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	**Supercedes**	N/A	
Scope	Babies (term), children and young people up to 16th birthday			
Links to other policies	• 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	• 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 fluids[1].

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 Inquiry[2] 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 hyponatraemia[3]. 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 2008[4] and again in 2010[5] to improve HSC Trust arrangements to reduce risk in this area.

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[1] Intravenous 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

[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

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 2008[6] and again in 2010[7] 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 resources[8] 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 2015[9]. 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 2018[10].

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.

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[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

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 recommendations[5], NICE Guidance (NG29)[9] and recommendations from the O'Hara Inquiry[2].

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

<u>Chief Executive</u>

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 ≥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

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

[11] NPSA Alert 22 https://improvement.nhs.uk/resources/learning-from-patient-safety-incidents/
[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)

- 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

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.

[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)

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]

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 Framework[15] developed by Trusts working with the PHA and Educational Providers.

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

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.

- 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 Na^+ < 130 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 <130mml/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.

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

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 ☐

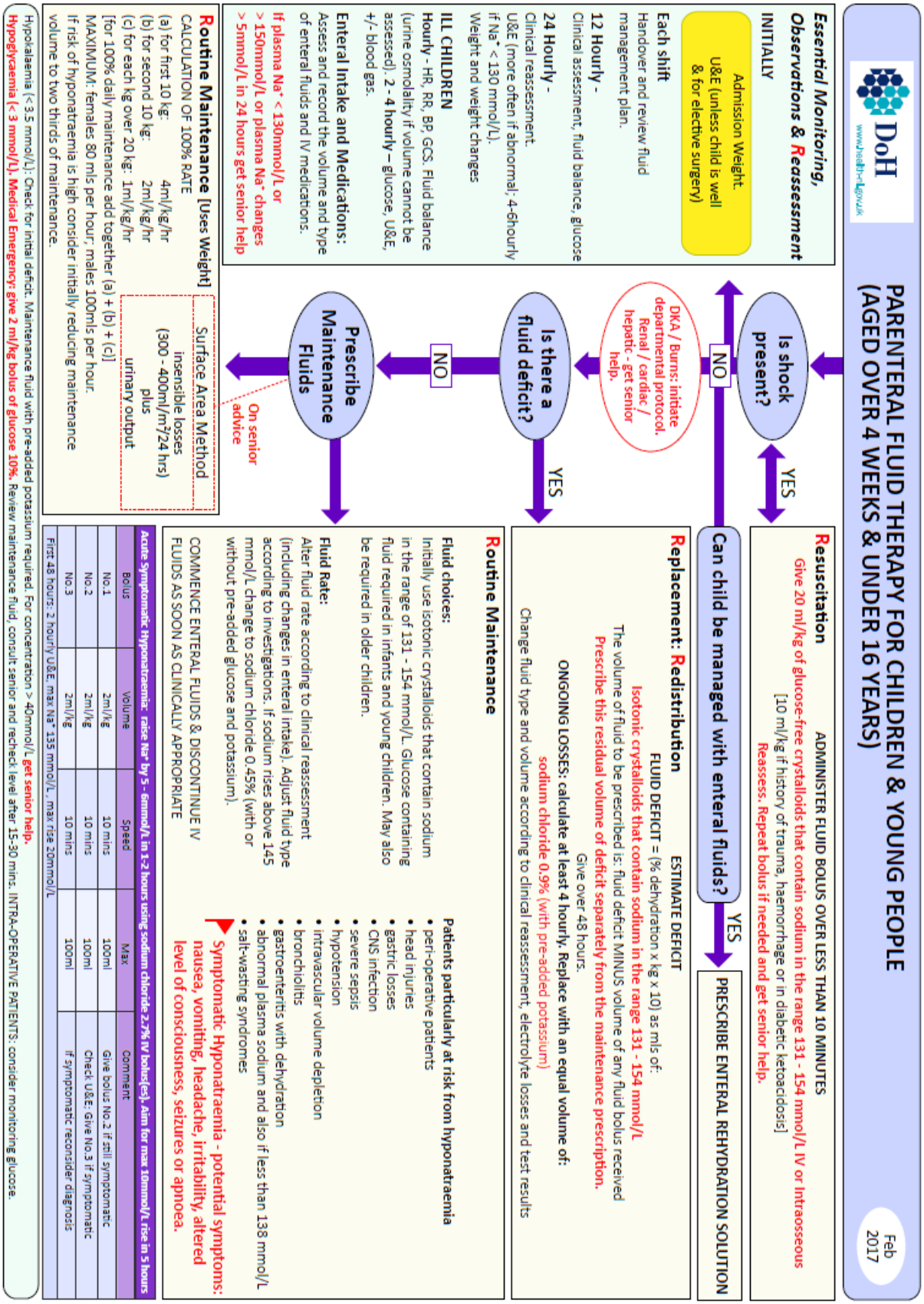
Minor impact ☐

No impact. X

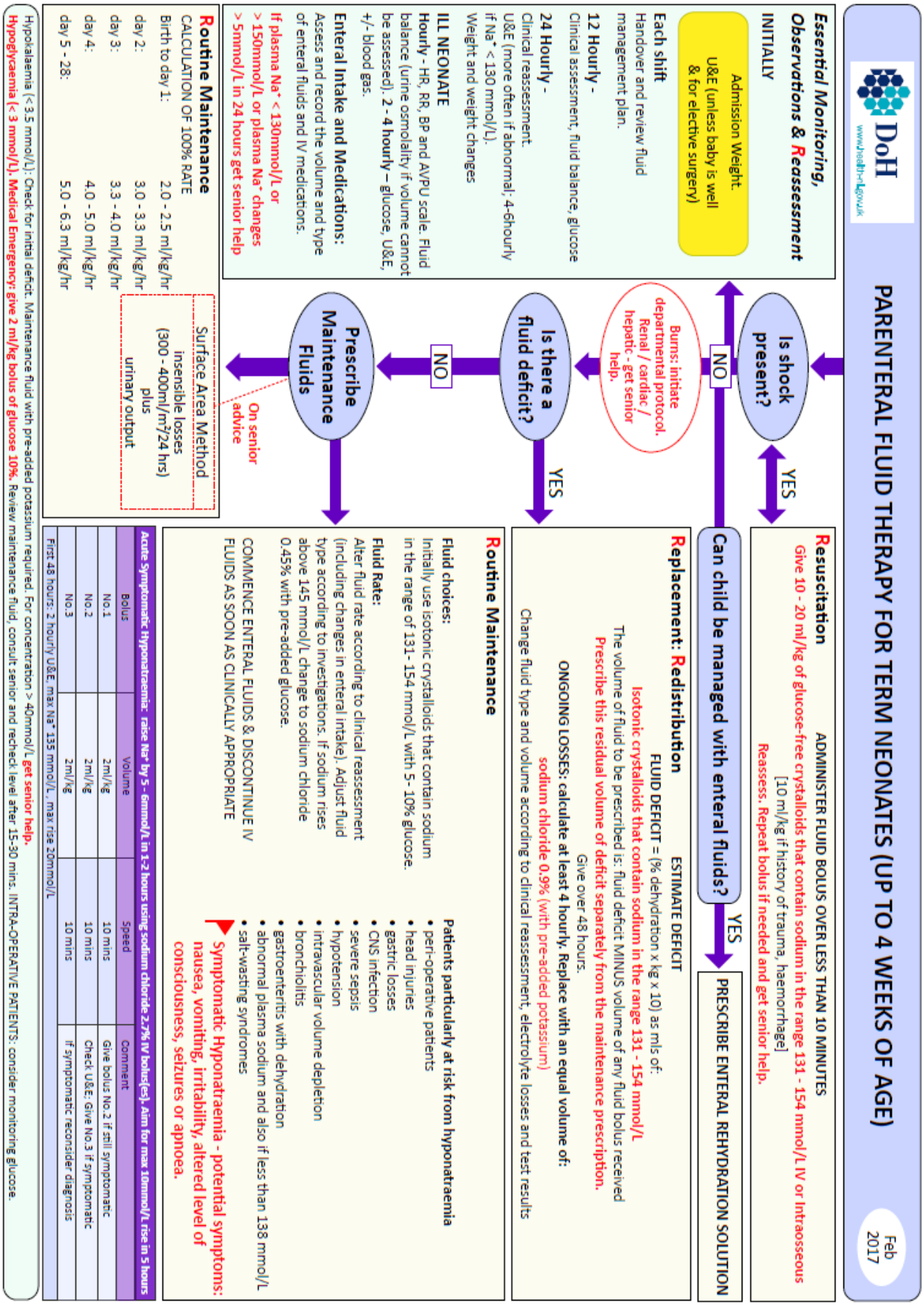
APPENDICES

Appendix 1

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



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



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 FINDINGS[17].

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:

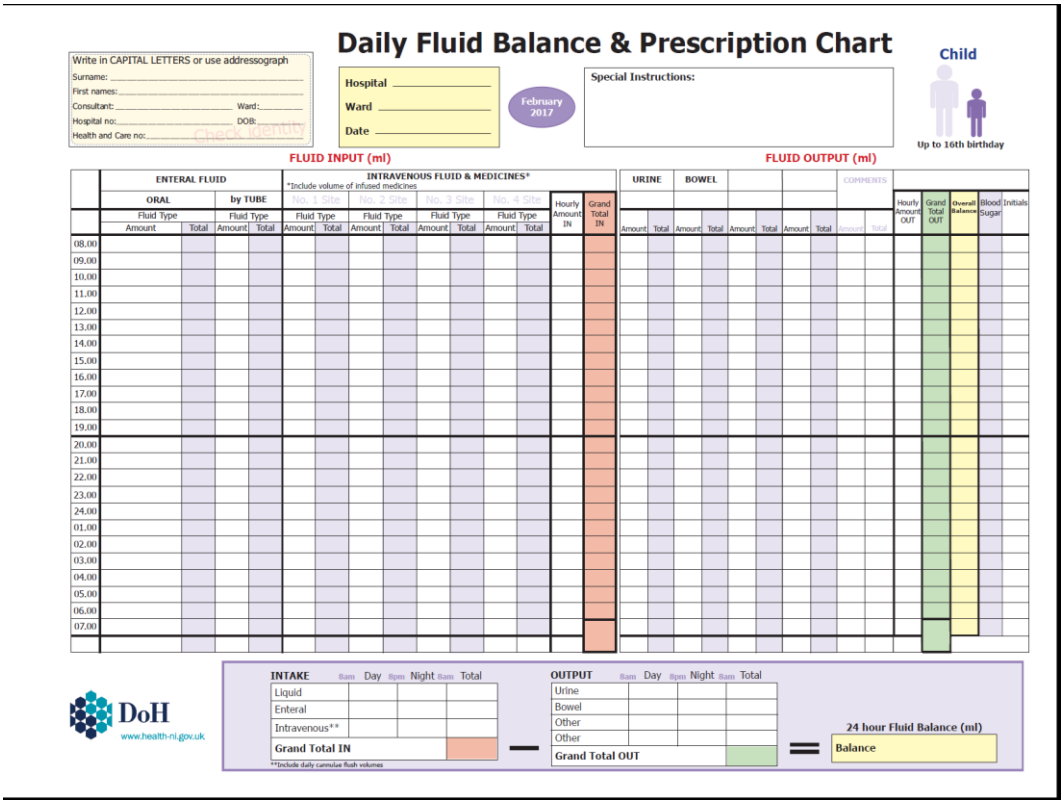
- Wherever possible, only preparations of IV fluids as supplied my manufacturers should be used.

- 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 names:
Consultant: Ward:
Hospital no: DOB:
Health and Care no:
Check Identity

Hospital
Ward
Date
February 2017

Special Instructions:

FLUID INPUT (ml) | FLUID OUTPUT (ml)

	ENTERAL FLUID				INTRAVENOUS FLUID & MEDICINES* *Include volume of infused medicines								URINE		BOWEL				COMMENTS					
	ORAL		by TUBE		No. 1 Site		No. 2 Site		No. 3 Site		No. 4 Site		Hourly Amount IN	Grand Total IN									Hourly amount OUT	Grand Total OUT	Overall Balance	Blood Sugar	Initials
	Fluid Type		Fluid Type		Fluid Type		Fluid Type		Fluid Type		Fluid Type																
	Amount	Total	Amount	Total	Amount	Total	Amount	Total	Amount	Total	Amount	Total			Amount	Total	Amount	Total	Amount	Total	Amount	Total					
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DoH
www.health-ni.gov.uk

INTAKE	8am	Day	8pm	Night	8am	Total
Liquid						
Enteral						
Intravenous**						
Grand Total IN						

**Include daily cannulae flush volumes

OUTPUT	8am	Day	8pm	Night	8am	Total
Urine						
Bowel						
Other						
Other						
Grand Total OUT						

24 hour Fluid Balance (ml)
Balance

CHILD

Write in CAPITAL LETTERS or use addressograph

Surname:
First names:
Consultant: Ward:
Hospital no: DOB:
Health and Care no:
Check Identity

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
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 calculation.

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

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

RESUSCITATION = B

Fluid bolus volume for shocked patients = I — Give over less than 10 minutes

Required Bolus volume (ml) = body weight (kg) x 20 for child: x 10-20 for term neonate = I ml

but if the setting is trauma or DKA x 10 = I ml

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 = II ml

Amount given as fluid bolus volume = I ml

Residual deficit (II minus I) = III ml

Give residual Deficit over 48 hours (III divided by 48) = IV ml/hr

Prescribe the calculated Maintenance and Deficit fluids individually.

Additional ongoing losses volume (e.g. vomiting, diarrhoea, drainage) = O

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) = V ml

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
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
Term Neonate = VI ml/hr

First 10kg: 4ml/kg/hr
Second 10kg: 2ml/kg/hr
For each kg over 20kg: 1ml/kg/hr
Child
= VI ml/hr
= VII ml/hr
= VIII ml/hr

Maintenance total for Term Neonate = VI: Child = (VI+VII+VIII) = IX ml/hr

If risk of hyponatraemia is high, consider restricting fluids to 50-80% of routine maintenance needs. = IX ml/hr

Weight _____ kg Weighed / /
Weight Change _____ kg Estimated

Date	Time	Weight (kg)	Na (mmol/L)	K (mmol/L)	Urea (mmol/L)	Creatinine (micromol/L)	Glucose (mmol/L)	Chloride (mmol/L)	Bicarbonate (mmol/L)

Indications - all that apply: Fluid Bolus volume, Deficit, On-going loss volume, Maintenance, Drug Prescription

*Medicines must be recorded in Drug Kardex ** Model name, Serial number.

	Date	Time	Volume	Infusion Fluid/Type	Additives*	Rate ml/hr Range	Prescriber's Signature	Administered By	Checked By	Batch/Lot No. and Expiry Date	Pump Details**	Start Time	Finish Time	Volume Given
				ⓐ										
				ⓑ										
				ⓒ										
				ⓓ										
				ⓔ										
				ⓕ										
				ⓖ										
				ⓗ										
				ⓘ										
				ⓙ										

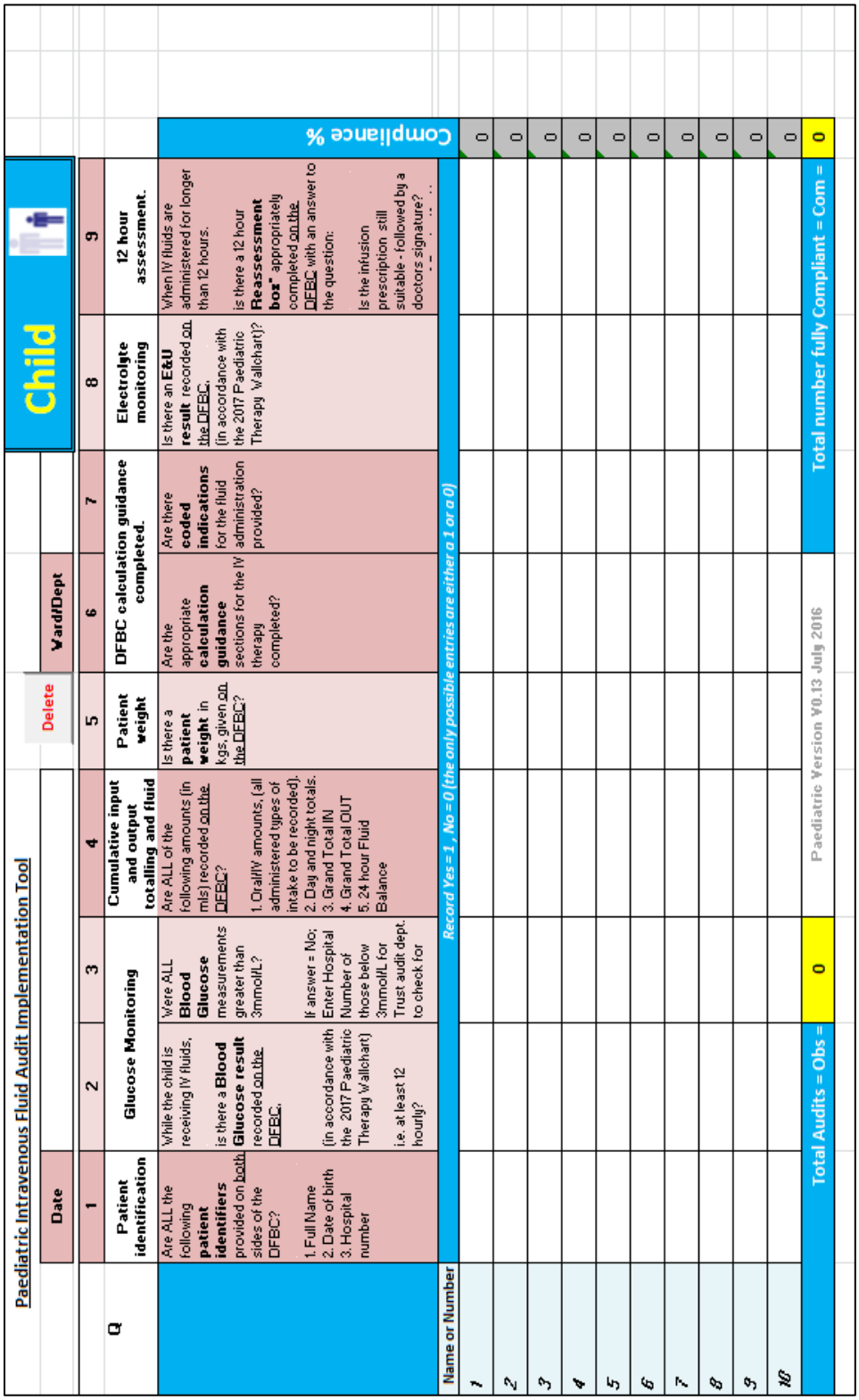
REASSESSMENT	Date	Time	Is infusion prescription still suitable?	Doctors Signature
12 hour Reassessment			Yes or No Yes or No	

Is patients hydration improving?
Are oral fluids now appropriate?
Is potassium needed?
What about Urine output?

Special Instructions:

Appendix 7

PAEDIATRIC INTRAVENOUS FLUID AUDIT IMPLEMENTATION TOOL (PIVFAIT)



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)

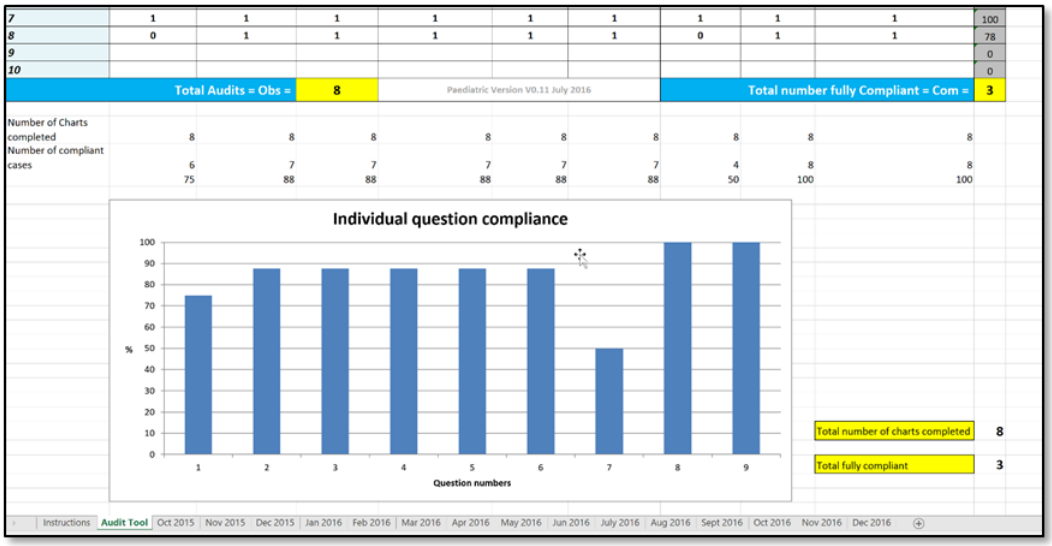
Figure 1. Data collection page

Paediatric Intravenous Fluid Audit Implementation Tool

Date		Ward/Dept		Child

Q	1	2	3	4	5	6	7	8	9	
	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 Wallchart) 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 Wallchart)?	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	Compliance %
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



Questions[18]

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*

Patient weight

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

[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).

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
B	85	40	34	40	40	39	40	40	38	39	40	38
C	60	5	3	5	5	5	5	5	5	5	5	3
D	55	18	10	18	13	15	14	17	17	17	12	16
E	20	10	2	9	10	10	5	10	7	9	6	2
F	90	21	19	21	21	21	21	21	21	21	21	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.