloride

- Osmotherapeutic agent for treatment of **cerebral oedema** and raised intracranial pressure (e.g. head injury, DKA).^{1,2}
- Treatment of symptomatic **hyponatraemic seizures**.^{3,4}
- **“Small volume” resuscitation** for shock (e.g. associated with traumatic head injury) or as a
- Renoprotective agent (e.g. prevention of radiocontrast and cytotoxic nephropathy, rhabdomyolysis induced renal failure)

Mechanism of action

- IV hypertonic sodium chloride induces a shift of fluid from the intracellular to the extracellular space across the osmotic gradient it generates.
- It therefore reduces brain water, increases blood volume and increases plasma sodium. Note that intracellular volume is inversely proportional to plasma sodium concentration

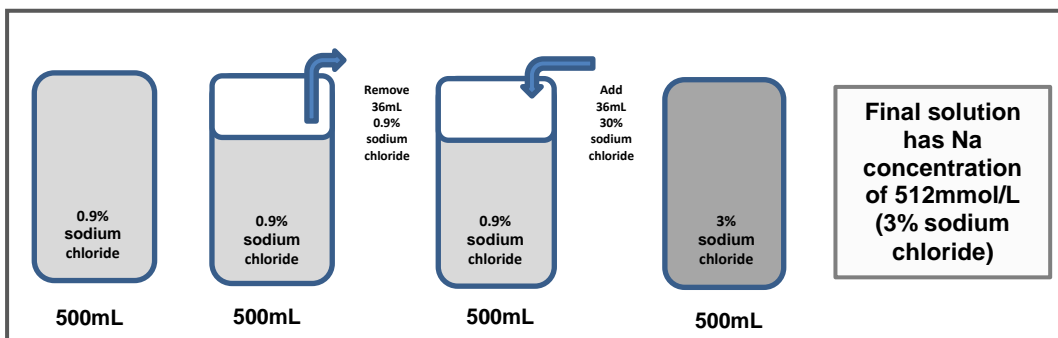
Advantages of hypertonic sodium chloride over mannitol

- Hypertonic sodium chloride is as effective as mannitol for treatment of raised intracranial pressure in traumatic brain injury in children. Plasma sodium of up to 170 mmol/L has been targeted to control ICP.
- Hypertonic sodium chloride may produce less “rebound” intracranial hypertension after administration compared to mannitol which cannot be easily removed from intracellular space.
- Hypertonic sodium chloride does not cause obligatory osmotic diuresis and hence is likely to preserve or augment plasma volume rather than deplete it.
- Mannitol may precipitate acute renal failure and may not be excreted in oligo-anuria whereas hypertonic sodium chloride is renoprotective.
- Hypertonic sodium chloride directly increases plasma Na, measurable changes in blood osmolality can be easily monitored by measuring plasma Na whereas the effect of mannitol on plasma osmolality can only be estimated using an osmole gap.

Dose of 3% sodium chloride or pre-made 2.7% sodium chloride

- **3 mls/kg of IVI 3% sodium chloride** (over 10 – 20 minutes) via central vein (preferable) or peripherally.³
- Use same volume (3mL/kg) even if the pre-made 2.7% sodium chloride solution is used (clinical difference is negligible)
- Dosing may be repeated as clinically indicated according to the indication of use.
- 3mls/kg **may increase plasma Na by approximately 2 - 3 mmol/L**. A greater increase may occur if a large diuresis occurs. Check plasma Na if any doubt on the rate of Na increase.
- For hyponatraemic seizures there is no fixed threshold above which seizures stop, usually an increase in Na of 3 to 7mmol/L is adequate.³
- An acute rise in plasma Na at a rate less than 10mmol/L in 24 hrs is probably safe.⁴

PREPARATION OF 3% SODIUM CHLORIDE USING 30% SODIUM CHLORIDE



Use "ready-made" hypertonic sodium chloride solutions (i.e. 2.7%) if available in preference to mixing 3% to reduce risk of drug preparation errors

Do not connect the 500mL bag of 3% sodium chloride directly to the patient IV line (risk of serious sodium overdose if full bag accidentally infused). Always withdraw the prescribed volume of 3% sodium chloride and administer to the patient separately

In case of accidental overdose of 3% sodium chloride: STOP the infusion and contact STRS for immediate advice

- **DO NOT attempt to correct high sodium with free water or 0.45% sodium chloride (risk of sudden drop in brain osmolality)**
- **Measure plasma sodium every hour for trend**

References

- 1) Khanna et al Crit Care Med. 2000 28:1144-51
- 2) Curtis et al Pediatr Diabetes. 2001 2:191-4.
- 3) Sarnaik et al Crit Care Med. 1991 19 :758-62.
- 4) Madias et al, N Engl J Med. 2000 25;342):1581-9