Western Health and Social Care Trust

Policy for Prescribing and Administering Intravenous Fluids to Children

Policy for Prescribing Intravenous Fluids to Children

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Name of Responsible officer	Dr Anne Kilgallen

1.0 INTRODUCTION

Intravenous fluids play a key role when caring for children who are ill. Many aspects of the way fluids are used must be considered if their use is to be beneficial.

This Policy sets out recommended practice for everyone who looks after children aged one month up to their 16th birthday receiving intravenous fluids. It is based on regional and national guidance, ongoing clinical audit and the published literature. It should be considered alongside the Trust Algorithm "Paediatric Parenteral Fluid Therapy" (Appendix 1) based on the NPSA Patient Safety Alert 22 (Appendix 2) and Department of Health, Social Services and Public Safety (NI) Parenteral Fluid Therapy Guidance, September 2007. Further information can be obtained from CMO Update 31 on http://www.dhsspsni.gov.uk.

2.0 POLICY STATEMENT

The Trust is committed to providing safe, high quality care to all patients, including children admitted to its acute facilities. The Trust will ensure that registered nurses, midwives and medical practitioners are supported in delivering safe and effective care to children through the implementation of recommendations as set out in the NPSA/2007/22 alert and the DHSSPS Parenteral Fluid Therapy Guidance, September 2007.

The Trust will support registered nurses, midwives and medical practitioners by:-

- Providing access to evidenced-based practice relating to intravenous infusion therapy;
- Providing necessary training and updates to ensure all staff are appropriately trained in undertaking this clinical procedure;
- Clarifying the roles and responsibilities of those involved in the prescription, administration, monitoring and review of intravenous infusions to children; and
- Setting in place clinical governance arrangements to provide assurance on safe, high quality practice.

3.0 PROFESSIONAL RESPONSIBILITIES

The minimum responsibilities that professionals are required to adhere are as follows:

- All professionals involved in treating children who are on IV fluids have a responsibility to ensure that their practice meets the knowledge and competency framework set out regionally and within the Trust.

- Clinical Directors, Clinical Leads and Clinical Tutors have a responsibility to ensure medical training and governance requirements are met as set out above.

- All registered Nurses and Midwives involved in caring for children aged one month up to their 16th birthday must attend the IV Fluid Management, Children and Young People session provided by the Trust and complete their competency record.

- Pharmacy will not procure or stock sodium chloride 0.18% with glucose 4% intravenous infusions within the trust.

- All professionals involved in the prescribing, monitoring and reviewing of Paediatric IV Infusions must be compliant with the Parenteral Fluid Therapy Guidance and clinical incident triggers (Appendix 4).

- All professionals involved in the prescribing, monitoring and reviewing of Paediatric IV Infusions must be aware of and adhere to appropriate documentation including the Western Trust paediatric fluid prescription and balance chart (Appendix 3).

- All professionals involved in the prescribing, monitoring and reviewing of paediatric IV Infusions will facilitate and participate in relevant audit and learning about acquired hyponatraemia.

4.0 STANDARD PROCEDURE

1. An **accurate** weight must be obtained prior to the administration of any fluid to any child. This must be cross-referenced with the child's age to minimize the risk of error. In exceptional cases e.g. resuscitation weight can be estimated from a suitable source e.g. APLS Algorithms.

2. Children must not receive intravenous fluids unnecessarily. Intravenous fluids should not be commenced or continued if a child can tolerate enteral hydration.

3. Shocked or collapsed children must receive fluid boluses as outlined on the resuscitation guidelines. There are separate IV fluid guidance for children with certain conditions e.g. burns / diabetic ketoacidosis.

4. All other children must have prospective electrolyte monitoring before intravenous maintenance fluids are started. It is the responsibility of the prescriber to ensure that this is undertaken fully and recorded on the prescription sheet. Fluids will not be administered unless this has been completed. Electrolyte results must be clearly documented on the relevant fluids prescribing chart. This must be repeated at least 24 hourly, more often if clinically indicated. Where electrolyte results are not available treatment should continue as per clinical judgement. If there is a significant delay in receiving these results this should constitute as a clinical incident.

5. The Western Health and Social Care Trust 'Daily Fluid Balance Chart for Children aged 1 month to 16 years' must be used for all fluid prescriptions.

6. Calculation of overall fluid deficit and the prescription of deficit replacement should not be undertaken by an occasional paediatric practitioner. If a prescription for a deficit is required the help of a senior paediatric colleague should be obtained.

7. Apart from boluses for shocked patients and children undergoing surgery, fluids may only be administered by way of an infusion device and a buretrol. The Trust recommends that the details of the pump must be recorded on the fluids observations sheet. A buretrol **MUST ALWAYS BE USED** to prevent the risk of volume overload.

8. Nothing may be added to fluids for use in the ward setting. Where additional electrolytes are required, they should only be administered as supplied by the manufacturer and in line with guidance. In exceptional circumstances modifications can be made under the direct guidance of a senior doctor. If this happens it will constitute as a clinical incident.

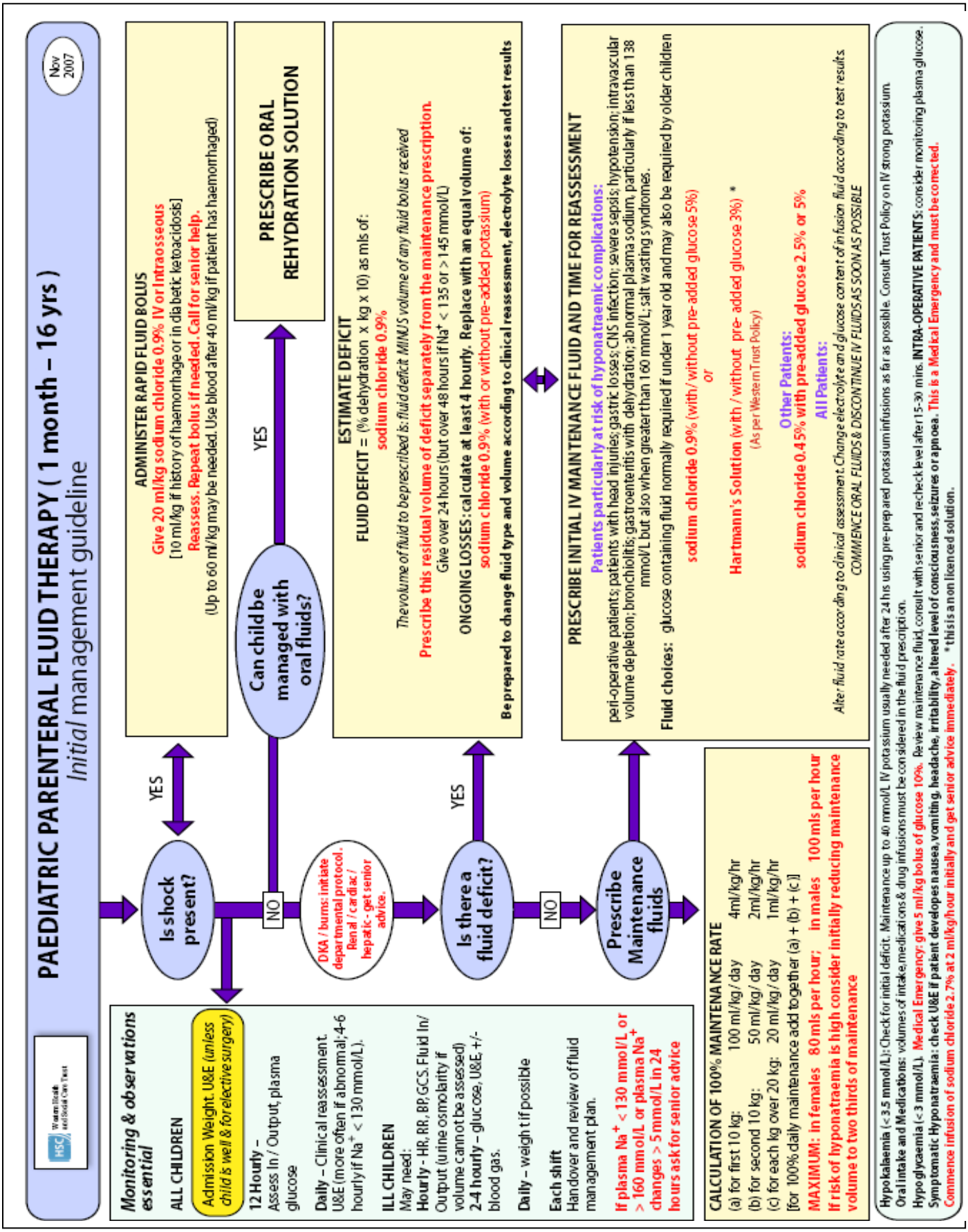
9. All professionals caring for children must be able to diagnose and manage acute hypoglycaemia.

10. All professionals caring for children must be familiar with the signs of hyponatraemia and its emergency management.

Equality and Human Rights

EQUALITY AND HUMAN RIGHTS STATEMENT: The Western Health and Social Care Trust's equality and human rights statutory obligations have been considered during the development of this policy.

APPENDIX 1 – Trust Algorithm



APPENDIX 2 – NPSA Alert 22: Reducing the Risk of Hyponatraemia when Administering Intravenous Infusions to Children

http://www.nrls.npsa.nhs.uk/resources/?EntryId45=59809

NHS
National Patient Safety Agency

Patient safety alert 22

Alert

28 March 2007

Immediate action	☐
Action	☑
Update	☐
Information request	☐

Ref: NPSA/2007/22

Reducing the risk of hyponatraemia when administering intravenous infusions to children

The National Patient Safety Agency (NPSA) is issuing advice to healthcare organisations on how to minimise the risks associated with administering infusions to children.

The development of fluid-induced hyponatraemia in the previously well child undergoing elective surgery or with mild illness may not be well recognised by clinicians. To date, the NPSA's National Reporting and Learning System (NRLS) has received only one incident report (that resulted in no harm), but it is likely that incidents have gone unreported in the UK.

Since 2000, there have been four child deaths (and one near miss) following neurological injury from hospital-acquired hyponatraemia (see definition on page 7) reported in the UK.[1-3] International literature cites more than 50 cases of serious injury or child death from the same cause, and associated with the administration of hypotonic infusions.[4]

Action for the NHS and the independent sector

The NPSA recommends that NHS and independent sector organisations in England and Wales take the following actions by 30 September 2007 to minimise the risk of hyponatraemia in children:

1 Remove sodium chloride 0.18% with glucose 4% intravenous infusions from stock and general use in areas that treat children. Suitable alternatives must be available. Restrict availability of these intravenous infusions to critical care and specialist wards such as renal, liver and cardiac units.

2 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.

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

4 Reinforce safer practice by reviewing and improving the design of existing intravenous fluid prescriptions and fluid balance charts for children.

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.

For response by:
- All NHS and independent sector organisations in England and Wales

For action by:
- The chief pharmacist/pharmaceutical advisor should lead the response to this alert, supported by the chief executive, medical director, nursing director and clinical governance lead/risk manager

We recommend you also inform:
- Clinical governance leads and risk managers
- Clinical directors – paediatrics and child health
- Clinical directors – anaesthetics
- Clinical directors – surgery
- Directors of NHS laboratories
- Medical staff
- Nursing staff
- Pharmacy staff
- Patient advice and liaison service staff in England
- Procurement managers

The NPSA has informed:
- Chief executives of acute trusts, primary care organisations, ambulance trusts, mental health trusts and local health boards in England and Wales
- Chief executives/regional directors and clinical governance leads of strategic health authorities (England) and regional offices (Wales)
- Healthcare Commission
- Healthcare Inspectorate Wales
- Medicines and Healthcare products Regulatory Agency
- Business Services Centre (Wales)
- NHS Purchasing and Supply Agency
- Welsh Health Supplies
- Royal colleges and societies
- NHS Direct
- Relevant patient organisations and community health councils in Wales
- Independent Healthcare Forum
- Independent Healthcare Advisory Services
- Commission for Social Care Inspection

Patient safety alert 22

Reducing the risk of hyponatraemia when administering intravenous infusions to children

Action deadlines for the Safety Alert Broadcast System (SABS)

Deadline (action underway): 2 July 2007
Action plan to be agreed and actions started

Deadline (action complete): 30 September 2007
All actions to be completed

Further information about SABS can be found at:
www.info.doh.gov.uk/sar2/cmopatie.nsf

The recommendations made in this patient safety alert relate to paediatric patients from one month to 16 years old. They are not intended for paediatric and neonatal intensive care units or specialist areas such as renal, liver and cardiac units where hypotonic solutions have specialist indications.

Further information on the action points

1 **Remove sodium chloride 0.18% with glucose 4% intravenous infusions from stock and general use in areas that treat children. Suitable alternatives must be available. Restrict availability of these intravenous infusions to critical care and specialist wards such as renal, liver and cardiac units.**

There is evidence that there is a greater level of risk of hyponatraemia associated with the use of hypotonic solutions in comparison to other types of solution. Within the range of hypotonic solutions available, the use of sodium chloride 0.18% with glucose 4% presents an even greater risk. All children are potentially at risk. Since 2000, UK literature has cited four deaths and one near miss following neurological injury associated with the use of sodium chloride 0.18% with glucose 4%. In two of the institutions where these incidents took place, the solution was removed from ward stock, and no further cases of iatrogenic hyponatraemia have been reported.[1,3]

In 2003, the Royal College of Anaesthetists issued a statement advising against the use of sodium chloride 0.18% with glucose 4% due to the possibility of water overload with severe hyponatraemia, and recommended suitable alternatives.[5] This statement was supported by the Royal College of Paediatrics and Child Health (RCPCH). A subsequent survey of consultant anaesthetists showed that less than half of the respondents were aware that the statement had been issued, and this suggests that action has not been taken in some organisations.[6]

Patient safety alert 22

Reducing the risk of hyponatraemia when administering intravenous infusions to children

Page 3 of 12

2 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.

The NPSA has developed a template that can assist the development of local guidelines for prescribing and monitoring infusions for children outside of critical care areas. This is available at **www.npsa.nhs.uk/health/alerts**

Much of the international and UK literature on appropriate paediatric fluid management reinforces the need for rigorous clinical and laboratory monitoring, and raises concerns about the frequent absence of baseline parameters before infusions are started.[7-11]

While there is much debate about the management of paediatric fluid therapy in the literature, there are some common principles which should be applied. These are:

- when fluids are prescribed, they must be given the same consideration as other medicines with reference to indications, contraindications, dose, monitoring and, particularly, volume;[11]
- prescribed fluids must be individualised;[12]
- whichever fluid is used, the optimal way of avoiding dangerous hypo- or hypernatraemia is to calculate fluid balance and monitor the plasma sodium concentration regularly.

Carefully managed oral fluids are preferable to intravenous infusions. However, when intravenous infusions are prescribed, local guidelines should be based on the following clinical recommendations:

Resuscitation: intravascular volume depletion should be managed using bolus doses of sodium chloride 0.9% (isotonic solution).

Deficit: estimate any fluid deficit and replace as sodium chloride 0.9% with glucose 5% (isotonic solution) or sodium chloride 0.9% over a minimum of 24 hours.

Maintenance: do not use sodium chloride 0.18% with glucose 4%.

The low sodium content of sodium chloride 0.18% with glucose 4% infusion increases the risk of the patient developing hyponatraemia, particularly in the absence of individualised prescribing and robust on-going monitoring.

The majority of children may be safely administered sodium chloride 0.45% with glucose 5% (hypotonic solution), or sodium chloride 0.45% with glucose 2.5% (hypotonic solution). There is currently little evidence to recommend a particular strength of glucose.

Some children at high risk of hyponatraemia should only receive isotonic solutions (see Table 1). These include children who are peri- and post-operative, require the replacement of ongoing losses or have:

- plasma sodium at the lower normal reference range and definitely if less than 135mmol/L;
- intravascular volume depletion;

Patient safety alert 22
Reducing the risk of hyponatraemia when administering intravenous infusions to children
Page 4 of 12

- hypotension;
- central nervous system (CNS) infection;
- head injury;
- bronchiolitis;
- sepsis;
- excessive gastric or diarrhoeal losses;
- salt-wasting syndromes;
- chronic conditions such as diabetes, cystic fibrosis and pituitary deficits.

Some examples of isotonic solutions include sodium chloride 0.9% with glucose 5%, sodium chloride 0.9% and compound sodium lactate solution (Hartmann's solution/ Ringer-Lactate solution). The choice should be determined by the individual patient's circumstances.

Sodium chloride 0.18% with glucose 4% should be restricted to specialist areas to replace ongoing losses of hypotonic fluids. These areas include high dependency, renal, liver and intensive care units.

Children requiring both maintenance fluids and the replacement of ongoing losses should receive a single isotonic fluid such as sodium chloride 0.9% with glucose 5% or sodium chloride 0.9%.

While most children will tolerate standard fluid requirements, some acutely ill children with increased anti-diuretic hormone (ADH) secretion may benefit from their maintenance fluid requirement being restricted to two-thirds of the normal recommended volume. Such children include post-operative patients and those with intracranial infections or head injuries.

Children found to have significant hypernatraemia with a plasma sodium greater than 160mmol/L should receive only isotonic solutions to reduce the risk of neurological injury associated with a rapid fall in plasma sodium concentration. Where hypernatraemia exists, plasma sodium should be reduced at a maximum rate of 0.5mmol/L/hour, or more slowly if it has prevailed for more than five days.[13]

Children in the peri-operative period should receive isotonic intravenous fluids. These should contain glucose to avoid the risk of hypoglycaemia. If glucose-free solutions are used during anaesthesia and surgery then plasma glucose levels should be monitored.

Consider adding potassium chloride up to 40mmol/L to maintenance fluids once plasma potassium levels are known.

Patient safety alert 22
Reducing the risk of hyponatraemia when administering intravenous infusions to children
Page 5 of 12

Losses

Ongoing losses should be assessed every four hours. Fluids used to replace ongoing losses should reflect the electrolyte composition of the fluid being lost. In most circumstances an isotonic solution is the safest choice, for example, sodium chloride 0.9%, or compound sodium lactate solution (Hartmann's solution/Ringer-Lactate solution) with or without the addition of potassium. In this way, for example, gastro-intestinal losses should be replaced with sodium chloride 0.9%.

Monitoring

Hyponatraemia can develop within a short timescale and a robust monitoring regime is essential. Weight should be measured, if possible, prior to commencing fluid therapy, and daily thereafter. Fluid balance including oral intake should be recorded using a fluid balance chart.

Plasma sodium, potassium, urea and/or creatinine should be measured at baseline and at least once a day. Consider measuring every four to six hours if an abnormal reading is found. This should definitely be done if the plasma sodium is below 130 mmol/L. Check plasma electrolytes immediately if clinical features suggest hyponatraemia is developing. Symptoms include increased headaches, vomiting, nausea, irritability, altered levels of consciousness, seizures and apnoea.

Ideally, use the same sample technique, either capillary or venous blood sampling, and analytical method on each occasion. This can avoid potentially misleading changes in serial sodium measurements.[14]

Urine chemistry may be useful in a small number of high-risk cases.[15]

Acute hyponatraemic encephalopathy

This medical emergency should be treated under senior medical supervision with hypertonic sodium chloride and should never be managed with fluid restriction alone.[1,4]

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

The NPSA has developed a proposed work competence statement for the prescribing and monitoring of intravenous infusions in the format developed by Skills for Health (**www.skillsforhealth.org.uk**). It is available at **www.npsa.nhs.uk/health/alerts** The NPSA will work with Skills for Health to develop these proposed competences as national workforce competences in the future.

The NPSA has developed an e-learning module to enable practitioners to assess their current level of competence and knowledge. The module also provides training materials to improve knowledge and understanding of the safe prescribing and use of infusion fluids in children. The e-learning module is available at **www.npsa.nhs.uk/health/alerts**

Doctors in training are responsible for prescribing 80 to 90 per cent of intravenous fluids on general wards.[9,16] A research study tested pre-registration and senior house officers' knowledge of fluid prescribing practices. This study showed significant gaps in knowledge. Conclusions from the survey included the need to review the fluid and electrolyte prescribing of doctors-in-training and also supervision arrangements. It recommended that under- and post-graduate medical training puts an emphasis on practical application.[16]

Patient safety alert 22
Reducing the risk of hyponatraemia when administering intravenous infusions to children
Page 6 of 12

The 1999 report of the National Confidential Enquiry into Perioperative Deaths recorded 20 per cent of patients sampled had either poor documentation of fluid balance or unrecognised/untreated fluid imbalance. The report recommended that prescribing fluids be accorded the same status as other medicines. It also recommended that medical and nursing staff should receive training to raise their awareness of risks with infusion therapy and spread good practice of prescribing, monitoring and completion of healthcare documentation.[17]

4 Reinforce safer practice by reviewing and improving the design of existing intravenous fluid prescriptions and fluid balance charts for children.

A suggested template for an infusion fluid prescription chart that can be adapted for local use is available at **www.npsa.nhs.uk/health/alerts**

The design of the intravenous fluid prescription and fluid balance chart can reinforce safer practice by including guidelines for infusion fluid selection; methods for calculating infusion fluid requirements; and a record of essential monitoring data such as a patient's weight and blood electrolyte levels.

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.

The incidence of moderate and severe hyponatraemia and associated harm resulting from hospital fluid treatment regimes is difficult to quantify because prospective studies have not been done and, it is suggested, incidents are not recognised or reported.[4]

All NHS staff should report incidents via their local risk management reporting system. This will enable both local and national monitoring of the incidents of hospital-acquired hyponatraemia, and can inform future understanding of the issues.

The NPSA recommends that healthcare organisations should audit infusion therapy in children as part of their annual medicines management audit. This will help to ensure that NPSA recommendations and local procedures are being adhered to. Audit results should be reviewed alongside local patient safety incident data concerning infusion therapy in children. The NPSA has developed a template audit form and this is available at **www.npsa.nhs.uk/health/alerts**

Patient safety alert 22

Reducing the risk of hyponatraemia when administering intravenous infusions to children

Page 7 of 12

Background information

Further information about the content of this patient safety alert can be found at **www.npsa.nhs.uk/health/alerts**

Table 1: features of commonly used intravenous fluids in the UK[1]

Solution	Osmolarity (mOsmol/L)	Sodium content (mequiv/L)	Osmolality (compared to plasma)	Tonicity (with reference to cell membrane)
Sodium chloride 0.9%	308	154	Isosmolar	Isotonic
Sodium chloride 0.45%	154	77	Hyposmolar	Hypotonic
Sodium chloride 0.45% with glucose 5%	432	75	Hyperosmolar	Hypotonic
Glucose 5%	278	–	Isosmolar	Hypotonic
Glucose 10%	555	–	Hyperosmolar	Hypotonic
Sodium chloride 0.9% with glucose 5%	586	150	Hyperosmolar	Isotonic
Sodium chloride 0.45% with glucose 2.5%	293	75	Isosmolar	Hypotonic
Sodium chloride 0.18% with glucose 4%	284	31	Isosmolar	Hypotonic
Hartmann's solution	278	131	Isosmolar	Isotonic
4.5% human albumin solution	275	100-160	Isosmolar	Isotonic

Definition of hyponatraemia

The normal range for plasma sodium varies between different laboratories but is often quoted as 135-145mmol/L. Hyponatraemia is defined as a plasma sodium of less than 135mmol/L. Severe hyponatraemia is defined as a plasma sodium of less than 130mmol/L. Severe acute hyponatraemia is defined as a decrease in plasma sodium from normal to less than 130mmol/L in less than 48 hours.

Patient safety alert 22

Reducing the risk of hyponatraemia when administering intravenous infusions to children

Page 8 of 12

Mechanism of hyponatraemia

Hyponatraemia has been documented in otherwise healthy children on intravenous fluids and can be due to too much water or too little sodium in extracellular fluid. Most commonly, it indicates an expanded extracellular fluid volume and is rarely caused by sodium (or salt) depletion. The infusion of hypotonic fluids together with the non-osmotic secretion of ADH may result in hyponatraemia. Non-osmotic secretion of ADH can be induced in a variety of clinical situations, including pain, anxiety, the post-operative state, nausea, vomiting, certain drugs, pyrexia, sepsis, reduced circulating volume, respiratory disorders, CNS infections, and metabolic and endocrine disorders.[18]

Mechanism of hyponatraemic encephalopathy

A major consequence of hyponatraemia is an influx of water into the intracellular space resulting in cellular swelling, which can cause cerebral oedema, seizures and brain stem herniation. Hyponatraemic encephalopathy is a serious complication and children are a group of patients particularly susceptible to developing neurological complications.

This is due to the reduced space for brain swelling in the skull and impaired ability of the paediatric brain to adapt to hyponatraemia compared to adults. Acute symptomatic hyponatraemic encephalopathy is considered a medical emergency.

Hospital-acquired hyponatraemic encephalopathy is most often seen in patients with excess ADH secretion, frequently in the post-operative period. Mortality directly attributed to encephalopathy in children with post-operative hyponatraemia is estimated as eight per cent. The most important contributing factors are the failure to recognise that the patient's ability to manage free water may be compromised, and the administration of hypotonic solutions in such situations.[19-22]

Patient safety alert 22

Reducing the risk of hyponatraemia when administering intravenous infusions to children

Prevention of hyponatraemia

The practice of prescribing hypotonic solutions dates back to the work of Holliday and Segar in the 1950s and hypotonic solutions are still in common use today. Their approach recommended a simple methodology for calculating fluid and energy requirements and the use of an 'ideal' hypotonic solution, glucose 5% and sodium chloride 0.2% (sodium chloride 0.18% and glucose 4% in the UK).[23] These recommendations do not take into account deficits, losses, unusual metabolic demands or the secretion of excess ADH during illness and particularly in the peri-operative period. A number of investigators, including Holliday, have since concurred that the administration of hypotonic parenteral fluids can result in dangerous hyponatraemia.[1,2,23-28]

There is much debate in recent literature about the preferred approach to paediatric fluid management and the prevention of hyponatraemia. However, there are no reports of clinical trials. The literature emphasises that, where possible, oral administration remains the preferred route of choice but it must be remembered that injudicious use of oral fluids can also be life-threatening.[4] In relation to parenteral fluid choice, the differing clinical opinions for prevention include: continued use of hypotonic solutions with fluid restriction,[29] isotonic solutions with fluid restriction,[30] the use of only isotonic solutions[22] or the use of isotonic and hypotonic solutions in specific clinical situations.[1,12]

Whilst there is evidence of harm associated with the use of hypotonic solutions, there is an absence of definitive evidence for clinicians that can help them when choosing a solution. It is against this backdrop that the NPSA is making the recommendations outlined in this patient safety alert.

Acknowledgements

The NPSA gratefully acknowledges the contributions of members of the multi-disciplinary working group and the individuals, teams and organisations who contributed to the consultation process. Further information about contributors can be found at **www.npsa.nhs.uk/health/alerts**

Further details

For further information about this patient safety alert, please contact:

Linda Matthew, Senior Pharmacist, Safe Medication Practice
National Patient Safety Agency
4-8 Maple Street
London W1T 5HD
Tel: 020 7927 9500
Email: **paediatric-infusions@npsa.nhs.uk**

For more information on the NPSA, visit **www.npsa.nhs.uk**

Patient safety alert 22

Reducing the risk of hyponatraemia when administering intravenous infusions to children

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A patient safety alert requires prompt action to address high risk safety problems.

This patient safety alert was written in the following context:

It represents the view of the National Patient Safety Agency, which was arrived at after consideration of the evidence available. It is anticipated that healthcare staff will take it into account when designing services and delivering patient care. This does not, however, override the individual responsibility of healthcare staff to make decisions appropriate to local circumstances and the needs of patients and to take appropriate professional advice where necessary.

APPENDIX 3 – Intravenous Fluid Prescription for Children aged from 1 Month - 16 Years

INTRAVENOUS FLUID PRESCRIPTION FOR CHILDREN AGED FROM 1 MONTH - 16 YRS

Addressograph:

ELECTROLYTES { Sodium ____ mmol/L; Potassium ____ mmol/L; Chloride ____ mmol/L; Urea ____ mmol/L; Glucose ____ mmol/L

PATIENT'S WEIGHT_____ kgs
☐ Estimated
☐ Weighed

SOLUTION KEY	RAPID FLUID BOLUS	RATE (mls/hr)	VOLUME (mls)	SITE	A* Prescribed by (signed, date, time) B* Checked by (signed, date, time)
B1	☐ Sodium chloride 0.9% Serial_____ Expiry__/__/__	STAT			A. B.
B2	☐ Sodium chloride 0.9% Serial_____ Expiry__/__/__	STAT			A. B.

Calculation of Rapid Fluid Bolus
20mls/kg 0.9% sodium chloride I.V or I.O
(10ml/kg aliquots if trauma or DKA)
=_____mls
Reassess after first bolus. May be repeated. Get senior help.

	MAINTENANCE FLUIDS (Please see wallchart to assess risk of hyponatraemia)	HRLY RATE	ADDITIVES	A* Prescribed by (signed, date, time) B* Checked by (signed, date, time)
S1 S2 S3 S4 S5	For surgical patients and other patients at risk of hyponatraemic complications (Please select one of the following) ☐ 1000mls 0.9 % sodium chloride with glucose 5% ☐ 500mls Hartmann's solution with glucose 3% Serial_____ Expiry__/__/__	____ ml/hr		A. B. B. B. B. B. End time: ____:____hrs (Max 24 hours) Discontinued by_____
1A 1B 1C 1D 1E	Serial_____ Expiry__/__/__	____ ml/hr		A. B. B. B. B. B. End time: ____:____hrs (Max 24 hours) Discontinued by_____
2				A. B.
3				A. B.
4				A. B.
5				A. B.
6				A. B.

Calculation of 100% Maintenance rate:
(a) First 10kg = 4 mls x _____ kg = _____ ml/hour
(b) Second 10kg = 2 mls x _____ kg = _____ ml/hour
(c) Beyond 20kg = 1 mls x _____ kg = _____ ml/hour
for 100% maintenance rate add (a) + (b) + (c)
_____ ml / hour
(MAXIMUM RATES 80ml/hr in females, 100ml/hr males)
Consider reducing to two thirds maintenance if risk of hyponatraemia is high
*Nil Hartmann's solution with 3% glucose is the trust- approved solution for surgical patients

Notes:
Please use this space for calculations, additional blood results and to detail fluid management plan. See wallchart for advice

	REPLACEMENT FLUIDS	HRLY RATE	ADDITIVES	A* Prescribed by (signed, date, time) B* Checked by (signed, date, time)
R1 R2 R3	☐ 1000mls sodium chloride 0.9% Serial_____ Expiry__/__/__	____ ml/hr		A. B. B. B. End time:

Calculation of Fluid Deficit (must be prescribed separately)
Volume to be replaced = (% dehydration X kg X 10) as mls of: sodium chloride 0.9% minus fluid bolus volume
Replacement period = 24 hours (48 hours if Na <135 or >145)
{ volume to be replaced (mls) } = _____
{Replacement period (hrs) } = _____
Replacement rate = _____ mls / hour

Pump particulars
Type of pump: _____
Asset ID: _____

V. I. P. Score (Visual Infusion Phlebitis Score)

I.V. site appears healthy	0	No signs of phlebitis ☐ OBSERVE CANNULA
One of the following is evident: • Slight pain near I.V. site or slight redness near I.V. site	1	Possible first signs of phlebitis ☐ OBSERVE CANNULA
Two of the following are evident: • Pain near I.V. site • Erythema • Swelling	2	Early stage of phlebitis ☐ REVIEW CANNULA
ALL of the following are evident: • Pain along path of cannula • Erythema • Induration	3	Medium stage of phlebitis ☐ REMOVE CANNULA ☐ COMMENCE TREATMENT
ALL of the following are evident & extensive: • Pain along path of cannula • Erythema • Induration • Palpable venous cord	4	Advanced stage of phlebitis or start of thrombophlebitis ☐ REMOVE CANNULA ☐ COMMENCE TREATMENT
ALL of the following are evident & extensive: • Pain along path of cannula • Erythema • Induration • Palpable venous cord • Pyrexia	5	Advanced stage of thrombophlebitis ☐ REMOVE CANNULA ☐ COMMENCE TREATMENT

Cannula # 1	Cannula # 2	Cannula # 3
Date/Time of Insertion: _____	Date/Time of Insertion: _____	Date/Time of Insertion: _____
Size/type: _____	Size/type: _____	Size/type: _____
Site: _____	Site: _____	Site: _____
Inserted by: _____	Inserted by: _____	Inserted by: _____
Patent ☐ Removed ☐	Patent ☐ Removed ☐	Patent ☐ Removed ☐

WHC219 Rev 11.09

Western Health and Social Care Trust

DAILY FLUID BALANCE CHART FOR CHILDREN AGED 1MONTH - 16 YEARS

NAME:
D.O.B. AGE:
HOSP. NO:
CONSULTANT:

24 HOURS BEGINNING _____/_____/20_____

ORAL & ENTERAL				INTRAVENOUS FLUIDS												OUTPUT				
				First Fluid						Second Fluid										
TIME	TYPE OF FLUID	ROUTE	AMOUNT	SOLUTION KEY	RATE	AMOUNT INFUSED	REMAINING	CANNULA CHECK Pressure	VIP	SOLUTION KEY	RATE	AMOUNT INFUSED	REMAINING	CANNULA CHECK Pressure	VIP	URINE	VOMIT	FAECES	BM OR COMMENTS	SIGNED
08:00																				
09:00																				
10:00																				
11:00																				
12:00																				
13:00																				
14:00																				
15:00																				
16:00																				
17:00																				
18:00																				
19:00																				
Day total																				
20:00																				
21:00																				
22:00																				
23:00																				
00:00																				
01:00																				
02:00																				
03:00																				
04:00																				
05:00																				
06:00																				
07:00																				
Night total																				

		ORAL & ENTERAL	INTRAVENOUS	URINE	FAECES	VOMIT	OTHER
DAY TOTAL	7am - 7pm						
NIGHT TOTAL	7pm - 7am						
24 HOUR TOTAL							

LPC 08/09/1008

TOTAL INTAKE: TOTAL OUTPUT:

APPENDIX 4 – Trigger List

Reporting triggers for potential adverse events related to the administration of intravenous fluids to children (1 month - 16th birthday)

a. Choice of IV fluid

- **Bolus fluid: use of a solution with sodium content less than 131mmol/L for treatment of shock**
- **Maintenance fluid: use of a solution with sodium content less than 131mmol/L in a peri-operative patient (24 hours before – 24 hours after surgery)**
- **Deficit fluid: use of a solution with sodium content less than 131mmol/L for correction**
- **The addition of electrolytes to fluids stocked at ward level e.g. potassium**

b. Biochemical abnormalities

- **any episode of symptomatic hyponatraemia while in receipt of IV fluids**
- **any episode of hypoglycaemia (<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 48hrs of starting IV treatment)**

c. Assessment

- **Electrolytes not checked at least once per 24 hours in any patient receiving IV fluids exclusively**
- **Failure to check and record electrolytes at commencement of IV fluids**
- **Failure to record the calculations for fluid requirements in the case notes/ on the prescription sheet**
- **Failure to note in the case notes/ prescription sheet a serum sodium less than 130mmol/L**
- **Failure to document in the case notes the steps taken to correct a serum sodium less than 130mmol/L**
- **If electrolyte results are not available within 60 minutes of commencing maintenance fluids**