

IV rehydration therapy in children

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Before you start with intravenous rehydration therapy in children, you should ask yourself the following questions:

1. Can I use oral rehydration?
2. Do I need to take blood for blood tests? (if so, do it from the intravenous cannula immediate after insertion)
3. Do I need to give [resuscitation fluids](#)?
4. Do I need to replace any special / continuing losses for the child?

If you are happy and confident that you need to give intravenous fluids to a dehydrated child, you need to first assess the "degree" of dehydration. A rough guide:

Minimal to mild dehydration ("3% dry")

- The child is usually alert and looks well;
- mostly normal thirst;
- moist mucous membranes though lips may be dry;
- normal to slightly decreased urine output (or only slightly less number of wet nappies);
- less than 3 percent weight loss;
- normal heart rate;
- no tachypnoea;
- good tissue perfusion with capillary refill less than 2 seconds;
- normal skin turgor.

Moderate dehydration ("5% dry")

- The child may be irritable and unhappy;
- increased thirst;
- dry mucous membranes (though usually still have tears);
- decreased urine output (less number of wet nappies);
- normal to slightly tachycardic;
- normal to slightly tachypnoeic;
- tissue perfusion is good, but extremities may be cool;
- capillary refill at or less than 2 seconds;
- skin turgor normal;
- may have slightly sunken eyes and fontanelles.

Severe dehydration ("7% dry")

- The child is irritable to listless;
- dry mouth but may be uninterested in oral intake;
- significantly decreased urine output (dry nappy for most of the day);

- tachycardia;
- tachypnoea;
- tissue perfusion is impaired, cool peripheries - some mottling;
- capillary refill > 2 seconds
- skin turgor noticeably impaired > 2 seconds

Extreme (dangerous / pre-arrest) dehydration ("> 7% dry")

- The child is listless to unconscious;
- dry mucous membranes, no tears;
- minimal to no urine output;
- significant tachycardia with weak thready pulse;
- significant tachypnoea;
- cool mottled skin peripherally and centrally (on chest and abdomen);
- capillary return significantly impaired > 2 seconds
- skin turgor significantly impaired > 2 seconds
- sunken eyes and fontanelles.

Treatment

Extreme dehydration and severe dehydration

- The child should be given [fluid resuscitation](#).
- Boluses of 10-20 mL/kg of 0.9% NaCl solution until clinically stable and then proceed to below.

Moderate and mild dehydration

- Plan to replace fluids and return to euvolaemia over 24 hours.

Replacement fluids (up to 5% dry)

$$\text{Volume of fluid (mL/day)} = \text{"Percentage dry"} \times \text{weight (kg)} \times 10$$

Example:

8 week old infant, 5.5 kg, 3% dehydrated

Replacement fluid:

- $3 \times 5.5 \times 10$ (in mL/day)
- = 165 mL/day
- ~ **7 mL/hr**

[Maintenance fluid:](#)

- 4 mL/kg/hr x 5.5 kg

- = 22 mL/hr

Total IV fluid infusion rate:

- replacement fluid + maintenance fluid
- = 7 + 22 mL/hr
- = **29 mL/hr**

Fluid type in dehydration

Traditionally, you would have used **0.45% NaCl + 2.5% dextrose + 10 mmol KCl** (in a 500 mL bag) and this is still a valid choice. However, there is reasonable evidence now that especially in children with gastroenteritis, that there is [increased secretion of anti-diuretic hormone](#) (ADH) (1) and that in some children, using "half normal saline" can precipitate hyponatraemia.

There is evidence through a [trial of children with gastroenteritis](#) (2) at the Sydney Children's Hospital (Randwick), that rehydration with "normal saline", i.e., **0.9% NaCl**, is protective against hyponatraemia and does not appear to cause hypernatraemia.

Research articles

(1) Neville KA. Verge CF. O'Meara MW. Walker JL. High antidiuretic hormone levels and hyponatremia in children with gastroenteritis. *Pediatrics*. 116(6):1401-7, 2005 Dec.

(2) Neville KA. Verge CF. Rosenberg AR. O'Meara MW. Walker JL. Isotonic is better than hypotonic saline for intravenous rehydration of children with gastroenteritis: a prospective randomised study. *Archives of Disease in Childhood*. 91(3):226-32, 2006 Mar.

Updated: Michael Tam (19 June 2006)

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