

NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

SCOPE

1 Guideline title

Intravenous fluid therapy in children and young people in hospital

1.1 *Short title*

Intravenous fluid therapy in children and young people in hospital

2 The remit

The Department of Health has asked NICE: 'to develop a clinical guideline on intravenous fluid therapy in children and young people in hospital'.

3 Clinical need for the guideline

3.1 *Epidemiology*

- a) Correct fluid and electrolyte balance is essential to maintain normal physiological function. In hospital, some children may not be able to maintain their normal fluid requirements by eating and drinking normally and, as such, may have depleted fluid levels and/or an electrolyte deficit. These children may need intravenous fluid therapy to maintain or restore the correct fluid and electrolyte balance.
- b) Children may also need intravenous fluids to account for losses of red blood cells, plasma, water or electrolytes, beyond the usual losses in urine, stool and sweat. These losses can occur via the loss of blood, plasma and other fluids resulting from burns, diarrhoea vomiting or leakage of fluid from the circulation into the

interstitial space. In these situations, the aim is to replace any depleted fluids and restore associated electrolyte imbalances.

- c) Other conditions, such as cardiac dysfunction, inappropriate antidiuretic hormone secretion (SIADH) and nephrotic syndrome can result in fluid overload, that is, an excess of fluids in the body. In these situations, the aim is to rebalance and redistribute fluids and ensure normal levels of electrolytes.
- d) Whether intravenous fluid therapy is needed for fluid resuscitation, routine maintenance, replacement or redistribution, it is vital that the choice, volume and timing of intravenous fluids are all correct. Different types of fluids are appropriate for different situations, and include colloids, crystalloids and combinations of fluids. Errors in prescribing or administering intravenous fluids can result in inadequate or excessive provision, leading to hypovolaemia and poor organ perfusion, or hypervolaemia, oedema and heart failure respectively. Furthermore, failing to correct imbalances in electrolytes can lead to disturbances in intracellular or extracellular electrolyte balance, particularly in patients with reduced liver or kidney function. Errors in prescribing and administering intravenous fluids can therefore have a significant impact upon morbidity and mortality.
- e) Providing intravenous fluid therapy for infants, children and young people differs from that for adults. For example, infants and children are prescribed intravenous fluids based on their body weight, but body surface area may be a more appropriate means by which to calculate optimum fluid requirements. Additionally, a National Patient Safety Agency (NPSA) alert has highlighted safety concerns about the use of hypotonic intravenous fluids in children associated with the development of hyponatraemia. Children are more at risk of developing brain swelling and neurological complications because of hyponatraemia compared to adults.

3.2 Current practice

- a) Prescribers are not always aware of the specific constituents of the various intravenous replacement therapies and as such, many fluid prescriptions provide too little or too much fluid or electrolytes to restore and maintain fluid balance. There is little formal training and education in intravenous fluid management to support correct prescribing.
- b) There is a wide variation in the type of charts used to record fluid and electrolyte status in practice. Monitoring of patients is often suboptimal, with fluid and electrolyte status not being recorded accurately. Changes to patients' requirements are often not assessed. There is often insufficient attention by clinical staff to ensure that appropriate identification, treatment and monitoring of changes in fluid and electrolyte status is maintained and documented.
- c) There is a need for a standardised approach to the clinical assessment of patients' fluid and electrolyte status and the prescription of intravenous fluid therapy in the NHS. This guidance represents a major opportunity to improve patient safety.
- d) Additionally, there is debate within current paediatric practice as to the most effective means of calculating routine maintenance requirements for infants and children, notably whether weight or body surface area is the more appropriate method.

4 The guideline

The guideline development process is described in detail on the NICE website (see section 6, 'Further information').

This scope defines what the guideline will (and will not) examine, and what the guideline developers will consider. The scope is based on the referral from the Department of Health.

4.1 Population

This guideline will include recommendations about general principles for managing intravenous fluids in children and young people, and applies to a range of conditions and different settings. It will not include recommendations relating to specific conditions.

4.1.1 Groups that will be covered

- a) Babies born at term, infants, children and young people older than 2 weeks of age and younger than 16 years.
- b) No patient subgroups have been identified as needing specific consideration.

4.1.2 Groups that will not be covered

- a) Adults aged 16 years or older.
- b) Term babies aged 14 days or less.
- c) Babies born who are less than a post conceptional age of 42 weeks.

4.2 Healthcare setting

- a) Hospitals in which NHS care is provided.

4.3 Clinical management

4.3.1 Key clinical issues that will be covered

- a) Assessment, monitoring and reassessment of fluid and electrolyte status:
 - Clinical assessment and reassessment:
 - the influence of antidiuretic hormone secretion in certain clinical situations
 - measuring and recording weight and surface area.
 - Laboratory or ward-based assessment of, for example:

- plasma or blood (sodium, potassium, chloride, urea, creatinine, pH, bicarbonate and glucose)
- urine(sodium and potassium).

b) Intravenous fluid therapy for resuscitation:

- Types, volume and timing of fluids and electrolytes to restore fluid balance (resuscitation), including:
 - albumin compared with crystalloids
 - synthetic colloids compared with crystalloids
 - albumin compared with colloids
 - balanced crystalloids compared with saline
 - normal saline compared with normal saline with additional electrolytes
 - half saline compared with half saline with additional electrolytes.
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c) Intravenous fluid therapy for routine maintenance:

- Types, volume and timing of fluids and electrolytes to maintain fluid balance, including:
 - how to calculate fluid and electrolyte maintenance requirements
 - the need for and how to calculate glucose requirements
 - the type of fluid and/or electrolyte to offer, including:
 - ◇ normal saline compared with half saline
 - ◇ normal saline compared with crystalloids
 - ◇ half saline compared with crystalloids
 - ◇ normal saline compared with normal saline with additional electrolytes
 - ◇ half saline compared with half saline with additional electrolytes
 - ◇ normal saline compared with normal saline with glucose

- ◇ half saline compared with half saline with glucose
- ◇
- d) Intravenous fluid therapy for replacement and redistribution:
 - Types, volume and timing of intravenous fluid and electrolytes to address abnormal deficits or to replace abnormal losses.
- e) Principles for recording and monitoring intravenous fluid therapy in children and young people.
- f) Management of hypernatraemia and hyponatraemia.
- g) Training and education of healthcare professionals.

4.3.2 Clinical issues that will not be covered

- a) Use of blood and blood products, except albumin.
- b) Specific monitoring or prescription of electrolytes, minerals and trace elements other than sodium, potassium and chloride, unless their status directly influences sodium, potassium, chloride provision (for example, low magnesium preventing the correction of hypokalaemia).
- c) Use of inotropes to support circulatory failure.
- d) Invasive monitoring of fluid status, for example in critical care or during surgical anaesthesia.
- e) Parenteral nutrition beyond consideration of fluid and electrolyte content.
- f) Labelling, preparation and storage of both standard and non-standard intravenous fluids.
- g) Ethical issues related to intravenous fluid prescription at the end of life.
- h) Patient/carer information needs specific to intravenous fluids.

4.4 Main outcomes

- a) Mortality.
- b) Length of stay in hospital.
- c) Adverse events.
- d) Quality of life.

4.5 Review questions

Review questions guide a systematic review of the literature. They address only the key clinical issues covered in the scope, and usually relate to interventions, diagnosis, prognosis, service delivery or patient experience. Please note that these review questions are draft versions and will be finalised with the Guideline Development Group.

4.5.1 Principles and protocols for intravenous fluid therapy

- a) What key components need to be documented to ensure safe prescribing and improved fluid balance recording?

4.5.2 Assessment, monitoring and reassessment

- b) What are the most clinically and cost effective methods for assessing, monitoring and reassessing fluid intake and output to detect hypovolaemia and dehydration?
- c) What are the most clinically and cost effective laboratory-based methods to assess, monitor and reassess fluid and electrolyte status?
- d) How effective is measuring and recording body weight compared with measuring and recording body surface area to calculating intravenous fluid requirements?

4.5.3 Intravenous fluid therapy for resuscitation

- e) What is the most clinically and cost-effective rate of administration for intravenous fluid resuscitation?

- f) What is the clinical and cost effectiveness of albumin compared with crystalloids?
- g) What is the clinical and cost effectiveness of synthetic colloids compared with crystalloids?
- h) What is the clinical and cost effectiveness of albumin compared with synthetic colloids?
- i) What is the clinical and cost effectiveness of balanced crystalloids compared with saline?
- j) What is the clinical and cost effectiveness of adding electrolytes to saline?

4.5.4 Intravenous fluid therapy for routine maintenance

- k) What is the most clinically and cost-effective rate of administration for routine maintenance?
- l) What is the clinical and cost effectiveness of normal saline (0.9% NaCl) compared with half saline (0.45% NaCl)?
- m) What is the clinical and cost effectiveness of normal saline (0.9% NaCl) compared with balanced crystalloids?
- n) What is the clinical and cost effectiveness of half saline (0.45% NaCl) compared with balanced crystalloids?
- o) What is the clinical and cost effectiveness of adding other electrolytes to normal saline (0.9% NaCl)?
- p) What is the clinical and cost effectiveness of adding other electrolytes to half saline (0.45% NaCl)?
- q) What is the clinical and cost effectiveness of adding glucose to prevent hypoglycaemia?

4.5.5 Intravenous fluid therapy for replacement and redistribution

- r) What are the most clinically and cost-effective methods to calculate intravenous fluid and electrolyte requirements to address abnormal deficits or excesses or to replace abnormal losses?

- s) What is the clinical and cost effectiveness of different rates of intravenous fluid administration to address abnormal deficits or excesses or to replace abnormal losses?
- t) What fluid types are the most clinically and cost effective to address abnormal deficits or excesses or to replace abnormal losses?

4.5.6 Management of hypernatraemia and hyponatraemia

- u) What are the most clinically and cost effective methods to address hyponatraemia and hypernatraemia?

4.5.7 Training and education

- v) What information is needed for adequate training and education for healthcare professionals involved in prescribing and administering intravenous fluids?

4.6 *Economic aspects*

Developers will take into account both clinical and cost effectiveness when making recommendations involving a choice between alternative interventions. A review of the economic evidence will be conducted and analyses will be carried out as appropriate. The preferred unit of effectiveness is the quality-adjusted life year (QALY), and the costs considered will usually be only from an NHS and personal social services (PSS) perspective. Further detail on the methods can be found in 'The guidelines manual' (see 'Further information').

4.7 *Status*

4.7.1 Scope

This is the consultation draft of the scope. The consultation dates are 22 July to 27 August 2013.

4.7.2 Timing

The development of the guideline recommendations will begin in November 2013.

5 Related NICE guidance

5.1 *Published guidance*

5.1.1 Other related NICE guidance

- [Feverish illness in children](#). NICE clinical guideline. CG160 (2013).
- [Neutropenic sepsis](#). NICE clinical guideline. CG151 (2012).
- [Sedation in children and young people](#). NICE clinical guideline. CG112 (2012).
- [Bacterial meningitis and meningococcal septicaemia](#). CG102 (2010).
- [Diarrhoea and vomiting in children](#). NICE clinical guideline. CG84 (2009).
- Diabetes in pregnancy. NICE clinical guideline. CG63 (2007).
- [Urinary tract infection in children](#). NICE clinical guideline. CG54 (2007).
- [Type 1 diabetes](#). NICE clinical guideline. CG15 (2004).
- [Pre-hospital initiation of fluid replacement therapy in trauma](#). NICE technology appraisal. TA74 (2004).

5.2 *Guidance under development*

NICE is currently developing the following related guidance (details available from the NICE website):

- Intravenous fluid therapy in adults in hospital. NICE clinical guideline. Publication expected November 2013.
- Acute kidney injury. NICE clinical guideline. Publication expected August 2013.
- Transfusion. NICE clinical guideline. Publication TBC.
- Major trauma. NICE clinical guideline. Publication TBC.
- Medicines optimisation. NICE clinical guideline. Publication TBC.
- Bronchiolitis in children. NICE clinical guideline. Publication TBC.
- Diabetes in children and young people. NICE clinical guideline. Publication TBC.

6 Further information

Information on the guideline development process is provided in the following documents, available from the NICE website:

- [‘How NICE clinical guidelines are developed: an overview for stakeholders the public and the NHS’](#)
- [‘The guidelines manual’](#).

Information on the progress of the guideline will also be available from the [NICE website](#).