

**From the Deputy Chief Medical Officer
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Department of
Health

An Roinn Sláinte

Mánnystrie O Poustie

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HSS(MD)2/2020

For Action:

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Related Documents:
HSS(MD) 16/2017

Dear Colleague

**PUBLICATION OF A NEW REGIONAL POLICY FOR THE ADMINISTRATION OF
INTRAVENOUS FLUIDS TO CHILDREN AGED FROM BIRTH (TERM) UNTIL
THEIR 16th BIRTHDAY: REDUCING THE RISK OF HARM DUE TO
HYPONATRAEMIA
AND
PUBLICATION OF REGIONAL UPDATED COMPETENCY FRAMEWORK FOR
REDUCING THE RISK OF HYPONATRAEMIA WHEN ADMINISTERING
INTRAVENOUS FLUIDS TO BABIES, CHILDREN & YOUNG PEOPLE –
OCTOBER 2019 (UPDATES AND REPLACES THE COMPETENCY FRAMEWORK
ISSUED IN FEBRUARY 2015).**

Following publication in 2018 of the report of the Inquiry into Hyponatraemia-related deaths (IHRD), the Department of Health has set up an Implementation Programme with appropriate Workstreams to take forward the report's 96 recommendations.

IHRD Recommendation 92 states that 'the Department should review healthcare standards in light of the findings and recommendations of this report and make such changes as are necessary'. To address this recommendation a new regional policy for the administration of intravenous fluids to children aged from birth (term) until their 16th birthday: reducing the risk of harm due to hyponatraemia has been developed.

Regional Policy for the administration of intravenous fluids to children aged from birth (term) until their 16th birthday: Reducing the risk of harm due to hyponatraemia

This policy has been developed by a cross Trust multidisciplinary group. Existing Trust policies have been adapted to provide a single core document for use across organisations. *Local exceptions/arrangements associated with the policy are denoted by text in green boxes throughout the document.*

Title:	Regional Policy for the administration of intravenous fluids to children aged from birth (term) until their 16th birthday: Reducing the risk of harm due to hyponatraemia		
Author(s):	Regional Paediatric Fluid Management Group		
Ownership:	HSC Trusts		
Approval by:		Approval date:	
Operational Date:	October 2019	Next Review:	October 2021
Version No.	V1	Supersedes	N/A
Scope	Babies (term), children and young people up to 16 th birthday		
Links to other policies	<ul style="list-style-type: none"> • Intravenous fluid therapy in children and young people in hospital. NICE guidance: Intravenous fluid therapy in children and young people in hospital (NG29, Dec 2015) • HSC Competency Framework for reducing the risk of hyponatremia when administering intravenous infusions to babies, children and young people (October 2019) • Recording in Daily Fluid Balance & Prescription Charts (DoH (NI) Feb 2017) • Trust local DKA policy for children up to 18th Birthday • NICE Guidance: Diarrhoea and vomiting caused by gastroenteritis in under 5s: diagnosis and management (CG84, April 2009) • NICE Guidance: Sepsis: recognition, diagnosis and early management (NG51, Sept 2017) 		
Exclusions	<ul style="list-style-type: none"> • Preterm infants whose corrected gestational age is less than 37 weeks • Young women under the age of 16 years who are in labour • Children under the age of 16 admitted in DKA • Those cared for in ICUs, HDUs and specialist units • Those with acute burns • Those cared for in the community • Postnatal wards and acute neonatal units • Patients receiving Parenteral Nutrition (PN) 		

1 Introduction

Intravenous fluids are regularly used in the initial and ongoing management of the sick child. It is important to recognise that children are at greater risk than adults of permanent neurological complications and death due to hyponatraemia from inappropriate use of intravenous fluids¹.

Careful assessment and monitoring of body weight, fluid balance and fluid status are essential during intravenous fluid therapy in children, as is the correct choice of fluid, to avoid serious complications including death and neurological injury.

Intravenous fluids are potentially dangerous and should only be used when clinically indicated with ongoing observation and assessment by staff who are knowledgeable and skilled in this area.

This policy has been developed by a cross Trust multi-professional group to align and standardise current practice in the use of intravenous fluids in children.

The development of this policy has drawn on existing local policies, national guidance and the significant efforts undertaken to date in reducing the risk of harm due to hyponatraemia outlined in section 2.

2 Background

Risks associated with suboptimal fluid management in children are well documented. As a result, understanding and reducing the risk of hyponatraemia has been the focus of significant efforts across the health service for some years. Within Northern Ireland, the O'Hara Inquiry² into deaths due to hyponatraemia established in 2004 has also given an added emphasis to this work.

In March 2007, the National Patient Safety Agency (NPSA) reported on learning from four child deaths reported in the UK since 2000 following neurological injury from hospital-acquired hyponatraemia³. NPSA 'Patient Safety Alert 22: Reducing the risk of hyponatraemia when administering intravenous infusions to children' also referenced international literature citing more than 50 cases of serious injury or child death from the same cause. All were associated with the administration of hypotonic infusions.

In Northern Ireland, The Regulation and Quality Improvement Authority (RQIA) reviewed the local implementation of Patient Safety Alert 22. Recommendations were made by RQIA in

¹Intravenous fluids in children and young people: summary of NICE guidance BMJ 2015;351:h6388

² Report of the Inquiry into Hyponatraemia related Deaths, published 31st January 2018. Available at <http://www.ihrdni.org/inquiry-report.htm>

³ National Patient Safety Agency (2007) Patient Safety Alert 22: Reducing the risk of hyponatraemia when administering intravenous infusions to children <http://www.nrls.npsa.nhs.uk/resources/type/alerts/?entryid45=59809&p=3>

2008⁴ and again in 2010⁵ to improve HSC Trust arrangements to reduce risk in this area. In Northern Ireland, The Regulation and Quality Improvement Authority (RQIA) reviewed the local implementation of Patient Safety Alert 22. Recommendations were made by RQIA in 2008⁶ and again in 2010⁷ to improve HSC Trust arrangements to reduce risk in this area.

In order to harmonise practice and to ensure a consistent approach to training across HSC Trusts, the Chief Medical Officer asked that a cross Trust group be convened to support implementation of those recommendations related to competency and training. The resulting Competency Framework, first developed by the group in 2013, has been regularly reviewed and updated. The most recent update, circulated in October 2019, also links to a suite of resources⁸ developed within Northern Ireland to support Trusts and staff in reducing risk of harm due to hyponatraemia.

The National Institute for Health and Care Excellence (NICE) also published guidance on Intravenous fluid therapy in children and young people in hospital NICE guideline [NG29] in December 2015⁹. All hyponatraemia resources in Northern Ireland have since been adapted to take account of NG29.

2.1 Report of the Inquiry into Hyponatraemia-related Deaths - The O'Hara Inquiry

In parallel with work being undertaken within the health service, a separate inquiry into deaths due to hyponatraemia in Northern Ireland was set up in 2004 by the then Minister with responsibility for Health, Social Services and Public Safety, under Article 54 of the Health and Social Services (Northern Ireland) Order 1972. The resulting report, also known as the O'Hara Inquiry, was published in January 2018¹⁰.

⁴ Reducing the risk of hyponatraemia when administering intravenous infusions to children, April 2008. RQIA. [Summary report following Validation Visits to Trusts and Independent Hospitals throughout Northern Ireland]. <https://www.rqia.org.uk/RQIA/files/04/043bc7ac-b299-4f57-87ef-e80cc6ec4e64.pdf>

⁵ Reducing the risk of hyponatraemia when administering intravenous infusions to children, May 2010. RQIA [Report of actions taken by HSC Trusts and independent hospitals to implement recommendations made in the report "Reducing the risk of hyponatraemia when administering intravenous fluids to children" (RQIA, June 2008)] <https://www.rqia.org.uk/RQIA/files/6a/6ae95bf4-56e6-46b6-9c3b-8f5df1590cde.pdf>

⁶ Reducing the risk of hyponatraemia when administering intravenous infusions to children, April 2008. RQIA. [Summary report following Validation Visits to Trusts and Independent Hospitals throughout Northern Ireland]. <https://www.rqia.org.uk/RQIA/files/04/043bc7ac-b299-4f57-87ef-e80cc6ec4e64.pdf>

⁷ Reducing the risk of hyponatraemia when administering intravenous infusions to children, May 2010. RQIA [Report of actions taken by HSC Trusts and independent hospitals to implement recommendations made in the report "Reducing the risk of hyponatraemia when administering intravenous fluids to children" (RQIA, June 2008)] <https://www.rqia.org.uk/RQIA/files/6a/6ae95bf4-56e6-46b6-9c3b-8f5df1590cde.pdf>

⁸ HSC resources relating to fluid management on the PHA website at: <http://www.publichealth.hscni.net/directorate-nursing-and-allied-health-professions/nursing/central-repository-hsc-resources-relating->

⁹ Intravenous fluid therapy in children and young people in hospital NICE guideline, NG29. Available at: <https://www.nice.org.uk/guidance/ng29>

¹⁰ Report of the Inquiry into Hyponatraemia related Deaths, published 31st January 2018. Available at <http://www.ihrdni.org/inquiry-report.htm>

3 Policy Aim

To improve the safe use of intravenous fluid in babies, children and young people and reduce the risk of harm due to hyponatraemia.

The policy is based on Regional and National guidance, ongoing clinical audit and the published literature.

This Policy derives largely from the guidance from the National Patient Safety Agency Patient Safety Alert 22, the Regional Paediatric Fluid Therapy Group wallcharts (appendix 1), RQIA recommendations⁵, NICE Guidance (NG29)⁹ and recommendations from the O'Hara Inquiry².

4 Scope of the Policy

This policy sets out recommended practice for staff in all HSC Trusts who look after children receiving intravenous fluids from birth (term) until their 16th birthday. It is relevant across all general inpatient areas that treat patients within this age range (even if it is only occasionally) and includes the post-operative scenario, emergency departments, day case departments and the ambulance service. Therefore it also applies to children, referred to as 'young people', being cared for in an adult environment.

4.1 Exclusions

The following groups of patients* may use different fluid prescription and/or balance charts.

- Preterm infants whose corrected gestational age is less than 37 weeks
- Young women under the age of 16 years who are in labour
- Children under the age of 16 admitted in Diabetic Ketoacidosis (DKA)
- Those cared for in ICUs, HDUs and specialist units
- Those with acute burns
- Those cared for in the community i.e. charts for fluid prescription only
- Postnatal wards and acute neonatal units
- Patients receiving Parenteral Nutrition (PN) are not within the scope of this policy and their fluid management should be done in line with best practice guidance for the management of PN

*** Staff working in all clinical areas where these patients are being cared for will still be expected to comply with the training and associated competencies, storage of fluid and labelling, monitoring, incident reporting and auditing aspects of this policy.**

Of note, they may choose to use either their own specialist fluid prescription and balance charts e.g. ICU/HDU/Intraoperative or the standard Regional fluid balance and prescription charts.

5 Roles and Responsibilities

5.1 Corporate Responsibilities

Chief Executive

Has responsibility for ensuring that this policy is implemented effectively and that its adherence is specifically monitored as part of the Trust Corporate Governance Programme.

5.2 Individual Responsibilities

Roles and responsibilities are outlined in section 8.3 on Training and Assessment.

As outlined by individual professional bodies, registered professional staff are required to work only within the scope of their professional practice.

Individual practice should be informed and limited by the accountable practitioner's own knowledge and competence.

All professionals involved in the assessment and clinical management of children must ensure that their practice meets the knowledge and competency framework set out regionally and meets the training requirements of their individual Trust.

This advice does not override or replace the responsibility of health professionals to make appropriate decisions in the circumstances of their individual patients' needs, in consultation with the patient and/or guardian or carer OR in consultation with a more senior clinician.

The roles and responsibilities of individuals and organisations in terms of knowledge, skills and training are documented in detail in the competency framework available at: <http://www.publichealth.hscni.net/directorate-nursing-and-allied-health-professions/nursing/central-repository-hsc-resources-relating->

All staff should be aware of where they can receive further advice if required.

Local Policy – Contact numbers of where to get advice on paediatric fluid therapy are provided for the Trust in Appendix 2.

6 Definitions

- For the purposes of this policy, a child is defined as being aged from birth (term) up to their 16th birthday.
- Hyponatraemia is:
 - an abnormally low concentration of sodium (Na) in serum. The normal range is generally agreed to be 135 – 145 mmol/L.
 - defined as a plasma Na of less than 135 mmol/L. It represents an excess of water in relation to sodium in extracellular fluid and is described as severe or significant if below 130 mmol/L.

- Hospital acquired hyponatraemia is:
 - Na \geq 130mmol/l at time of admission, & a subsequent Na of < 130mmol/l whilst on IV fluids.
 - Na < 130mmol/l on their initial U&E's, where the U&E's are done >48hrs after admission and they are on IV fluids.
 - Admitted from another hospital with Na < 130mmol/l at time of admission whilst on IV fluids.
- Acute hyponatraemia is defined as a decrease in plasma sodium from normal to less than 130 mmol/L in less than 48 hours.
- Symptoms are likely with serum Na <125 mmol/L or if the serum Na has fallen rapidly; greater than 5 mmol/L decline in 24 hours.
- Hypoglycaemia is defined as a blood glucose of less than 3 mmol/L.

7 Causes and symptoms of Hyponatraemia

All children are potentially at risk of hyponatraemia, even those not considered to be obviously 'sick'. The complications of hyponatraemia often occur because of the inappropriate management of intravenous fluids but they can also occur with inappropriately managed oral fluid regimes. Vigilance is required for all children receiving fluids.

The main causes of hyponatraemia in children are:

- Conditions with impaired free water excretion and high anti-diuretic hormone levels
- Meningitis, encephalitis, pneumonia, bronchiolitis, sepsis
- Surgery, pain, nausea and vomiting
- Gastrointestinal fluid losses
- Administration of hyponatraemic fluids, intravenous or enteral (e.g. excessively dilute formula or sodium chloride 0.18% and glucose 4% (No 18 solution)

Less common but important causes are:

- Adrenal insufficiency (Congenital Adrenal Hyperplasia, Addison's Disease)
- Defect in renal tubular absorption, including obstructive uropathy
- Psychogenic polydipsia

Symptoms of hyponatraemia:

- The main symptoms of hyponatraemia in children relate to its central

nervous system effects and include cerebral oedema, seizures and death.

- Warning signs may be non-specific and include confusion, irritation, reduced consciousness, disorientation, nausea, malaise and headache. The presence of an open fontanelle does not prevent death from cerebral oedema.
- Symptoms of low sodium can be very non-specific and it is important to take on board parents' view of changes in their child.

8 NI Policy to reduce the risk of harm due to hyponatraemia

A series of recommendations were implemented in NI in response to *NPSA Alert 22 (2007)*¹¹

8.1 Remove No.18 solution

Remove 'No. 18 solution' from general areas that treat children and restrict availability to specialist areas except in critical care and specialist wards such as renal, liver and cardiac units.

Sodium chloride 0.18% with glucose 4% has been withdrawn from general use in all ward areas that treat children. The availability of these fluids is restricted to critical care areas and other specialist wards such as renal, liver and cardiac units.

Where required local Trust policies should be in place to outline:

- Areas permitted to stock or order 'No.18 solution'
- Arrangements for labelling and separate storage of 'No.18 solution'
- Trust governance arrangements for prescribing and administration of 'No.18 solution'

Local Policy – Appendix 3

Local Trust policy relating to No.18 solution

¹¹ NPSA Alert 22 <https://improvement.nhs.uk/resources/learning-from-patient-safety-incidents/>

8.2 Clinical Guidelines

*Produce and disseminate **clinical guidelines** for the fluid management of paediatric patients.*

Department of Health (DoH) Guidance

This policy forms the basis of guidance on fluid therapy in children within the HSC. It should be read in conjunction with section 8.4 of this document and associated Regional Recording Fluid Prescription and Balance guidance.

- Paediatric Parenteral Fluid Therapy For Children and Young People (Aged Over 4 Weeks And Under 16 Years Wallchart (Feb 2017)¹² and
- Parenteral Fluid Therapy For Term Neonates (Up To 4 Weeks Of Age) Wallchart (Feb 2017)¹³
- Intravenous fluid therapy in children and young people in hospital. NICE guideline [NG29]

The Wallcharts should be displayed throughout HSC Trusts in **ALL** clinical settings that accommodate children aged from birth (term) until their 16th birthday including Emergency Departments, Adult Wards, Theatre and ICUs.

Processes must be in place to ensure that any previous versions of the wallcharts are removed and destroyed.

All medical and nursing staff should base their practice related to the prescribing and administration of intravenous fluids for children, young people (and indeed adults) on Paediatric Parenteral Fluid Therapy wallcharts. The wallcharts provide a structured approach to patient clinical assessment. A sequence of questions is offered that prompts the clinician to:

- Assess for the presence of shock and guide treatment, if required, in the administration of appropriate **Resuscitation** fluids.
- Assess whether there is also a deficit to be considered. Measuring/estimation and correction of any fluid deficit through **Replacement/Redistribution**.
- Calculate and prescribe a fluid **Routine Maintenance** regime (taking into account any ongoing losses).
- **Reassessment** at least 12 hourly

¹² PARENTERAL FLUID THERAPY FOR CHILDREN & YOUNG PEOPLE (AGED OVER 4 WEEKS & UNDER 16 YEARS) [http://www.publichealth.hscni.net/DoHWallchart \(Aged Over 4 Weeks And Under 16 Years\)](http://www.publichealth.hscni.net/DoHWallchart (Aged Over 4 Weeks And Under 16 Years))

¹³ PARENTERAL FLUID THERAPY FOR TERM NEONATES (UP TO 4 WEEKS OF AGE) [http://www.publichealth.hscni.net/DoHWallchart \(Up to 4 weeks of age\)](http://www.publichealth.hscni.net/DoHWallchart (Up to 4 weeks of age))

8.2.1 Baseline Assessment

- Good practice guidelines on monitoring body weight, electrolytes/urea and fluid balance should be followed.
- An essential preliminary to these assessments is to accurately measure the body weight in kilograms or failing this, to make an estimate. This must be cross-referenced with the child's age to minimise the risk of error.
- In the emergency situation an estimation of the child's weight should be made and an accurate weight obtained and recorded as soon as practically possible.
- Baseline measurement of electrolytes and urea should be made unless the child is healthy **AND** scheduled for elective surgery when it may be considered unnecessary.
- Baseline U&E should be recorded on the fluid balance chart.

8.2.2 Resuscitation/Shock therapy

- Shocked or collapsed children must immediately receive fluid boluses as outlined on the Regional Paediatric Fluid Therapy Group wallchart. Fluid bolus should be administered over a period of less than 10 minutes for children and term neonates.
- Good practice would indicate that the response to fluid therapy is closely observed and if there is no response by the time 40 ml/kg has been administered, senior medical advice and help is required.
- Note that special treatment is needed for children with diabetic ketoacidosis and trauma and the need to obtain senior advice and help is highlighted.
- Recommended fluid is glucose-free crystalloids that contain sodium in the range 131 - 154 mmol/L Intravenous or Intraosseous.

8.2.3 Fluid Deficit Management / Replacement and Redistribution

- Calculation of the overall fluid deficit and the prescription of deficit/ongoing loss replacement should only be undertaken by a doctor experienced in caring for dehydrated children and young people. The recommended fluid is a glucose free isotonic crystalloid that contains sodium in the range 131 - 154 mmol/L (For example Sodium Chloride or Hartman's solution) and it must be calculated as per relevant Wallchart. The rate at which it is given is determined by the degree of dehydration and a relevant electrolyte sample.
- For those staff caring for young people in a general adult ward, they should ensure that they can avail themselves of advice from the sources as detailed in appendix 2 (local details).

Local Details – please refer to appendix 2

- For advice regarding the estimation of the percentage of dehydration which is required for the fluid deficit calculation, the fluid balance chart and table in appendix 4 should be consulted.

8.2.4 Routine Maintenance fluid therapy

- When prescribing maintenance fluids to children, young people and adults, the following scheme would be standard practice.
 - For children and young people use the calculations as indicated in the Paediatric Parenteral Fluid Therapy for Children and Young People (Aged Over 4 Weeks and Under 16 Years Wallchart.
 - For term neonates use the calculations as indicated in Parenteral Fluid Therapy for Term Neonates (Up To 4 Weeks of Age) wallchart.
 - For young people prescribe:
 - For females a maximum of 80mls/hr
 - For males a maximum of 100 mls/hr
- The type of fluid selected must be tailored to the patient's needs as set out in the relevant Wallchart. For example, following surgery, children who require intravenous fluids will be prescribed either isotonic crystalloids that contain sodium in the range of 131-154 mmols/L with or without pre-added glucose or Hartmann's solution in the post-operative period for maintenance fluid needs.
- Children must not receive intravenous fluids unnecessarily. This guideline emphasises that assessment of each patient should include a decision on whether oral fluid therapy could be appropriately initiated instead of intravenous therapy and further prompts reconsideration of this question when IV therapy is reviewed.
- Complete box on 12 hourly review.

Locally agreed IV fluids – please refer to appendix 5 if applicable

Trusts may wish to provide a list of locally agreed IV fluids and insert as appendix 5

8.2.5 Management of acute fluid management related conditions

- Good practice in relation to the management of acute conditions which may develop during intravenous fluid therapy management including Hypoglycaemia, Hyponatraemia and Hypernatraemia is outlined in Intravenous fluid therapy in children and young people in hospital NICE guideline [NG29]¹⁴

¹⁴ Intravenous fluid therapy in children and young people in hospital NICE guideline, NG29. Available at:

8.3 Training and Assessment

*Provide adequate **training** and supervision for all staff involved in the prescribing, administering and monitoring of intravenous infusions for children.*

Training and Assessment

A description of the knowledge and skills required to reduce the risk of harm due to hyponatraemia is outlined in the Competency Framework¹⁵ developed by Trusts working with the PHA and Educational Providers.

The framework provides an overview of individual and organisational responsibilities in relation to training and assessment and also provides a list of resources to support training, skills and knowledge.

All resources are available at:

<http://www.publichealth.hscni.net/directorate-nursing-and-allied-health-professions/nursing/central-repository-hsc-resources-relating->

8.4 Fluid Balance and Prescription Charts (Appendix 6)

*Review and improve the design of existing intravenous fluid prescriptions and **fluid balance charts** for children.*

- The Regional fluid prescription/ balance (FB&P) chart should be used to record fluid prescription and balance for children and young people treated in HSC Trusts with the exception of:
 - diabetic ketoacidosis (DKA) when specialised fluid prescription charts may be used
 - acute burns when specialised fluid prescription charts may be used
 - day case patients where the ward has a clear protocol for the management of these patients using operating and post operative documentation. Any day case patient, who requires an inpatient stay, must be started on a fluid prescription and balance chart
 - Intensive care units
- A multidisciplinary training presentation outlining how the chart should be completed is available in the HSC Central Repository along with the other resources as referred to in section 8.3.

<https://www.nice.org.uk/guidance/ng29>

¹⁵ HSC Competency Framework for reducing the risk of hyponatraemia when administering intravenous fluids to babies, children and young people, October 2019. Available at:

<https://www.publichealth.hscni.net/directorate-nursing-and-allied-health-professions/nursing/central-repository-hsc-resources-relating->

- All children, other than those who are well and are for elective surgery, must have a blood sample taken for electrolyte and blood glucose measurement before intravenous maintenance fluids are started. Glucose monitoring must be done at least 12 hourly and U&E repeated at least 24 hourly (and recorded on the FB&P chart), more often in the circumstances described, while receiving IV therapy. Clinical and other methods of monitoring are outlined in the guidance.

8.5 Monitoring

Promote reporting of hospital acquired hyponatraemia incidents via local risk management reporting systems. Implement an audit programme to ensure adherence to the above

Monitoring of the child receiving parenteral fluid should follow guidance in the Wallcharts including:

- Body weight to be measured or assessed as a baseline and at least 24 hrly thereafter
- Clinical state to be closely monitored and recorded on a regular basis
- All fluid intake of any kind (intravenous, oral and medicines) must be measured and recorded on the fluid prescription and balance chart
- All fluid output of any kind must be assessed and recorded on the fluid prescription and balance chart
- Babies on intravenous fluids must have any nappies weighed. Babies receiving other forms of fluid intake must also have any nappies weighed when clinically indicated. If not clinically indicated to weigh nappies, an estimation e.g. small, moderate or large volume must still be made and recorded on the fluid prescription and balance chart. The rationale for any deviation from policy should be clearly documented
- An assessment of input/output and need for plasma glucose estimation should be made and documented on the FB&P chart every 12 hours
- A formal reassessment of the fluid prescription and the need for intravenous fluids must be made and documented every 12 hours
- Measurement of U&E's should be made at least daily and capillary blood glucose at least 12 hourly
- U&E (more often if abnormal; 4-6hourly if $\text{Na}^+ < 130 \text{ mmol/L}$)
- Urinary osmolarity and electrolytes measurements should be considered when dealing with hyponatraemia
- The ill child will require more frequent and detailed investigations
- Serum Sodium $< 130 \text{ mmol/L}$ should be documented in clinical notes along with a clear treatment plan to rectify

For more detailed information about the monitoring requirements the wallchart should be consulted.

8.5.1 Audit

Trusts should use the Paediatric Intravenous Fluid Audit Implementation Tool (PIVFAIT)¹⁶ to monitor compliance with Regional Policy. A copy of the tool and guidance on completion are available at Appendix 7.

Trusts may also wish to ask clinical biochemistry departments to collate, analyse and report quarterly on paediatric hyponatraemia incidents to designated clinicians for children and young people. A sample audit proforma is provided on the Central repository for HSC resources relating to fluid management in children & young people available at <http://www.publichealth.hscni.net/directorate-nursing-and-allied-health-professions/nursing/central-repository-hsc-resources-relating->

Incidents should be audited regularly and linked to Trust Incident Reporting Systems Audit processes.

8.5.2 Incident reporting

Trusts will report potential adverse incidents related to intravenous infusion through their Trust Adverse Incident Reporting System.

A system of 'triggers' (Appendix 8 - adapted from those developed by the NHSCT) may be used to:

- generate a list of hospital acquired hyponatraemia episodes
- highlight variance from best practice guidance as highlighted in this document
- generate a Trust Adverse Incident Form whenever such incidents occur.

These triggers cover the choice of fluid prescribed at ward level, charting relevant findings in the medical notes, the frequency of electrolyte analysis and the detection of biochemical abnormalities.

9 Consultation Process

The draft policy was agreed by a multiprofessional cross Trust group.

10 Equality Statement

In line with duties under the equality legislation (Section 75 of the Northern Ireland Act 1998), Targeting Social Need Initiative, Disability discrimination and the Human Rights Act 1998, an initial screening exercise to ascertain if this policy should be subject to a full impact assessment has been carried out. The outcome of the Equality screening for this policy is:

Major impact

Minor impact


No impact. X

¹⁶ Paediatric Intravenous Fluid Audit Implementation Tool (PIVFAIT) <http://www.publichealth.hscni.net/sites/pivfait>

APPENDICES

Appendix 1

PARENTERAL FLUID THERAPY FOR CHILDREN AND YOUNG PEOPLE (AGED OVER 4 WEEKS AND UNDER 16 YEARS) wallchart.



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PARENTERAL FLUID THERAPY FOR CHILDREN & YOUNG PEOPLE (AGED OVER 4 WEEKS & UNDER 16 YEARS)

Essential Monitoring, Observations & Reassessment

INITIALLY

Admission Weight
U&E (unless child is well & for elective surgery)

Each shift
Handover and review fluid management plan.

12 Hourly -
Clinical assessment, fluid balance, glucose

24 Hourly -
Clinical reassessment.
U&E (more often if abnormal); 4-6hourly if Na⁺ < 130 mmol/L).
Weight and weight changes

ILL CHILDREN
Hourly - HR, RR, BP, GCS. Fluid balance (urine osmolality if volume cannot be assessed). 2 - 4 hourly – glucose, U&E, +/- blood gas.

Enteral Intake and Medications:
Assess and record the volume and type of enteral fluids and IV medications.

If plasma Na⁺ < 130mmol/L or > 150mmol/L or plasma Na⁺ changes > 5mmol/L in 24 hours get senior help

Is shock present?

NO → **Is there a fluid deficit?**

YES → **Can child be managed with enteral fluids?**

NO → DKA / Burns: initiate departmental protocol, Renal / cardiac / hepatic - get senior help.

YES → **Can child be managed with enteral fluids?**

NO → **Prescribe Maintenance Fluids**

YES → **Prescribe Maintenance Fluids**

Resuscitation
ADMINISTER FLUID BOLUS OVER LESS THAN 10 MINUTES
Give 20 ml/kg of glucose-free crystalloids that contain sodium in the range 131 - 154 mmol/L IV or Intravenous [10 ml/kg if history of trauma, haemorrhage or in diabetic ketoacidosis]
Reassess. Repeat bolus if needed and get senior help.

Replacement: Redistribution
ESTIMATE DEFICIT
FLUID DEFICIT = (% dehydration x kg x 10) as ml of:
Isotonic crystalloids that contain sodium in the range 131 - 154 mmol/L
The volume of fluid to be prescribed is: fluid deficit MINUS volume of any fluid bolus received
Prescribe this residual volume of deficit separately from the maintenance prescription.
Give over 48 hours.
ONGOING LOSSES: calculate at least 4 hourly. Replace with an equal volume of: sodium chloride 0.9% (with pre-added potassium)

Routine Maintenance
Fluid choices:
Initially use isotonic crystalloids that contain sodium in the range of 131 - 154 mmol/L. Glucose containing fluid required in infants and young children. May also be required in older children.
Fluid Rate:
Alter fluid rate according to clinical reassessment (including changes in enteral intake). Adjust fluid type according to investigations; if sodium rises above 145 mmol/L change to sodium chloride 0.45% (with or without pre-added glucose and potassium).
COMMENCE ENTERAL FLUIDS & DISCONTINUE IV FLUIDS AS SOON AS CLINICALLY APPROPRIATE

Patients particularly at risk from hyponatraemia

- peri-operative patients
- head injuries
- gastric losses
- CNS infection
- severe sepsis
- hypotension
- intravascular volume depletion
- bronchiolitis
- gastroenteritis with dehydration
- abnormal plasma sodium and also if less than 138 mmol/L
- salt-wasting syndromes

Symptomatic Hyponatraemia - potential symptoms:
nausea, vomiting, headache, irritability, altered level of consciousness, seizures or apnoea.

Surface Area Method
Insensible losses (300 - 400ml/m²/24 hrs) plus urinary output

Routine Maintenance (Uses Weight)
CALCULATION OF 100% RATE
(a) for first 10 kg: 4ml/kg/hr
(b) for second 10 kg: 2ml/kg/hr
(c) for each kg over 20 kg: 1ml/kg/hr
For 100% daily maintenance add together (a) + (b) + (c)
MAXIMUM: females 80 mls per hour, males 100mls per hour.
If risk of hyponatraemia is high consider initially reducing maintenance volume to two thirds of maintenance.

Acute Symptomatic Hyponatraemia: raise Na⁺ by 5 - 6mmol/L in 1-2 hours using sodium chloride 2.7% IV bolus(es). Aim for max 10mmol/L rise in 5 hours

Bolus	Volume	Speed	Max	Comment
No. 1	2ml/kg	10 mins	100ml	Give bolus No. 2 if still symptomatic
No. 2	2ml/kg	10 mins	100ml	Check U&E. Give No. 3 if symptomatic
No. 3	2ml/kg	10 mins	100ml	If symptomatic reconsider diagnosis

First 48 hours: 2 hourly U&E, max Na⁺ 135 mmol/L, max rise 20mmol/L

INTRA-OPERATIVE PATIENTS: consider monitoring glucose.

Hypokalaemia (< 3.5 mmol/L): Check for initial deficit. Maintenance fluid with pre-added potassium required. For concentration > 40mmol/L get senior help.

Hypoglycaemia (< 3 mmol/L): Medical Emergency: give 2 ml/kg bolus of glucose 10%. Review maintenance fluid, consult senior and recheck level after 15-30 mins.

Feb 2017



PARENTERAL FLUID THERAPY FOR TERM NEONATES (UP TO 4 WEEKS OF AGE) wallchart.

DoH
www.health-irl.gov.uk

PARENTERAL FLUID THERAPY FOR TERM NEONATES (UP TO 4 WEEKS OF AGE)

Feb 2017

Essential Monitoring, Observations & Reassessment INITIALLY

Admission Weight:
U&E (unless baby is well & for elective surgery)

Each shift
Handover and review fluid management plan.

12 Hourly -
Clinical assessment, fluid balance, glucose

24 Hourly -
Clinical reassessment:
U&E (more often if abnormal; 4-6 hourly if Na⁺ < 130 mmol/L).
Weight and weight changes

ILL NEONATE
Hourly - HR, RR, BP and AVPU scale. Fluid balance (urine osmolality if volume cannot be assessed). 2 - 4 hourly – glucose, U&E, +/- blood gas.

Enteral Intake and Medications:
Assess and record the volume and type of enteral fluids and IV medications.
If plasma Na⁺ < 130mmol/L or > 150mmol/L or plasma Na⁺ changes > 5mmol/L in 24 hours get senior help

Is shock present?

NO → Burns: initiate departmental protocol. Renal / cardiac / hepatic - get senior help.

YES → **Resuscitation**
ADMINISTER FLUID BOLUS OVER LESS THAN 10 MINUTES
Give 10 - 20 ml/kg of glucose-free crystalloids that contain sodium in the range 131 - 154 mmol/L IV or Introsseous [10 ml/kg if history of trauma, haemorrhage]
Reassess. Repeat bolus if needed and get senior help.

Is there a fluid deficit?

NO → **Prescribe Maintenance Fluids**
On senior advice
Surface Area Method (300 - 400ml/m²/24 hrs) plus urinary output

Can child be managed with enteral fluids?

NO → **Replacement: Redistribution**
ESTIMATE DEFICIT
FLUID DEFICIT = (% dehydration x kg x 10) as mls of:
Isotonic crystalloids that contain sodium in the range 131 - 154 mmol/L
The volume of fluid to be prescribed is: fluid deficit MINUS volume of any fluid bolus received
Prescribe this residual volume of deficit separately from the maintenance prescription.
ONGOING LOSSES: calculate at least 4 hourly. Replace with an equal volume of:
sodium chloride 0.9% (with pre-added potassium)
Give over 48 hours.
Change fluid type and volume according to clinical reassessment, electrolyte losses and test results

Routine Maintenance

Fluid choices:
Initially use isotonic crystalloids that contain sodium in the range of 131- 154 mmol/L with 5- 10% glucose.

Fluid Rate:
Alter fluid rate according to clinical reassessment (including changes in enteral intake). Adjust fluid type according to investigations. If sodium rises above 145 mmol/L change to sodium chloride 0.45% with pre-added glucose.

COMMENCE ENTERAL FLUIDS & DISCONTINUE IV FLUIDS AS SOON AS CLINICALLY APPROPRIATE

Patients particularly at risk from hyponatraemia

- peri-operative patients
- head injuries
- gastric losses
- CNS infection
- severe sepsis
- hypotension
- intravascular volume depletion
- bronchiolitis
- gastroenteritis with dehydration
- abnormal plasma sodium and also if less than 138 mmol/L
- salt-wasting syndromes

Symptomatic Hyponatraemia - potential symptoms:
nausea, vomiting, irritability, altered level of consciousness, seizures or apnoea.

Routine Maintenance CALCULATION OF 100% RATE

Birth to day 1: 2.0 - 2.5 ml/kg/hr
day 2: 3.0 - 3.3 ml/kg/hr
day 3: 3.3 - 4.0 ml/kg/hr
day 4: 4.0 - 5.0 ml/kg/hr
day 5 - 28: 5.0 - 6.3 ml/kg/hr

Hypohalaemia (< 3.5 mmol/L): Check for initial deficit. Maintenance fluid with pre-added potassium required. For concentration > 40mmol/L get senior help.

Hypoglycaemia (< 3 mmol/L): Medical Emergency Give 2 ml/kg bolus of glucose 10%. Review maintenance fluid, consult senior and recheck level after 15-30 mins. INTRA-OPERATIVE PATIENTS: consider monitoring glucose.

Acute Symptomatic Hyponatraemia: raise Na ⁺ by 5 - 6mmol/L in 1-2 hours using sodium chloride 2.7% IV boluses. Aim for max 10mmol/L rise in 5 hours			
Bolus	Volume	Speed	Comment
No.1	2ml/kg	10 mins	Give bolus No.2 if still symptomatic
No.2	2ml/kg	10 mins	Check U&E. Give No.3 if symptomatic
No.3	2ml/kg	10 mins	if symptomatic reconsider diagnosis

Appendix 2

INSERT LOCAL TRUST CONTACT DETAILS HERE.

Appendix 3

INSERT LOCAL TRUST POLICY ON NO.18 SOLUTION HERE

Appendix 4

ESTIMATING THE PERCENTAGE DEHYDRATION BASED UPON PHYSICAL EXAMINATION FINDINGS¹⁷.

Estimating the percentage dehydration based upon physical examination findings

Degree of Dehydration		Signs are ordered in each column by severity
Moderate	5%	Dry mucous membranes (be wary in the mouth breather) Diminished skin turgor (pinch test 1–2 sec) Altered neurological status (drowsiness, irritability) Deep (acidotic) breathing
Severe	8%	Decreased peripheral perfusion Cool/mottled/pale peripheries; Capillary refill time >2 sec Circulatory collapse

Do not use more than 8% dehydration in calculations.

¹⁷ Daily Fluid Balance and Prescription Chart. Child up to 16th birthday, Department of Health, Feb 2017.

Appendix 5

LIST OF INTRAVENOUS FLUIDS FOR USE WITH PAEDIATRIC PATIENTS - (insert name) HSC TRUST

Note:

- Wherever possible, only preparations of IV fluids as supplied by manufacturers should be used.
- Apart from boluses for shocked patients, fluids may only be administered by way of an infusion device. Details of the pump must be recorded on the fluid prescription and balance chart.
- When referring to this policy, staff should consult their Trust policy on the management of strong intravenous potassium solutions and/or injections.

Appendix 6

DAILY FLUID BALANCE AND PRESCRIPTION CHART

Daily Fluid Balance & Prescription Chart

Child
Up to 16th birthday

Write in CAPITAL LETTERS or use addressograph

Surname: _____
 First name: _____
 Consultant: _____ Ward: _____
 Hospital no.: _____ DOB: _____
 Health and Care no.: _____

Hospital: _____
 Ward: _____
 Date: _____

February 2017

Special Instructions: _____

	FLUID INPUT (ml)												FLUID OUTPUT (ml)										
	ENTERAL FLUID				INTRAVENOUS FLUID & MEDICINES*								URINE		BOWEL		EMESIS		Hourly Amount OUT	Grand Total OUT	Overall Balance	Blood Sugar	Initials
	ORAL		by TUBE		No. 1 Site		No. 2 Site		No. 3 Site		No. 4 Site		Hourly Amount IN	Grand Total IN	Amount	Total	Amount	Total					
Fluid Type	Amount	Fluid Type	Amount	Fluid Type	Amount	Fluid Type	Amount	Fluid Type	Amount	Fluid Type	Amount	Fluid Type	Amount	Amount	Total	Amount	Total	Amount	Total	Amount	Total		
08.00																							
09.00																							
10.00																							
11.00																							
12.00																							
13.00																							
14.00																							
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24.00																							
01.00																							
02.00																							
03.00																							
04.00																							
05.00																							
06.00																							
07.00																							

INTAKE	Sum	Day	Night	Sum	Total
Liquid					
Enteral					
Intravenous**					
Grand Total IN					

OUTPUT	Sum	Day	Night	Sum	Total
Urine					
Bowel					
Other					
Grand Total OUT					

24 hour Fluid Balance (ml)

Balance =

**Exclude daily cannula flush volumes

CHILD

Write in CAPITAL LETTERS or use addressograph

Surname: _____
 First name: _____
 Consultant: _____ Ward: _____
 Hospital no.: _____ DOB: _____
 Health and Care no.: _____

Yesterday's Date: _____

Grand total in	Grand total out	Balance

Clinical signs of dehydration

Degree of Dehydration	Signs are ordered in each column by severity
None/mild, 5%	Dry mucous membranes (in way in the mouth/breath) Diminished skin turgor (pinch test 3-5 sec) Altered neurological status (drowsiness, irritability) Deep (costic) breathing
Severe, 8%	Decreased peripheral perfusion Cool/mottled/pale peripheries Capillary refill time > 2 sec Circulatory collapse

Do not use more than 8% dehydration in calculation.

Calculation guidance for intravenous therapy for term neonates and children under 16 years

based on Parenteral Fluid Therapy Walkcharts - December 2016 and NICE NG29 - 12/2015

RESUSCITATION = B
 Fluid bolus volume for shocked patients = I
 Resuscitation bolus volume (ml) = body weight (kg) x 20 for child; 10-20 for term neonate
 but if the setting is trauma or DKA x 10

Record this bolus volume I (ml) in prescription box below and identify this fluid bolus volume with letter B.
Use only glucose-free crystalloids (with sodium content 131-154 mmol/L) - repeat if necessary - REASSESS - call for senior help

For DKA use separate prescription protocol.

REPLACEMENT: REDISTRIBUTION
 Fluid deficit calculations (maximum 8%) = D
 % of dehydration _____ x bodyweight in kg _____ x 10
 Amount given as fluid bolus volume:
 Residual deficit (I minus I)
 Give residual deficit over 48 hours (III divided by 48)

Additional ongoing losses volume (e.g. vomiting, diarrhoea, drainage) = Q
 Prescribe the calculated Maintenance and Deficit fluids individually.
 Calculate at least every 4 hours (unless otherwise instructed)
 Replace Ongoing lost volume with an equal volume of fluid (usually sodium chloride 0.9% +, KCL)

ROUTINE MAINTENANCE = M
 Maintenance fluid - in females > 40kg max 2000 ml/day, in males > 60kg max 2500 ml/day (equivalent to 80 & 100 ml/hour respectively)

From birth → day 1	2.0 - 2.5 ml/kg/hr	}	Term Neonate	= VI	ml/hr
Day 2	3.0 - 3.3 ml/kg/hr				
Day 3	3.3 - 4.0 ml/kg/hr				
Day 4	4.0 - 5.0 ml/kg/hr				
Day 5 → 28	5.0 - 6.3 ml/kg/hr				

First 10kg: 4ml/kg/hr } Child = VII ml/hr
 Second 10kg: 2ml/kg/hr }
 For each kg over 20kg: 1ml/kg/hr
 Maintenance total for Term Neonate = VI Child = (VI + VII + VIII) ml/hr

If risk of hyponatraemia is high, consider restricting fluids to 50-80% of routine maintenance needs.

Indications - all that apply	Fluid	Bolus volume	Deficit	Ongoing loss volume	Maintenance	Drug	Prescription
Date	Time	Volume	Infusion Fluid/Type	Additive*	Rate ml/hr Range	Prescriber's Signature	Administered By
			(a)				
			(b)				
			(c)				
			(d)				
			(e)				
			(f)				
			(g)				
			(h)				
			(i)				
			(j)				

*Medicine must be recorded in Drug Kardex ** Medial name, Serial number.

REASSESSMENT	Date	Time	Is infusion prescription still suitable?	Doctors Signature	Is patients hydration improving? Are oral fluids now appropriate? Is potassium needed? What about Urine output?	Special Instructions:
12 hour Reassessment			Yes or No			

Appendix 7

PAEDIATRIC INTRAVENOUS FLUID AUDIT IMPLEMENTATION TOOL (PIVFAIT)

Paediatric Intravenous Fluid Audit Implementation Tool										
Q	Date		Vard/Dept		Child					
	1	2	3	4	5	6	7	8	9	
	1 Patient identification Are ALL the following patient identifiers provided on both sides of the DFBC? 1. Full Name 2. Date of birth 3. Hospital number	2 Glucose Monitoring While the child is receiving IV fluids, is there a Blood Glucose result recorded on the DEBC. (in accordance with the 2017 Paediatric Therapy Waichart) i.e. at least 12 hourly?	3 Glucose Monitoring Were ALL Blood Glucose measurements greater than 3mmol/L? If answer = No; Enter Hospital Number of those below 3mmol/L for Trust audit dept. to check for	4 Cumulative input and output totalling and fluid Are ALL of the following amounts (in ml) recorded on the DEBC? 1. Oral/IV amounts (all administered types of intake to be recorded). 2. Day and night totals. 3. Grand Total IN 4. Grand Total OUT 5. 24 hour Fluid Balance	5 Patient weight Is there a patient weight in kgs. given on the DEBC?	6 DFBC calculation guidance Are the appropriate calculation guidance sections for the IV therapy completed?	7 DFBC calculation guidance completed. Are there coded indications for the fluid administration provided?	8 Electrolyte monitoring Is there an E&U result recorded on the DEBC. (in accordance with the 2017 Paediatric Therapy Waichart)?	9 12 hour assessment. When IV fluids are administered for longer than 12 hours. Is there a 12 hour Reassessment box appropriately completed on the DEBC with an answer to the question: Is the infusion prescription still suitable - followed by a doctors signature?	Compliance %
1										0
2										0
3										0
4										0
5										0
6										0
7										0
8										0
9										0
10										0
Total Audits = Obs = 0										Total number fully Compliant = Com = 0
Paediatric Version V0.13 July 2016										

Paediatric IV Fluid Audit Improvement Tool

Background

In August 2014, GAIN produced an audit of Parenteral Fluid Therapy for Children and Young People from Babies (term), children and young people up to 16th Birthday. It had 13 recommendations and, based on the lessons learnt from this audit, advised that GAIN produce a simple Paediatric IV Fluid Audit Improvement Tool (PIVFAIT) which Trusts can use to obtain high and consistent compliance with these recommendations. It has been agreed that the PIVFAIT will be used internally within each Trust as a KPI within its own quality assurance framework. Notwithstanding this, the results with this audit tool may be asked for by the DoH, RQIA or GAIN in the future.

Methodology

This audit tool is:

- ward based;
- with data collection by nursing staff;
- performed at an agreed collection interval (weekly or monthly);
- if possible, performed in ONE data collection session;
- reported monthly; and

It is performed on:

- Children and Young People from Babies (term), children and young people up to 16th Birthday;
- who are receiving intravenous fluids;
- for >12 hours.

The collection interval will depend on the number of children being cared for within each ward and Trust. It is recommended to:

- sample and analyse 10 daily fluid prescription and balance charts (DFBC);
- sample 10 cases a week or 10 a month;
- collect the data in ONE collection session; and
- a majority of daily DFBCs should be audited.

Each chart will be subject to examination using the following questions, answering using 1 = Yes and 0 = No. This will allow the tool to automatically calculate the compliance figure weekly and/or monthly. The aim is for 100% compliance.

Answers MUST either be a 1 for YES or a 0 for a NO.

There should be assurance of this ward audit by an independent audit review, quarterly, performed by the Trust's corporate (paediatric) management team or the Trust's Audit department, using the PIVFAIT.

The PIVFAIT consists of:

- i. this Method and instructions
- ii. PIVFAIT Excel spreadsheet containing
 - a. Instruction sheet
 - b. Audit Tool (data collection page), and
 - c. Weekly & Monthly data presentation worksheet
- iii. Overall monthly hospital compliance result sheet – for forwarding
- iv. Parenteral Fluid Therapy for children & young people Wallchart (Feb 2017)

Figure 1. Data collection page


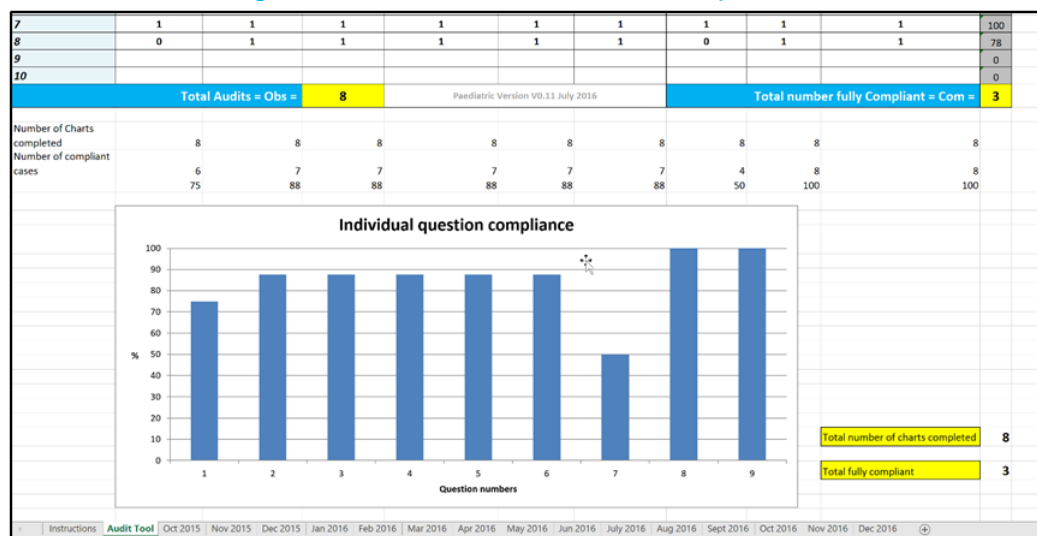
Paediatric Intravenous Fluid Audit Implementation Tool								Child 			
Date	Ward/Dept										
Q	1	2	3	4	5	6	7	8	9	Compliance %	
	Patient identification	Glucose Monitoring	Cumulative input and output totalling and fluid balance.	Patient weight	DFBC calculation guidance completed.	Electrolyte monitoring	12 hour assessment.				
	Are ALL the following patient identifiers provided on both sides of the DFBC? 1. Full Name 2. Date of birth 3. Hospital number	While the child is receiving IV fluids, is there a Blood Glucose result recorded on the DFBC. (in accordance with the 2014 Paediatric Therapy Walkchart) i.e. at least 12 hourly?	Were ALL Blood Glucose measurements greater than 3mmol/L? If answer = No: Enter Hospital Number of those below 3mmol/L for Trust audit dept. to check for treatment.	Are ALL of the following amounts (in mls) recorded on the DFBC? 1. Oral/IV amounts, (all administered types of intake to be recorded). 2. Day and night totals. 3. Grand Total IN 4. Grand Total OUT 5. 24 hour Fluid Balance	Is there a patient weight in kgs, given on the DFBC?	Are the appropriate calculation guidance sections for the IV therapy completed?	Are there coded indications for the fluid administration provided?	Is there an E&U result recorded on the DFBC. (in accordance with the 2014 Paediatric Therapy Walkchart)?	When IV fluids are administered for longer than 12 hours. Is there a 12 hour Reassessment box* appropriately completed on the DFBC with an answer to the question: Is the infusion prescription still suitable - followed by a doctors signature? * Can be 10 - 14 hours		
Name or Number											
Record Yes = 1 , No = 0 (the only possible entries are either a 1 or a 0)											
1											0
2											0
3											0
4											0
5											0
6										0	
7										0	
8										0	
9										0	
10										0	
Total Audits = Obs =		0		Paediatric Version V0.13 July 2016			Total number fully Compliant = Com =			0	

Figure 2. Individual Question Compliance

**Questions¹⁸****Patient identification**

1. Are ALL of the following patient identifiers provided, on both sides of the DFBC?

- i. Full name
- ii. Date of birth
- iii. A hospital number

Glucose monitoring

2. While the child is receiving IV fluids, is there a Blood Glucose result recorded on the DFBC, (in accordance with the Paediatric Therapy Wallchart (Feb 2017) i.e. at least 12 hourly?

*The Blood Glucose result must be actually on the DFBC.
A Blood Glucose result must be available for each 12 hours.*

3. Were ALL episodes of Blood Glucose measurements >3 mmol/L?

*If answer = No; enter Hospital Number of those **below 3 mmol/L** for Trust audit department to check for treatment.*

If the answer to Q2 was No and is score = 0, then answer to Q3 is also score = 0.

Cumulative input and output totalling and fluid balance

4. Are ALL of the following amounts (in mls) recorded on the DFBC?

- i. Oral/IV amounts, (all administered types of intake to be recorded)
- ii. Day & night totals, (child on IV fluids for longer than 12 hours)
- iii. Grand Total IN
- iv. Grand Total OUT
- v. 24 hour Fluid Balance

¹⁸ Based on the recommendations of the GAIN Audit of Parenteral Fluid Therapy for Children and Young Persons (August 2014) and the Parenteral Fluid Therapy for children & young people Wallchart (Feb 2017).



Patient weight

5. *Is there a patient weight, in kgs, given on the DFBC?*

Daily fluid balance chart calculation guidance completed

6. *Are the appropriate Calculation guidance sections for IV therapy completed?*

7. *Are there coded indications for the fluid administration provided?*

Electrolyte & Urea monitoring

8. *Is there an E&U result recorded on the DFBC, (in accordance with the Paediatric Therapy Wallchart (Feb 2017))?*

*The E&U result must be actually on the DFBC.
If there is an E&U previously performed within a suitable time period (4 -24 hours) of the fluids being discontinued - as per the Paediatric Therapy Wallchart Guidance (2014) – the answer can be recorded as YES.*

12 hour reassessment

9. *When IV fluids are administered for longer than 12 hours, is there a 12 hour Reassessment box completed with an answer to the question “Is infusion prescription still suitable?”, followed by a doctor’s signature?*

Figure 3. Data presentation page

Fluid Balance Results for July 2016															
FLUID BALANCE PRESCRIPTION CHART	04/07/2016			11/07/2016			18/07/2016			25/07/2016					
	Obs	Com	Total	Obs	Com	Total	Obs	Com	Total	Obs	Com	Total	Obs	Com	Total
Ward 1	10	9	90	4	4	100	2	2	100	4	4	100	8	8	100
Ward 2	5	4	80	7	5	71	10	4	40	6	2	33	7	7	100
Ward 3	10	9	90	10	10	100	5	4	80	7	7	100	6	2	33
Ward 4	10	10	100	4	4	100	10	9	90	9	9	100	4	3	75
Ward 5	8	8	100	9	8	89	10	10	100	8	7	88	9	8	89
Ward 6	10	10	100	10	10	100	10	6	60	10	10	100	10	10	100
Weekly Total	53	50		44	41		47	35		44	39		44	38	
Monthly Total	232	203													

Figure 4. Monthly overall hospital compliance results

EXAMPLE		Patient identification		Glucose Monitoring			Cumulative input and output totalling and fluid balance.		Patient weight		DFBC calculation guidance completed.		Electrolyte monitoring		12 hour assessment.	
November 2015		TOTAL														
Ward	%	Obs	Com													
A	100	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
B	85	40	34	40	40	39	40	40	38	39	40	40	38	38	38	
C	60	5	3	5	5	5	5	5	5	5	5	5	5	3	3	
D	55	18	10	18	13	15	14	17	17	17	12	12	16	16	16	
E	20	10	2	9	10	10	5	10	7	9	6	6	2	2	2	
F	90	21	19	21	21	21	21	21	21	21	21	21	19	19	19	
TOTAL		98	72 = 73%	97 = 99%	93 = 94%	94 = 96%	89 = 91%	97 = 99%	92 = 93%	95 = 97%	88 = 89%	82 = 83%				

Appendix 8

Triggers for potential adverse events related to the administration of intravenous fluids.

If any of these occur, an Adverse Incident Form must be completed.

CHOICE OF IV FLUID

- Bolus fluid: use of a solution with sodium content less than 131mmol/L for resuscitation
- Maintenance fluid: use of a solution with sodium content less than 131mmol/L in a peri-operative patient (intraoperative period and first 24 hours following surgery) OR in any of the patients particularly at risk of hyponatraemia as per Wall Chart Feb, 2017
- Replacement/Redistribution: use of a solution with sodium content less than 131mmol/L for correction

BIOCHEMICAL ABNORMALITIES

- Any episode of symptomatic hyponatraemia while in receipt of IV fluids
- Any episode of hypoglycaemia (blood glucose less than 3mmol/L) while in receipt of IV fluids
- Any episode of severe acute hyponatraemia (i.e. sodium level dropping from 135mmol/L or above to less than 130mmol/L within 48 hours of starting IV fluid treatment)

ASSESSMENT

- Electrolytes not checked before commencement of maintenance IV fluids
- Failure to check electrolytes at least once per 24 hours in any patient receiving continuing maintenance IV fluids
- Failure to record the calculations for fluid requirements on the fluid balance and prescription sheet
- Failure to note in the case notes or on the fluid prescription & balance sheet a serum sodium of <130mmol/L
- Failure to document in the case notes the steps taken to correct a serum sodium of <130mmol/L

Note: the list above is not exhaustive.

HSC COMPETENCY FRAMEWORK FOR REDUCING THE RISK OF HYPONATRAEMIA WHEN ADMINISTERING INTRAVENOUS FLUIDS TO BABIES, CHILDREN & YOUNG PEOPLE

All of the resources referred to in this document can be accessed on a central repository for HSC resources relating to fluid management on the PHA website at: <http://www.publichealth.hscni.net/directorate-nursing-and-allied-health-professions/nursing/central-repository-hsc-resources-relating->

1 Introduction

This document provides a framework to support existing Trust processes in reducing the risk of hyponatraemia when administering IV fluids to babies, children and young people.

The framework outlines recommendations that Trusts should implement locally to support their own internal governance requirements in providing assurance that all staff, who require it, are deemed competent in the safe administration of intravenous fluids to children from birth (term) up to their 16th birthday.

2 Background

A series of national and regional reports, outline a significant risk of increased mortality and morbidity associated with inappropriate management of IV fluids and hyponatraemia in children and young people.

In Northern Ireland, The Regulation and Quality Improvement Authority (RQIA) reviewed the implementation of *National Patient Safety Agency (2007) Patient Safety Alert 22: Reducing the risk of hyponatraemia when administering intravenous infusions to children*¹⁹.

Recommendations were made by RQIA in 2008²⁰ and again in 2010²¹ to improve HSC Trust arrangements to reduce risk in this area.

In reporting progress against the implementation of the recommendations of the RQIA 2010 report, a number of Trusts highlighted that a regional approach would be beneficial in the implementation of the following two recommendations:

¹⁹ National Patient Safety Agency (2007) Patient Safety Alert 22: Reducing the risk of hyponatraemia when administering intravenous infusions to children

<http://www.nrls.npsa.nhs.uk/resources/type/alerts/?entryid45=59809&p=3>

²⁰ Reducing the risk of hyponatraemia when administering intravenous infusions to children, April 2008. RQIA. [Summary report following Validation Visits to Trusts and Independent Hospitals throughout Northern Ireland].

<https://www.rqia.org.uk/RQIA/files/04/043bc7ac-b299-4f57-87ef-e80cc6ec4e64.pdf>

²¹ Reducing the risk of hyponatraemia when administering intravenous infusions to children, May 2010. RQIA [Report of actions taken by HSC Trusts and independent hospitals to implement recommendations made in the report

"Reducing the risk of hyponatraemia when administering intravenous fluids to children" (RQIA, June 2008)]

<https://www.rqia.org.uk/RQIA/files/6a/6ae95bf4-56e6-46b6-9c3b-8f5df1590cde.pdf>

- Development of a competency assessment tool on the administration of intravenous fluids; and
- Training and assessment of staff in the administration of intravenous fluids to children.

In order to harmonise practice and to ensure that training is consistent across HSC Trusts, the Chief Medical Officer asked the PHA to form a Cross Trust Task and Finish Group to address these recommendations, provide advice and share regional learning across Trusts in Northern Ireland.

A Competency Framework was developed by the group in consultation with internal and external stakeholders to ensure consistency of approach in the implementation of RQIA recommendations. The framework, which was initially circulated in 2013, has been regularly reviewed and updated.

In the interim, the National Institute for Health and Care Excellence (NICE) has also published guidance on Intravenous fluid therapy in children and young people in hospital NICE guideline [NG29] (December 2015)²². All hyponatraemia educational resources developed to reduce the risk of harm due to hyponatraemia in Northern Ireland have been adapted to take account of NG29.

3 Scope of the Framework

This Framework applies to all staff working in HSC Trusts who may be involved in the prescription, administration, monitoring and review of intravenous infusions to children from birth (term) up to their 16th birthday. Staff will include registered nurses, medical practitioners, midwives, pharmacists, agency and locum staff, and operating department assistants.

This framework will be reviewed again in October 2021, or earlier in light of relevant new guidance being published in the interim.

4 Professional Responsibility

All registered professional staff are required to work only within the scope of their professional practice. Individual practice should be informed and limited by the accountable practitioner's own knowledge and competence. This instruction is reflected in the regulations of individual professional bodies.

All registered professional staff involved in the care, assessment and clinical management of children must ensure that their practice in relation to the provision of intravenous fluids meets the knowledge and competency standards set out in this document and the training requirements of their individual Trust.

The requirements and responsibilities of individuals and Trusts are outlined in section 6.

²² <https://www.nice.org.uk/guidance/ng29>

5 Policy and guidance documentation in Northern Ireland to support reducing risk of harm due to hyponatraemia

This competency framework has been developed to support Trusts in providing assurance that all relevant Trust staff are aware of their responsibilities and adhere to recommended clinical procedures in relation to the prescription, administration, monitoring and review of intravenous fluids, including hypotonic infusions.

All documents and resources within this framework are available on a Central repository for HSC resources relating to hyponatraemia at:

<http://www.publichealth.hscni.net/directorate-nursing-and-allied-health-professions/nursing/central-repository-hsc-resources-relating->

Policy and guidance in Northern Ireland to support reducing the risk of harm from hyponatraemia includes:

- 5.1 National Patient Safety Agency (2007) Patient Safety Alert 22: Reducing the risk of hyponatraemia when administering intravenous infusions to children¹⁹.

RQIA recommended specific actions for Trusts to take in response to the NPSA Patient Safety Alert 22 (table 1) and also reported on their implementation^{4, 5}.

Trusts were required to:

- Remove sodium chloride 0.18% with glucose 4% intravenous infusions from stock and general use in areas that treat babies, children and young people. Suitable alternatives must be available. Availability of these intravenous infusions should be restricted to critical care and specialist wards such as renal, liver and cardiac units;
- Produce and disseminate clinical guidelines for the fluid management of paediatric patients. These should give clear recommendations for fluid selection, and clinical and laboratory monitoring. Within Northern Ireland these clinical guidelines are specifically those issued by the Department of Health NI (Wall Charts 5.3 and 5.4);
- Provide adequate training and supervision for all staff involved in prescribing and administration of intravenous infusions for children and young people (outlined in section A and B);
- Reinforce safer practice by reviewing and improving the design of existing intravenous fluid prescriptions and fluid balance charts for children and young people (5.5);
- Promote the reporting of hospital acquired hyponatraemia incidents via local risk management reporting systems. Implement an audit programme to ensure NPSA recommendations and local procedures are being adhered to. In NI, the Paediatric Intravenous Fluid Audit Implementation Tool (PIVFAIT) has been implemented.

- 5.2 Intravenous fluid therapy in children and young people in hospital NICE guideline [NG29]²³ (December 2015).
- 5.3 Parenteral Fluid Therapy for Children and Young People (Aged over 4 weeks and under 16 years). Wallchart - Updated February 2017.
- 5.4 Parenteral Fluid Therapy for Term Neonates (Up To 4 Weeks of Age). Wallchart - February 2017.
- 5.5 Daily Fluid Balance and Prescription Chart (Child up to 16th birthday). Updated February 2017 (includes term neonates).

Updated guidance was endorsed by the Department of Health and two letters to Trusts and relevant bodies were issued:

Circular reference:

- HSS(MD) 16/2017, issued 6 September, 2017
- HSC (SQSD) (NICE NG29) 24/17, issued 20 June 2017

A number of resources are also provided to support knowledge, training and implementation of guidance including:

- PowerPoint presentation on Paediatric Fluid Balance & Prescription Chart
- Online Assessment on Paediatric Fluid Balance & Prescription Chart
- Additional guidance on use of the Paediatric Fluid Balance & Prescription Charts
- Guidance on how to prescribe intravenous medicine infusions on a medicines kardex and/or daily fluid balance & prescription sheet
- Clinical e-learning case studies to support knowledge and understanding
- Access to the BMJ e-learning module – Reducing the risk of hyponatraemia when administering IV fluids to children
- An audit tool for Trusts to use in monitoring compliance (Paediatric intravenous Fluid Audit Implementation Tool - PIVFAIT)

It is the responsibility of individual Trusts to ensure all Trust local policies are updated to reflect any new or updated guidance.

²³ <https://www.nice.org.uk/guidance/ng29>

6 Trust Competency Framework

Introduction

Hyponatraemia is an important, avoidable cause of mortality and neurological morbidity in children.

To minimise risks associated with the administration of intravenous fluids to children, including hyponatraemia, **HSC Trusts must ensure that all staff who care for children are aware of and use best practice guidance in relation to the provision of intravenous fluids for children and can demonstrate competence against the requisite knowledge and skills.**

The framework outlines actions for individuals and organisations to ensure that all staff caring for children have the right knowledge and skills to reduce the risk of harm due to hyponatraemia in clinical settings.

The practical administration of intravenous fluids is not covered in this document as Trusts have well established standard operating procedures²⁴ in place to support this aspect of IV fluid administration.

Exemptions:

This framework may not be applicable in a small number of settings – for example care of the elderly wards. Decisions to exempt staff from training associated with reducing the risk of hyponatraemia should be made on a case by case basis by clinical service leads.

Where individual staff members do not need to undertake training or feel that it is not required, the following declaration may be used for appraisal and governance processes.

I confirm that I am not required in the course of my practice to administer intravenous fluids to children aged from Birth (term) until the 16th Birthday or to supervise the administration of such fluids, and that where such circumstance exceptionally arises, that I will ensure I obtain advice from colleagues with appropriate expertise.

²⁴ Royal Marsden Manual of Clinical Nursing Procedures, ninth edition, available at: <https://www.rmmonline.co.uk/>

<p>Knowledge and competency framework to reduce the risk of harm associated with hyponatraemia when administering intravenous infusions to babies, children and young people.</p>	
Rationale	<p>To reduce risk of harm due to hyponatraemia by ensuring that all relevant registered health care staff have the appropriate knowledge and competencies required to safely care for babies, children and young people who need intravenous infusions.</p> <p>All staff involved in the prescribing, administering and monitoring of IV fluids for children need to be both knowledgeable and competent in prescribing IV fluids appropriately and safely.</p> <p>All registered health care professionals involved in caring for children must be able to identify and take appropriate action in instances of inappropriate prescribing.</p>
Scope	<p>For all staff who may be required to care for children, from birth (term) up to 16th birthday:</p> <ul style="list-style-type: none"> ❖ Medical staff – including foundation, core and specialist trainee staff, consultant and career grade staff, locum and agency staff ❖ Registered Nurses and Midwives – including agency staff and those working in relevant psychiatric wards, paediatric nurses and midwives with the exception of care of the elderly ❖ Registered Pharmacy Staff (except Victoria Pharmaceuticals) ❖ Operating department assistants
Resources	<p>The resources listed in this framework support both the provision of knowledge and tools to support assessment of competence in prescribing to reduce risk of harm due to hyponatraemia.</p> <p>All resources can be accessed at : http://www.publichealth.hscni.net/directorate-nursing-and-allied-health-professions/nursing/central-repository-hsc-resources-relating-</p> <ul style="list-style-type: none"> • BMJ e-learning module – Reducing the risk of hyponatraemia when administering IV fluids to children. • The Clinical Education Centre (CEC) which provides in-service education to Nurses and AHPs employed in the five Health & Social Care Trusts also runs the following course for nurses: <i>Fluid Management in Children and Young People from birth (term) up to 16th Birthday</i>. CEC email: enquiries@cec.hscni.net • PowerPoint presentation on Paediatric Fluid Balance & Prescription Charts. • Online Assessment on Paediatric Fluid Balance & Prescription Charts. • Additional guidance on use of the Paediatric Fluid Balance & Prescription Charts. • Guidance on how to prescribe intravenous medicine infusions on a medicines kardex and/or daily fluid balance & prescription sheet. • Case studies (2 medical, 2 surgical and 1 neonatal). Case studies have been developed by clinical staff in Northern Ireland to enhance individual assessment of knowledge and understanding of the concepts covered within the BMJ e-learning module and Daily Fluid Balance and Prescription Chart (Child up to 16th birthday – includes term neonates). • DoH Wall Chart – Updated February 2017 – PARENTERAL FLUID THERAPY FOR TERM NEONATES (UP TO 4 WEEKS OF AGE) BEING NURSED IN AN ACUTE SETTING. • DoH Wall Chart – Updated February 2017 – PARENTERAL FLUID THERAPY FOR CHILDREN AND YOUNG PEOPLE (AGED OVER 4 WEEKS AND UNDER 16 YEARS). • Daily Fluid Balance and Prescription Chart (Child up to 16th birthday). Updated February

	<p>2017 (includes term neonates).</p> <ul style="list-style-type: none"> Regional Policy for the administration of intravenous fluids to children aged from birth (term) until their 16th birthday: Reducing the risk of harm due to hyponatraemia, HSC Guidance, October 2019.
<p>Actions for individuals:</p>	<p>What training? Who needs to do it? When does it need to be done & Documented?</p> <p>What:</p> <p>A. <u>Review Power Point presentation</u> on Paediatric Fluid Balance & Prescription Charts and <u>complete online assessment</u>. Staff should also participate in any local Trust training associated with the use of Daily Fluid Balance and Prescription Charts (Child from birth (term) up to 16th birthday).</p> <p>B. <u>Complete online BMJ e-learning module</u>.</p> <p>C. <u>Provide evidence of completion of at least 2 prescribing case studies</u> pertinent to their field of practice using the Daily Fluid Balance and Prescription Chart (Child from birth (term) up to 16th birthday). Ideally the completion of these case studies should take place close to completion of BMJ module to enhance learning and assess understanding.</p> <p>Staff must ensure that their prescribing practice is in line with DoH Guideline (Wall Charts). Relevant staff must be supervised in the management of intravenous infusions in children and young people until their training and induction is complete and competence demonstrated.</p> <p>Who: (training required as above)</p> <ul style="list-style-type: none"> Medical – consultant and career grade staff (complete A, B and C) Medical – Trainees <ul style="list-style-type: none"> Foundation years 1 and 2 (complete A, B and C). Core and specialist trainees (complete A, B and C) Medical – Locum and Agency staff <ul style="list-style-type: none"> Contracted and non-contracted agency workers are required as a minimum to have successfully completed the e-BMJ module (part B) within the past 3 years. Agency or locum staff working within HSC Trusts for more than one month should complete all aspects of training (A, B and C) in line with requirements with other medical staff. Registered Nurses and Midwives – including those working in relevant psychiatric wards, paediatric nurses and midwives with the exception of care of the elderly (complete A, B and C). Nursing – Agency. The same principles apply to nurses from agency organisations as to locum and agency medical staff. Registered Pharmacy Staff (except Victoria Pharmaceuticals) (complete A, B and C). <p>All pharmacy staff should also be aware of their own Trust pharmacy department’s policy or Standard Operating procedure (SOP) for the supply of fluids containing sodium chloride 0.18%</p> <ul style="list-style-type: none"> Operating department assistants (complete A, B and C). <p>When:</p> <p><u>At Induction</u></p>

	<p>All new staff should complete all three components of training (A, B and C) during their induction period. Existing staff who have not yet completed all components should do so as early as possible and submit evidence of such to their line manager.</p> <p>Ongoing Thereafter all staff (as outlined above) should revisit the training (A, B and C) once every three years as a minimum. Evidence of completion should be submitted to the appropriate line manager, e.g. during annual appraisal.</p> <p>Documentation:</p> <ul style="list-style-type: none"> • Evidence of completion of required training should be submitted to the appropriate line manager e.g. during annual appraisal. • Medical trainees should provide evidence of completion of A, B and C to their employing organisation as required.
<p>Actions for Trusts</p>	<p>Supporting training</p> <ul style="list-style-type: none"> • All staff noted above should have access to BMJ e-learning module and resources as listed in this and be facilitated to participate in training associated with the use of Daily Fluid Balance and Prescription Charts (Child from birth (term) up to 16th birthday). • Trust education departments should ensure that trainees and new staff are signposted to education resources on hyponatraemia at Trust, local and specialty induction. • All staff who need to, should be advised on the timeframe for completion of training as outlined above and timeframe to refresh skills and knowledge (Trusts may wish to increase the frequency of refresher training for some cohorts of staff). • Clear instructions should be provided for staff who have difficulty in completing module/case studies, on how to access further educational support and input locally. • Relevant staff should have access to relevant courses provided by the Clinical Education Centre (CEC). <p>Clinical practice</p> <ul style="list-style-type: none"> • Relevant staff must be supervised in the management of intravenous infusions in children and young people until their training and induction is complete and competence demonstrated. • Trusts should ensure that locum Doctors who have not completed the e-BMJ module are not placed unless: <ul style="list-style-type: none"> ○ Prospective approval of the Service Manager and Clinical Director is obtained prior to the placement commencing. ○ Structures should be in place to ensure that all locum staff are aware of how to access advice on the prescribing and administration of IV fluids to babies, children and young people if required. • Structures should be in place to ensure that all agency nursing staff have the necessary skills and competence to care for children who may be receiving IV fluids and how to access advice as required. • The DoH Guideline (Wall Charts) should be clearly displayed in all appropriate clinical areas. • Ensure all trust local policies are updated to reflect any new/updated guidance. <p>Monitoring</p>

	<ul style="list-style-type: none">• Trusts should establish robust internal processes to evidence compliance with training for all relevant staff.• Trusts should assess compliance in the use of the Daily Fluid Balance and Prescription Charts using the PIVFAIT audit tool available on the HSC central repository.
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