HSC Business Services Organisation

**Directorate of Legal Services**

*Practitioners in Law to the Health & Social Care Sector*

2 Franklin Street, Belfast, BT2 8DQ
DX 2842 NR Belfast 3

Your Ref:
AD-0167-10

Our Ref:
NSC B04/1

Date:
10th January 2011



Ms Anne Dillon
Solicitor to the Inquiry
Arthur House
41 Arthur Street
Belfast
BT1 4GB

Dear Madam

**RE: INQUIRY INTO HYPONATRAEMIA RELATED DEATHS**

I refer to your letter of 15th September 2010 (AD-0167-10). In relation to the questions posed the Trust has determined the following:

1. (a) If a post mortem is directed by the Coroner decisions regarding the extent of the examination are not made by the clinician or family but by the pathologist and Coroner. If the case is a consented hospital autopsy decisions regarding the extent of the post mortem examination are made by the clinician and next of kin. Limitation of the post mortem may be at the request of the parents e.g. they may request that the brain is not examined if they do not wish the skull to be opened – this is sometimes the case in an autopsy on a stillborn baby. The clinician bases his or her decision to request consent for a full or limited post mortem on the child's clinical history, clinical findings, investigations and questions to be answered by the post mortem examinations, e.g. a clinician may request a brain-only examination if the pathology is known to be confined to the brain or similarly in a child with congenital heart disease but no other congenital abnormalities, the autopsy may be confined to the heart and lungs.

   In 1995 (and 1996 [redacted] the post-mortem consent form asked only for consent to the post-mortem examination and if limited consent was given this was annotated on the form by the consenting doctor [redacted] There were no guidelines or protocols in place at that time.

   (b) I enclose a booklet produced by the Coroner's Service for NI which explains the circumstances in which a death should be reported to the Coroner. The Coroner's

Service for NI have confirmed there has been no change in protocol from 1995 in reporting a death.
(c) A hospital post mortem cannot be performed without consent from the next of kin. This has not changed from 1995.

2. There was no written RBHSC policy in 1996 on measuring and recording fluid losses.

3. (a) There was in 1996 no written policy on the frequency of blood sampling.
(b) There was in 1996 no policy regarding the testing and monitoring of a child's urine & electrolytes in a patient who has potential for electrolyte imbalance.
(c) There was in 1996 no written policy on how to monitor and measure fluid output.

   The Trust introduced the enclosed "Policy for the administration of intravenous fluids to children aged from 1 month until the 16th birthday: reducing the risk of hyponatraemia" in 2009 and this is currently in use.

4. There was no written policy in 1995 regarding information giving.

5. There was and is no protocol for admission to PICU.

6. (a) Protocol (unwritten) is that a patient was and is admitted under the care of the relevant consultant on call defined by the on call rota. The protocol (unwritten) is that transfer of care between consultants took and takes place by discussion and contact between consultants either personally or by a junior doctor intermediary.
(b) Protocol (unwritten) is that a consultant should see their patient within a 24 hour period of time of admission and earlier if necessary.
(c) Senior staff in the Emergency Department will have taken APLS (advanced paediatric life support); other staff will have taken BLS (basic life support) regularly to maintain skills and competencies relevant to their practice.

Yours faithfully

pp Nicola Doaks

Wendy Beggs
Assistant Chief Legal Adviser

Direct Line: [redacted]
Fax: [redacted]
Email: [redacted]

# Coroners Service for Northern Ireland

serving
the community
through the
administration
of justice

For further information on the work of the
Northern Ireland Court Service please contact

**Northern Ireland Court Service**
Information Centre
Windsor House
Bedford Street
Belfast BT2 7LT

Telephone 028 9032 8594
Facsimile [redacted]
Textphone
Email informationcentre[redacted]
www.courtsni.gov.uk

From November 2008 we will be relocating to the
following address:
Laganside House
23-27 Oxford Street
Belfast BT1 3LA

Other contact details remain the same.

# Coroners Service for Northern Ireland

## Coroners

### Who are the Coroners?

Coroners are independent judicial officers who are available to deal with matters relating to deaths that may require further investigation to establish the cause of death.

Coroners in Northern Ireland can either be barristers or solicitors and are appointed by the Lord Chancellor.

### What do Coroners do?

Coroners inquire into deaths reported to them that appear to be:

- unexpected or unexplained,
- as a result of violence,
- an accident,
- as a result of negligence,
- from any cause other than natural illness or disease, or
- in circumstances that require investigation.

The Coroner will seek to establish the cause of death and will make whatever inquiries are necessary to do this e.g. ordering a postmortem examination, obtaining witness statements and medical records, or holding an inquest.

**Where is the Coroners Service Office?**
The Coroners Service is based in Mays Chambers, Belfast. The address and other contact details are:

Coroners Service for Northern Ireland
Mays Chambers
73 May Street
Belfast
BT1 3JL

Telephone: [redacted]
Fax:

E-mail: coronersoffice[redacted]
Web site: www.coronersni.gov.uk

### Who helps the Coroner?

The Coroners Service has dedicated staff based in the Coroners Office in Belfast. They support the work of the Coroner and will be able to deal with most queries you have regarding a death that has been reported to the Coroner.

There are a number of other people who will also normally help the Coroner in the investigation of a death and may need to speak to you about the deceased:

- Police Officers,
- Doctors,
- Pathologists.

Sometimes, depending on the circumstances of the death, there will be other people who also may need to speak to you for example officers from the Police Ombudsman or the Health and Safety Executive.

## Reporting a Death

### Are all deaths reported to the Coroner?

No. In most cases, a GP or hospital doctor can certify the

medical cause of death and the Registrar of Births, Deaths and Marriages can register the death in the usual way.

However, if a doctor has not seen and treated the deceased for the condition from which they died within 28 days of death, or the death occurred in any of the circumstances detailed below, then the death should be reported to the Coroner.

**When is a death reported to the Coroner?**

A death is reported to the Coroner in the following situations:

- a doctor did not treat the person during their last illness;
- a doctor did not see or treat them in the 28 days before they died;
- the cause of death was sudden, violent or unnatural such as an accident, or suicide;
- the cause of death was murder;
- the cause of death was an industrial disease of the lungs such as asbestosis, or
- the death occurred in other circumstances that may require investigation.

A death in hospital should be reported if:

- there is a question of negligence or misadventure about the treatment of the person who died;
- they died before a provisional diagnosis was made and the general practitioner is not willing to certify the cause; or
- the patient died as the result of the administration of an anesthetic.

A death should be reported to the Coroner by the police, when:

- a dead body is found;
- a death is unexpected or unexplained; or
- a death occurs in suspicious circumstances.

A death should be reported by the governor of a prison, immediately following the death of a prisoner.

**Who else can report a death?**

A death can also be reported to the Coroner by:

- the Registrar of Deaths,
- a Funeral Director,

- any member of the public,
  provided the death falls into one of the categories listed above.

Members of the deceased's family, who have concerns about the cause of death given by a doctor, may contact the Coroners Office to discuss this with the Coroner.

**What will the Coroner do when a death is reported?**
Initially the Coroner will gather information to investigate whether the death was due to natural causes and if a doctor can certify the medical cause of death.

The Coroner will authorise the police to gather this information which means that they will need to speak to relatives and others present when the death occurred or involved in the care of the deceased.

If the reason why a doctor cannot certify the death is simply because they have not treated the patient in the last 28 days, then the Coroner will discuss the cause of death with the doctor. If the Coroner is satisfied that the death was from natural causes and no further

investigation is necessary, then the Coroner may accept the medical cause of death that the doctor gives and issue a Coroners notification to enable the death to be registered.

If a doctor cannot certify the medical cause of death then the Coroner will investigate the death and may order a postmortem examination to be carried out.

## Postmortem Examination

If the Coroner orders a postmortem examination then a member of the family will be asked to formally identify the body. This could either be to the police at the place where the death has happened or it could be later at the mortuary before the postmortem examination is carried out.

A Coroners Liaison Officer will contact the family and give them information on the preliminary cause of death once the postmortem examination is completed.

### Why is a postmortem examination ordered?

The postmortem examination is a key stage in the Coroner's investigation as its findings identify the medical

cause of death and often determine whether any further action on the part of the Coroner is required.

The Coroner will normally notify relatives of the need for a postmortem examination via the police unless this is not practicable or would unduly delay the examination. The consent of the next-of kin is not required for a Coroner's postmortem examination. The next-of-kin can be represented at the examination by a doctor of their choice.

The postmortem examination is carried out as soon as possible after death and every effort is made to minimise any delay. The Coroner will release the body back to the family as soon as possible after the examination to enable the funeral to take place.

**What is a postmortem examination?**

A postmortem examination is a medical examination of the body. It is carried out on behalf of the Coroner by a pathologist in the State Pathologists Department or, in certain cases, by a hospital pathologist.

The postmortem examination may involve the removal and examination of organs of the body. Invariably, the

pathologist conducting a postmortem examination will require forensic laboratory tests to be carried out to enable an accurate diagnosis to be established. This may result in organs and various samples of tissue being retained for later inspection.

In cases where it has proved necessary to retain organs or tissue for further examination the Coroners Liaison Officer will inform next of kin of this. Relatives will be asked to indicate what they would like to happen to any tissue or organs that have been retained if they are released at a later time.

Organs and tissue can only be released on the authority of the Coroner to a funeral director for burial or cremation.

**Where is a postmortem examination carried out?**
The postmortem examination is usually carried out at Northern Ireland Regional Forensic Mortuary in Belfast. A postmortem may also in a small number of cases be carried out at a hospital.

**Will a postmortem examination delay the funeral?**
As the postmortem examination is normally carried out soon after death, the funeral arrangements should not need to be unduly delayed. However it is important to remember that the examination will take some time to carry out and this should be allowed for when making the funeral arrangements.

If a death has been reported to the Coroner, funeral arrangements should not be finalised until the Coroner's permission to release the body is received.

**When is the body released?**
Normally, the body will be released immediately following the postmortem examination. However in a very small number of cases, where there is an ongoing criminal investigation into the death, it may be necessary to retain the body for a longer period of time.

If charges have been brought against someone for causing the death, it may be necessary to have a second postmortem examination or further investigations, and the release of the body and the funeral arrangements may be delayed because of this.

**When will the results of the postmortem examination be available?**

The subsequent laboratory tests, carried out after the postmortem examination, may take considerable time to complete. Therefore it is possible that the final written postmortem report will not be available for some time after the death.

**What is in the postmortem report?**

The postmortem report gives details of the examination of the body. It may also give details of any laboratory tests which have been carried out.

Normally the deceased's medical practitioner is advised in writing of the medical cause of death contained in the postmortem report and will be sent a copy of the complete report. The family will also be advised when the final report has been received to enable them to make contact with the doctor. Because the report contains medical terminology it is advisable to have the assistance of a doctor when reading it to enable a full explanation to be given.

The Coroner may also make a copy of the report available to the family directly if this is requested.

The Coroner may also make the postmortem report available to a party who has a "proper interest". Persons with a 'proper interest' include:

- other relatives of the deceased
- the executors of the deceased's will or persons appointed as the deceased's personal representative
- solicitors acting for the next-of-kin
- insurers with a relevant interest
- anyone who may, in some way, be responsible for the death
- others appearing to the Coroner to have a proper interest.

**What happens after the postmortem examination?**
If the postmortem examination shows that the death was from natural causes and the Coroner decides there is no need for an inquest, then the Coroner will issue a Coroners certificate so that the death can be registered.

If the postmortem examination shows that the death was not from natural causes, then the Coroner may decide to hold an inquest and the death cannot be registered until after the inquest has been held.

The holding of an inquest is at the discretion of the Coroner but the views of the family can be made known to the Coroner and will be considered before any decision is made.

## Death Registration

### When can the death be registered?

If the death was due to natural causes which a doctor is able to confirm, the Coroner will advise the Registrar by issuing a Coroners notification and the death can be registered and a death certificate issued relatively quickly.

However, if a postmortem examination is ordered, or an inquest may be held, then the death cannot be registered until the Coroner's investigation has been completed.

A death certificate cannot be issued until the Registrar of Deaths has the appropriate certificate from the Coroner. In all cases the local Registrar will contact the family once

they receive the Coroner's certificate and ask that they attend and provide the details required for registration.

Before the final registration the Coroner's Liaison Officer will provide the family with a "Coroner's Certificate of Evidence of Death". While this can sometimes assist in the administration of the estate it must be noted that not all financial institutions will act on this and it may be necessary to await the issue of the final Coroners certificate and registration of the death. This certificate cannot be used to register the death with the Registrar of Deaths.



## Inquest

In Northern Ireland most deaths reported to the Coroner do not require an inquest.

### What is an inquest?

An inquest is an inquiry into the circumstances surrounding a death. The purpose of the inquest is to find out who the deceased person was and, how, when and where they died, and to establish the details the Registrar of Deaths needs to register the death.

**When will I know if an inquest is to be held?**
Once the Coroner's investigation into the death has finished, the Coroner will usually decide if an inquest is to be held. This can take some time to complete and is dependent on the circumstances of the death and the final report of the postmortem examination.

The postmortem report may not be received until some considerable time following the postmortem examination.

If, once the investigation is completed, the Coroner decides that an inquest is not necessary the Coroner will issue a Coroner's certificate to the Registrar of Deaths. The Registrar will then ask a relative to call and register the death.

The Coroners Office will be able to keep you informed of the progress of the Coroner's investigation and you should contact the office if you have any questions.

There is a separate leaflet on inquests and the procedures involved. This will be sent to you by the Coroners Office if the Coroner decides an inquest is necessary.

## Other Matters

### Is the Coroner concerned with organ transplants?

If the death has to be reported to the Coroner, you need the Coroner's permission before any organs are donated for transplant or the body is donated for medical research. The transplant co-ordinator in the hospital may provide guidance and assistance to the family in this situation.

### What happens if someone has been charged with causing the death?

If the Coroner is informed that some person or persons have been charged with an offence directly leading to the death of the deceased, the inquest or decision on holding an inquest will be postponed until after the conclusion of the criminal proceedings.

After the criminal proceedings have finished the Coroner will consider if an inquest should be held.

If the Coroner decides not to hold an inquest, the Registrar of Deaths is given a Coroner's certificate which will also include details of the cause of death together with the result of the criminal proceedings. This will enable the death to be registered.

**What about other court proceedings?**
Any civil court proceedings would normally follow the inquest if one is held, as it is the inquest which decides the facts about the cause of death. The inquest may help the family of the deceased find out what happened and in the case of a death arising from an accident at work, it may help to avoid similar accidents by highlighting the dangers.

**Removing a body from Northern Ireland**
If the Coroner is informed that a body is to be taken out of Northern Ireland for burial or cremation (whether or not there has been an inquest) and the Coroner is satisfied that the cause of death is known, then a Coroner's certificate will be issued, usually to an undertaker, allowing the body to be removed.

**Deaths outside Northern Ireland**
If a death occurs outside Northern Ireland, it will be necessary to obtain authorisation for the body to be removed and brought back to Northern Ireland from the country where the death occurred. The British or Irish Embassy or Consulate will be able to provide advice on this.

A Northern Ireland Coroner has no authority to investigate a death which occurs abroad.

If a death has happened on a ship, the Coroner in the place the body comes ashore must send certain details of the death to the Registrar General of Shipping and Seamen.

**Is a Coroner concerned with any other type of inquiry?**

A Coroner has the authority to investigate if treasure is found. Treasure can include objects not made of gold or silver but of significant historical value.

Depending on any prior interests and rights, treasure normally goes to the Crown. The Coroner must be told within 14 days if any treasure is found and **it is an offence not to do so.**

Occupiers and landowners have the right to be told about any finds of treasure on their land and, along with the finder, can get a reward. A Coroner's inquest into a find of treasure may be held without a jury unless, in a particular case, the Coroner thinks it is appropriate to have one. An inquest will decide if the find is treasure, who the finder is and where and when the object was found.

The Environment and Heritage Service is responsible for treasure. They can be contacted at:

The Environment and Heritage Service
5-33 Hill Street
Belfast
BT1 2LA.
Phone: [redacted]
www.ehsni.gov.uk

## Courts' Charter

**When you come to court, you can expect:**

- the court building to be open by 9am;
- the offices to be open to the public normally from 9.30am to 1pm and from 2pm to 4.30pm;
- polite and helpful staff; and
- clear signs.

**When you go to a public counter, we will:**

- respect your privacy and discuss any confidential business in private; and
- see you within 10 minutes and if you have to wait longer, a member of staff will explain why.

**When you phone a court office, you can expect:**

- your call to be answered within 30 seconds;
- to be given the name of the court official; and
- the court official to be clear and helpful.

**When you write to the court, we will:**

- acknowledge receipt of your letter and send you a reply within 15 working days; and
- give the name of a court official and contact telephone number.

If you ask, we will give you the appropriate forms and show you how to fill them in.
We cannot give you legal advice or tell you what to say.

**Helping us improve our service**

We want to know how you think we have done and your suggestions on how we might improve. There are comment cards in the main hall of each building.

**Disabled court users**

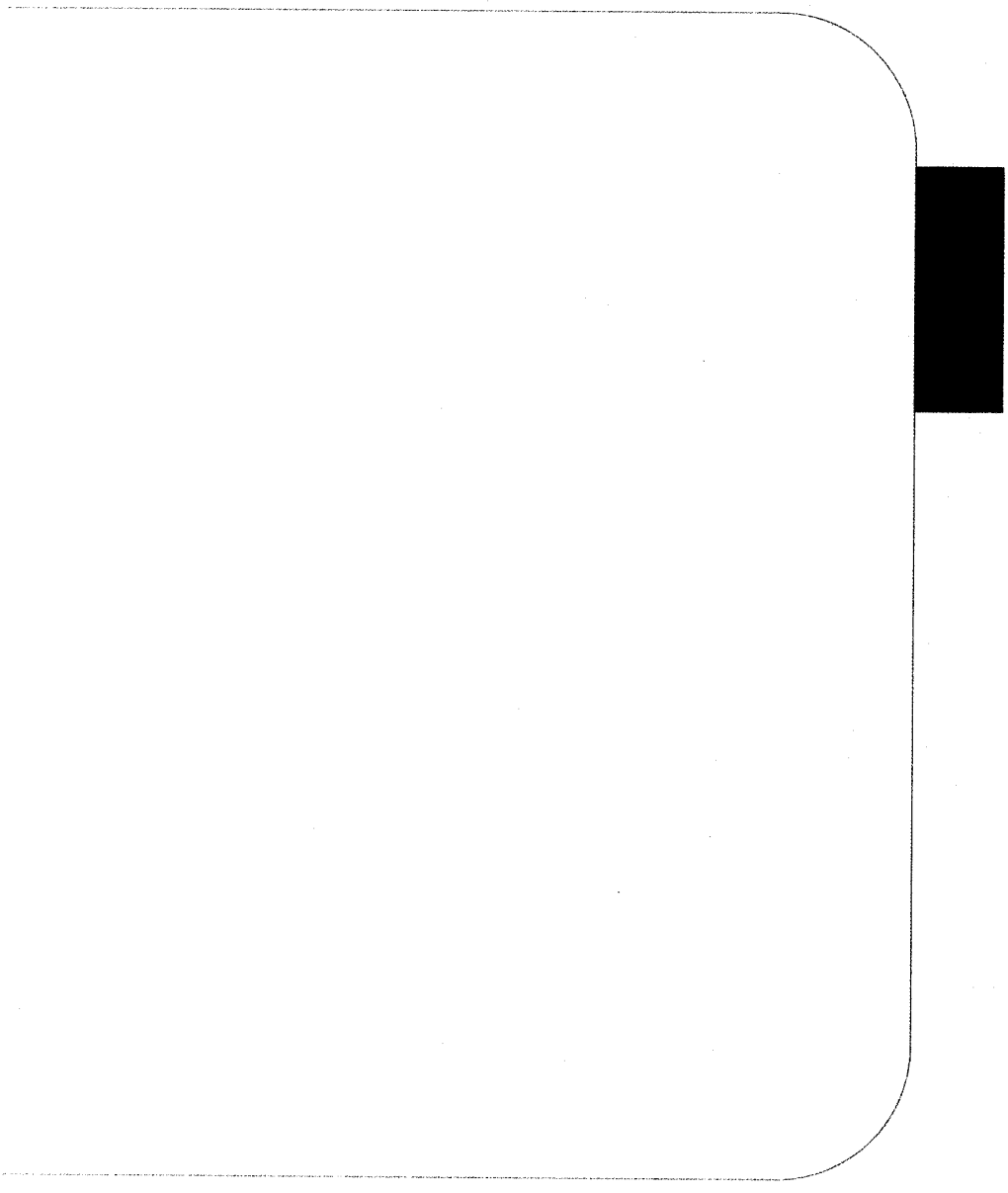
The Customer Service Officer or any other member of Court Service staff will be able to give you information about the facilities that are available for disabled people. A separate leaflet *'Information for Disabled Customers'* is also available. To obtain a copy of this leaflet, ask a member of Court Service staff or contact the Information Service at the address on the back of this publication:

**Other information**

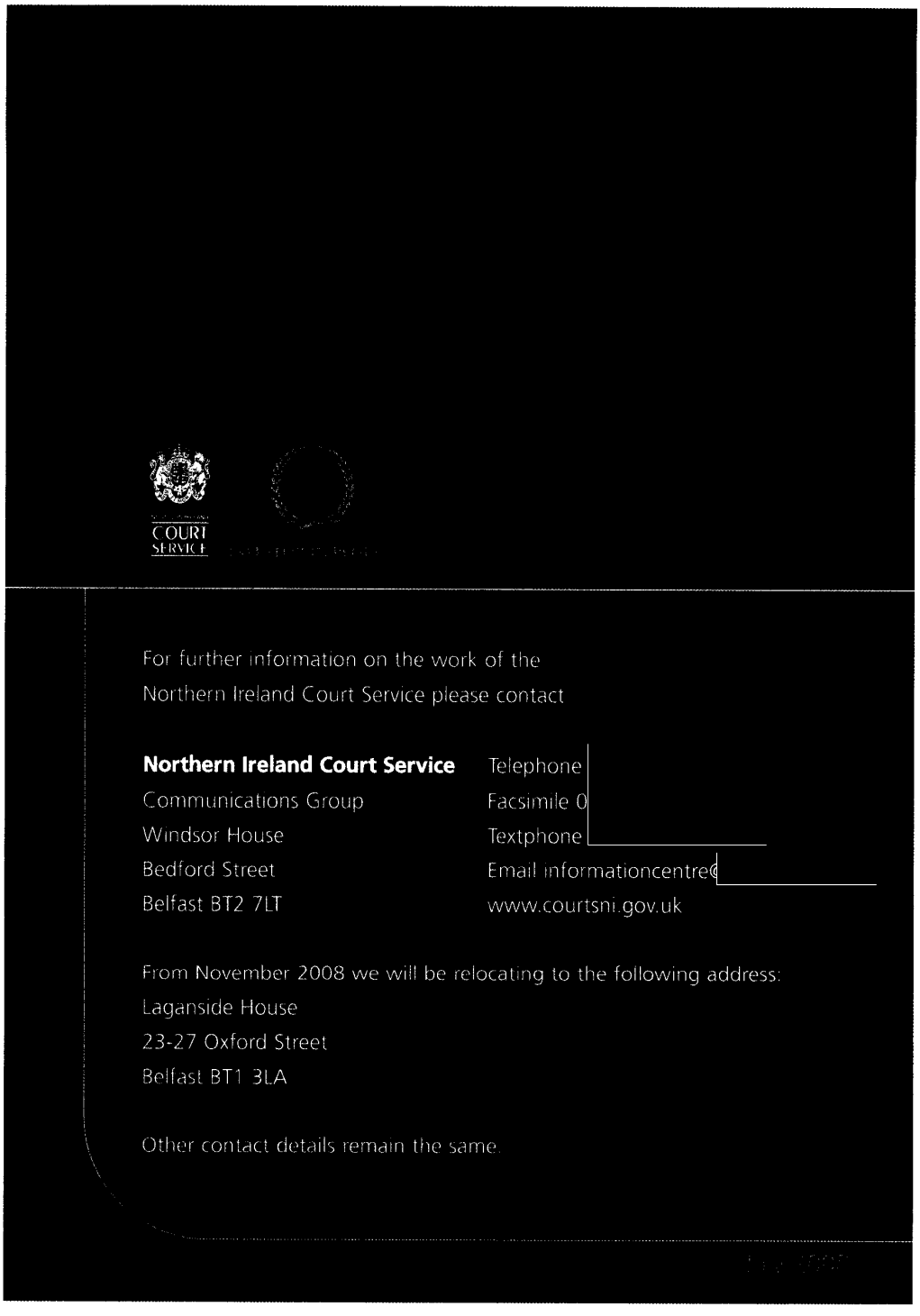
There are copies of other Courts' Charter leaflets on our work in every building. If you need more information about our work, you can contact the address on the back of this publication.

**Complaints**

The Northern Ireland Court Service respects the views of all court users. A separate leaflet *'Making a complaint about the Northern Ireland Court Service'* provides information on how to make a complaint. To obtain a copy of this leaflet, ask a member of Court Service staff or contact the address on the back of this publication.



www.coronersni.gov.uk


COURT
SERVICE
For further information on the work of the
Northern Ireland Court Service please contact
Northern Ireland Court Service
Communications Group
Windsor House
Bedford Street
Belfast BT2 7LT
Telephone
Facsimile 0
Textphone
Email informationcentre
www.courtsni.gov.uk
From November 2008 we will be relocating to the following address:
Laganside House
23-27 Oxford Street
Belfast BT1 3LA
Other contact details remain the same.

Belfast Health and Social Care Trust

**Standards and Guidelines Committee**

Hyponatraemia.- Reducing the risk in patients age 1 month up to 15 years

| | |
|---|---|
| **Summary** | This policy outlines the BHSCT approach for administration of intravenous fluids to children aged from 1 month until the 16th birthday with particular reference to reducing the risk of hyponatraemia.<br>It maps the advice issued in March 2007 from the National Patient Safety Agency (NPSA) and September 2007 from the Northern Ireland Regional Paediatric Fluid Therapy Working Group on how to reduce the risks associated with administering intravenous infusions to children.<br>This is fundamentally a document aimed at prevention of hyponatraemia and not treatment. |
| **Purpose** | To improve the safe use of intravenous fluid in children and reduce the risk of hyponatraemia. |
| **Operational date** | March 2008 |
| **Review date** | March 2010 |
| **Version Number** | V4 |
| **Supersedes previous** | V2.4 |
| **Director Responsible** | Medical Director |
| **Lead Author** | Dr. Peter Crean |
| **Lead Author, Position** | Consultant Paediatric Anaesthetist, RBHSC. |
| **Additional Author(s)** | Dr H Steen, Associate Medical Director. |
| **Department / Service Group** | Social Services, Family and Child Care |
| **Contact details** | Dr Peter Crean<br>Paediatric Intensive Care Unit<br>Royal Belfast Hospital for Sick Children<br>[redacted]<br>Peter.crean[redacted] |
| **Reference Number** | SG001/08 |
| Supercedes | N/A |

| Date | Version | Author | Comments |
|---|---|---|---|
| 25 August 2009 | V 3.1 | JR Johnston | Draft version 3 |
| 14 September 2009 | V 3.2 | JR Johnston | Minor RMcL amendments |
| 16 September 2009 | V 3.3 | JR Johnston | 8.3.4; Appendix 6 changes<br>Final Draft for RQIA |
| 17 September 2009 | V 3.4 | JR Johnston | 4.1; 8.4 - DKA Fluid chart change |
| 17 September 2009 | V 3.5 | JR Johnston | Appendix 4 changes |
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**Policy Record**

| | | Date | Version |
|---|---|---|---|
| Author (s) | Approval | 27/03/2008 | V1.2 |
| Director Responsible - Dr A Stevens | Approval | 27/03/2008 | V1.2 |

**Approval Process – Trust Policies**

| | | | |
|---|---|---|---|
| Policy Committee | Approval | | |
| Executive Team | Authorise | | |
| Chief Executive | Sign Off | | |

**Approval Process – Clinical Standards and Guidelines**

| | | | |
|---|---|---|---|
| Standards and Guidelines Committee | Approval | 31/03/2008 | V1.2 |
| Policy Committee | Approval | 14/04/2008 | V1.2 |
| Executive Team | Authorise | 16/04/2008 | V1.2 |
| Appropriate Director | Sign Off | 01/04/2008 | V1.2 |

**Ammendment**

| | | | |
|---|---|---|---|
| Author | Approval | 20th Oct 09 | V4 |
| Director | Approval | 21st Oct 09 | V4 |
| | | | |
| | | | |

## Summary

**Reference No:** SG001/08

**Title:**
***Policy for the administration of intravenous fluids to children aged from 1 month until the 16th birthday: reducing the risk of hyponatraemia.***

**Purpose:**
To improve the safe use of intravenous fluid in children and reduce the risk of hyponatraemia.

**Objectives:**
This Policy sets out recommended practice for everyone who looks after children receiving intravenous fluids. It is based on regional and national guidance, ongoing clinical audit, published literature and is also aimed at specifically reducing the risk of hyponatraemia.

It should be considered alongside the guidance from the National Patient Safety Agency Patient Safety Alert 22[1], and the Regional Paediatric Fluid Therapy Group wallchart[2].

**Policy Statement(s):**
1. The Paediatric Parenteral Fluid Therapy wallchart[2] forms the basis of BHSCT guidance on fluid prescription in paediatric patients aged from 1 month until the 16th birthday.
2. Sodium chloride 0.18% with glucose 4% will be withdrawn from general use in all BHSCT ward areas that treat children and the availability of these fluids will be restricted to critical care areas and other specialist wards such as renal, liver and cardiac units.
3. This policy and wallchart will be disseminated throughout the BHSCT.
4. Information about the availability of infusion fluids throughput the BHSCT will be attached to the Paediatric Fluid Guideline wall chart[2].
5. A new fluid prescription/ balance chart will be developed for the prescription of fluids for all children treated in the BHSCT.
6. All staff involved in prescribing, administering and monitoring IV fluids to such children will be made aware of this policy and the Paediatric Parenteral Fluid Therapy wallchart[2] through the BHSCT intranet and Service Group dissemination.
7. The BHSCT will implement the following governance measures – incident reporting using a set of reporting 'triggers' and formal auditing.

Chief Executive/ Director
*(delete as appropriate)*
Date: 21/10/09

Author
Date: 20 October 2009

**Contents Page:**

**Full Description**

**Reference No:** SG001/08

1. ***Policy for the administration of intravenous fluids to children aged from 1 month until the 16th birthday: reducing the risk of hyponatraemia.***

2. **Introduction:**

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.[1]

Since 2000, there have been four child deaths following neurological injury from hospital-acquired hyponatraemia reported in the UK.[1] 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.[1]

In March 2007 the National Patient Safety Agency (NPSA), with Alert 22, issued advice on how to reduce the risks associated with administering infusions to children[1].

In April 2007, with DHSSPSNI circulars[3,4], NHS organisations in Northern Ireland were tasked to produce and disseminate local clinical guidelines for the fluid management of paediatric patients based on the suggested NPSA guidelines template. The Northern Ireland Regional Paediatric Fluid Therapy Working Group produced an intravenous fluid clinical guideline in accordance with NPSA guidance[1]. This was disseminated to each HSC Trust for local implementation and monitoring.

In February 2009 the Regulation and Quality Improvement Authority (RQIA) published an independent review *"Reducing the risk of hyponatraemia when administering intravenous infusions to children"* which dealt with the implementation of recommended actions outlined within the NPSA Alert 22 and dissemination of the clinical guidelines / wall chart throughout HSC Trusts and independent hospitals. (see appendix 7.)

This document, using both the NPSA guidance and the RQIA recommendations, outlines the BHSCT policy for administration of intravenous fluids to children aged from 1 month until the 16th birthday with particular reference to reducing the risk of hyponatraemia; it is fundamentally a document aimed at prevention of hyponatraemia and not treatment.

3. **Purpose:**

To improve the safe use of intravenous fluid in children and reduce the risk of hyponatraemia.

4. **The scope:**

4.1 Applicable to all children more than 1 month and until their 16th birthday throughout the Belfast Health and Social Services Trust (BHSCT).

It is relevant for all general inpatient areas that treat patients from this age range (even if it is only occasionally) and includes the post-operative scenario, emergency departments, day case departments and the ambulance service.

This policy (and attendant fluid prescription chart) is not intended to apply to paediatric

and neonatal intensive care units, specialist areas such as renal, liver and cardiac units where it is used to replace ongoing losses of hypotonic fluids, or those suffering from burns or diabetic keto-acidosis (DKA) where hypotonic solutions may have specialist indications.

Children receiving long term Total Parenteral Nutrition (TPN) are not covered by the conditions of this policy.

4.2 Young people

As a child progresses through the teenage years there is a transitional stage of physical development i.e. adolescence, as that child progresses through towards adulthood. They will be referred to as 'young people' and many are cared for in adult wards by staff who generally treat adults.

The DHSSPSNI indicates that this paediatric fluid therapy guidance relates to all children from 1 month until their 16th birthday, regardless of the ward setting, except in the ICU and specialist areas mentioned above.

## 5. Objectives:

This policy sets out recommended practice for everyone who looks after children receiving intravenous fluids. It is based on regional and national guidance, ongoing clinical audit, the published literature and is also aimed at specifically reducing the risk of hyponatraemia.

It should be considered alongside the guidance from the National Patient Safety Agency Patient Safety Alert 22[1], and the Regional Paediatric Fluid Therapy Group wallchart[2] and the RQIA recommendations[5].

## 6. Roles and Responsibilities:

All professionals caring for children must:-

- be familiar with the signs of hyponatraemia.
- be familiar with its emergency management.
- ensure that they have received adequate training in intravenous fluids appropriate to their role.
- if they exclusively care for young people in an adult ward, know where to obtain expert paediatric should it be needed. (Appendix 5).
- be familiar with the guidance on intravenous fluids for children outlined by the Regional Paediatric Fluid Therapy Group wallchart[2].

## 7. The definition and background of the policy:

A child, for the purposes of this policy, is defined as being aged from 1 month 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.

Hyponatraemia is 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.

Significant 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.

The main causes of hyponatraemia in children are:

- Administration of hypotonic fluids, intravenous or enteral (e.g. excessively dilute formula or sodium chloride 0.18% and glucose 4% (No 18 solution))
- 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

Less common but important causes are:

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

The main symptoms of hyponatraemia relate to its central nervous system effects; cerebral oedema, seizures and death. Warning signs may be non-specific and include nausea, malaise and headache.

All children are potentially at risk, 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.

Children particularly at risk are those who are postoperative, have gastrointestinal fluid losses or who have bronchiolitis, CNS injuries or burns. These risk factors also apply to young people.

## 8. Policy / Guideline description:

The NPSA recommended in Alert 22 the following actions:-

1. **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.
2. Produce and disseminate **clinical guidelines** for the fluid management of paediatric patients.
3. Provide adequate **training** and supervision for all staff involved in the prescribing, administering and monitoring of intravenous infusions for children.
4. Review and improve the design of existing intravenous fluid prescriptions and **fluid balance charts** for children.
5. Promote reporting of hospital acquired hyponatraemia **incidents** via local risk management reporting systems. Implement an **audit** programme to ensure adherence to the above.

The 16 RQIA recommendations (appendix 7) map to the above NPSA recommendations:-

| NPSA | RQIA |
|---|---|
| 1 | 1, 2 |
| 2 | 3, (4), 5, 7 |
| 3 | 6, 7, 8, 9, 10 |
| 4 | 11 |
| 5 | 12, 13, 14, |
| 6 | 15, 16 |

The specific actions that the BHSCT will institute in order to limit the production of hospital acquired hyponatraemia are detailed below and are mapped to the RQIA recommendations.

8.1.1 *NPSA 1 RQIA 1* *Remove 'No. 18 Solution'*
Sodium chloride 0.18% with glucose 4% has been withdrawn from general use in all BHSCT ward areas that treat children and the availability of these fluids is restricted to critical care areas and other specialist wards such as renal, liver and cardiac units. A table showing areas permitted to stock or order 'No.18 solution' is given in Appendix 6.

8.1.2 *NPSA 1 RQIA 2* Any area that is still permitted to stock 'No. 18 solution will arrange for the provision of additional labelling or separate storage.

8.1.3 *NPSA 2 RQIA 5* Information about the availability of infusion fluids throughput the BHSCT (Appendix 4) will be attached to the Paediatric Fluid Guideline wall chart[2].

8.1.4 The BHSCT's list of sanctioned standard maintenance fluids is given in Appendix 4.

Where a senior clinician(s) considers that a "special" maintenance infusion fluid is required, then this alternative choice for fluid maintenance must be endorsed by the Chief Executive of the Trust with clear documentation of the reasons for that endorsement.

8.2 *NPSA 2 RQIA 3,5,7* *Clinical Guideline*
The Paediatric Parenteral Fluid Therapy wallchart[2] forms the basis of BHSCT guidance on fluid prescription in paediatric patients within the previously defined age range. This policy and wall chart will be disseminated and displayed throughout the BHSCT; to all wards that accommodate children aged from one month until their 16th Birthday including Emergency Departments, Adult Wards, Theatre and Intensive Care Units.

This will replace any previous wallchart including the 2002 wallchart issued by CMO entitled "Any Child Receiving Prescribed Fluids is at Risk of Hyponatraemia". All previous versions of the chart should be removed.

8.2.1 *NPSA 2 RQIA 7* The BHSCT will develop policy and guidelines on the general principles of intravenous therapy for adults and children.

Until then, this policy will form the basis of guidance on fluid therapy in children within the BHSCT and, as for all BHSCT policies, it will be reviewed and implemented throughout the organisation.

8.2.3 *NPSA 2 RQIA 3* All medical and nursing staff should base their intravenous fluid practice for children, young people (and indeed adults) on the following best practice model of:-

- administer appropriate therapy for shock such as fluid boluses
- measure/estimate and correct any fluid deficit
- prescribe a fluid maintenance fluid regime.

Treatment of these elements of the overall fluid status is outlined in the Paediatric Parenteral Fluid Therapy wallchart[2].

The fundamental layout selected for this guideline complements 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 guides treatment, if required;
- further assessment of whether there is also a deficit to be considered and then
- calculation and prescribing for maintenance requirements is also included.

8.2.4 This policy, centred on children, has many features that indicate good practice for young people and adults. An intravenous fluid therapy practice based on using

- an individual patient's weight in kilograms
- fluid administration based on a millilitres/hour prescription

is commended rather than blanket prescriptions based only on fluid volume.

8.2.5 Baseline Assessment

Good practice guidelines on monitoring body weight, electrolytes/urea and fluid balance should be followed. Again, these recommendations apply to adults as well as children.

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 minimize the risk of error.

In the emergency situation an estimation of the child's weight should be made and an accurate weight obtained 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.

8.2.6 Shock therapy

Shocked or collapsed children must immediately receive fluid boluses as outlined on the Regional Paediatric Fluid Therapy Group wallchart[2].

Good practice would indicate that the response to fluid therapy is closely observed and if there is no response by the time 40 mls/kg has been administered, senior medical advice and help is required.

Note that special treatment is needed for children with diabetic coma and trauma and the need to obtain senior advice and help is highlighted.

8.2.7 Fluid Deficit management

Calculation of the overall fluid deficit and the prescription of deficit replacement should only be undertaken by a doctor experienced in caring for dehydrated patients. The recommended fluid is sodium chloride 0.9% and it must be prescribed separately. The rate at which it is given is determined by the degree of dehydration and a relevant electrolyte sample.

For those caring for young people in a general adult ward, and who may not have such experience, they should ensure that they can avail themselves of advice from the sources as detailed in Appendix 5.

8.2.8 For advice regarding the estimation of the percentage of dehydration which is required for the fluid deficit calculation, the table in Appendix 2 should be consulted.

8.2.9 Maintenance fluid therapy
When prescribing maintenance fluids to children, young people and adults, the following scheme would be standard practice. For

- children use the calculations as indicated in the Regional Paediatric Fluid Therapy Group wallchart[2].
- young people and adults prescribe
    - 2 litres fluid for females over the weight of 40 kg.
    - 2.5 litres fluid for males over the weight of 60 kg.

8.2.10 The type of fluid selected must be tailored to the patient's needs as set out in the guideline. For example, following surgery, children who require intravenous fluids will be prescribed either sodium chloride 0.9% with or without pre-added glucose or Hartmann's solution in the post-operative period for maintenance fluid needs.

8.2.11 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.

8.2.12 This advice does not override or replace the individual responsibility of health professionals to make appropriate decisions in the circumstances of their individual patients, in consultation with the patient and/or guardian or carer or for consultation with a more senior clinician. This would, for example, include situations where individual patients have other conditions or complications that need to be taken into account in determining whether the guidance as detailed in the wallchart[4] is fully appropriate in their case.

8.3 Training
*NPSA 3 RQIA 3,6,8,10*
The BHSCT will use various forms of training on paediatric fluid management; didactic lectures, staff induction training and computer based training:-

1. a training presentation in the policies and guidelines section of the Intranet. This multidisciplinary presentation is accessible from any computer terminal within the BHSCT.
2. BMJ e-learning module
3. 'Training Tracker' (Multimedia Design Studio Limited).

The BHSCT advocates the adoption of a regional computer based educational tool that allows:-

- creation of an unlimited number of educational and training courses; to include mandatory modules.
- 'training' of all grades of staff.
- content of the training to be tailored to our own needs.
- tracking
    - who has taken each module.
    - who has not taken each module.
    - who has passed and who has failed.
    - precisely which questions each trainee got right and wrong.
- competency assessment tools.
- training record to be obtained at any time.
- to award personalised certificates to those who reach a stated passmark.

8.3.1 *NPSA 3 RQIA 6,8,10* All staff involved in prescribing, administering and monitoring IV fluids to children will be made aware of this policy and the Paediatric Parenteral Fluid Therapy wallchart[2] through the BHSCT intranet and Service Group dissemination.

All staff working exclusively with children and especially those prescribing fluids to children will be encouraged to ensure they are conversant with the knowledge required to prescribe intravenous fluids to children and that it is within their scope of practice.

They will be encouraged to use the intranet training presentation and the BMJ learning module on hyponatraemia - http://learning.bmj.com/learning/search-result.html?moduleId=5003358

The production of the certificate on completion of the above module may be sought at staff assessments, RITAs, performance review, personal development plans and appraisals.

The future BHSCT policy and guideline on the general principles of intravenous therapy (8.2.1) will also be available in the various training modules.

8.3.2 *NPSA 3 RQIA 6,8* All professionals caring for children must be familiar with the signs of hyponatraemia and its emergency management.

8.3.3 *NPSA 3 RQIA 6,8* For those caring for young people, they should either have received adequate training in intravenous fluids or if they exclusively care for young people in an adult ward, they should know where to obtain such expertise on children should it be needed. (Appendix 5).

Furthermore, they should be familiar with the guidance on intravenous fluids for children outlined in this policy and Regional Paediatric Fluid Therapy Group wallchart[2].

8.3.4 *NPSA 3 RQIA 9* The BHSCT has identified that young people aged 14 - 16 years old can be cared for (even if only occasionally) on most wards that are generally regarded as adult wards with the obvious exceptions of wards like Care of the Elderly. Staff in those locations will be made aware of the training opportunities mentioned in 8.3 and 8.3.1.

BHSCT Service groups will consider cohorting young people in dedicated wards - where this can be done safely and will not lead to any diminution in the level of care.

8.3.5 The BHSCT will work with the NIMDTA to ensure that the principles of paediatric fluid therapy and its potential risks, as highlighted in the National Patient Safety Agency Alert, are highlighted in postgraduate training programmes.

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

8.4 *NPSA 4 RQIA 11* Fluid prescription/ balance chart

A new fluid prescription/ balance chart has been developed within the Royal Belfast Hospital for Sick Children (RBHSC) with guidance from all other areas in the BHSCT that treat children. It will be used for the prescription of fluids for all children and young people treated in the BHSCT with the exception of treatment of diabetic ketoacidosis (DKA) when a specialised fluid prescription chart may be used.

If needed, they should avail themselves of advice from the sources as detailed in Appendix 5.

8.4.1 All children, other than emergencies, must have a blood sample taken for electrolyte and blood glucose estimation before intravenous maintenance fluids are started. This must be repeated at least 24 hourly, more often in the circumstances described. Clinical and other methods of monitoring are outlined in the guidance.

8.4.2 Monitoring

Monitoring of the child receiving parenteral fluid will include considerations of:-

- Body weight to be measured or assessed as a baseline and at least daily 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 balance chart.
- All fluid output must be assessed and, if clinically indicated, measured and recorded on the fluid balance chart.
- An assessment of input/output and need for plasma glucose estimation should be made and documented 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 E&U and blood glucose/BM should be made at least daily.
- If hyponatraemia exists, these measurements should be 4 – 6 hourly.
- Urinary osmolarity and electrolytes measurements should be considered when dealing with hyponatraemia.
- The ill child will require more frequent and detailed investigations.

For more detailed information about the monitoring requirements the wallchart[2] should be consulted.

8.5 **Audit**
*NPSA 5 RQIA 12*

The BHSCT will implement the following governance measures.

8.5.1 *NPSA 5 RQIA 13* The BHSCT clinical biochemistry department will collate, analyse and report quarterly on paediatric hyponatraemia incidents to designated clinicians for children and young people. They will regularly audit these incidents, collate them with the Trust Adverse Incident Reporting System and instigate actions linked to the NPSA Alert 22. Appendix 3 outlines this audit process.

8.5.2 *NPSA 5 RQIA 14* Incident reporting

The BHSCT will report these potential adverse incidents related to intravenous infusion through the Trust Adverse Incident Reporting System.

A system of 'triggers' (adapted from those developed by the NHSCT) will 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 (Appendix 3) will 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.

8.5.3 *NPSA 5 RQIA 15,16* Audit

The BHSCT will implement an audit programme for intravenous infusion therapy in children throughout the trust.

The audits will be based on the

- NPSA audit checklist
  http://www.npsa.nhs.uk/EasySiteWeb/GatewayLink.aspx?alId=5308
- the BHSCT trigger list (Appendix 3).
- Regional GAIN hyponatraemia audit

8.5.4 Where young people are cared for in general adult wards, special audit arrangements will be put in place to ensure they receive appropriate and safe fluid management.

## 9. Additional policy statements:

9.1 Senior medical advice must be sought when treating the child with hyponatraemia.

9.2 Where additional electrolytes are required, they should only be administered as supplied by the manufacturer and in line with guidance.

Children at or below the age of 13 years must not have electrolytes added to bags of intravenous fluids.

Ordinarily children from 13 to 16 should also not have electrolytes added to bags of intravenous fluids; in certain, predominantly adult areas, children of this age group may have magnesium sulphate or phosphates added.

9.3 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.

9.4 When referring to this policy, staff should consult the BHSCT policy on the management of strong intravenous potassium solutions and/or injections.

## 10. Implementation / Resource requirements:

The implementation requirements for this policy include:-

- Wallchart production and distribution
- Fluid prescription/ balance chart production and distribution
- Staff training costs – induction, postgraduate courses.

Raising staff awareness of the issues surrounding hyponatraemia and the subsequent staff training will be encouraged, as suggested by DHSSPSNI circular[4], by using the BMJ e-learning module.

## 11. Source(s) / Evidence Base:

The following sources were used:-

a) NPSA Alert 22
b) NPSA background information
   http://www.npsa.nhs.uk/EasySiteWeb/GatewayLink.aspx?alId=5310
c) HSC (SQSD) 20-07 - reducing risk of Hyponatraemia in children (27/04/2007)
d) HSC (SQSD) 20-07 - addendum (16/10/2007)
e) Paediatric Parenteral Fluid Therapy wallchart.

## 12. References, including relevant external guidelines:

1. Reducing the risk of hyponatraemia when administering intravenous infusions to children. National Patient Safety Agency, Patient Safety Alert 22, March 2007.
2. Paediatric Parenteral Fluid Therapy initial management guideline, DHSSPSNI 2007. http://www.dhsspsni.gov.uk/hsc_sqsd_20-07_wallchart.pdf.
3. HSC (SQSD) 20-07 reducing risk of Hyponatraemia in children
4. http://www.dhsspsni.gov.uk/hsc_sqsd_20-07_-_addendum.pdf

5. Regulation and Quality Improvement Authority (RQIA). Reducing the risk of hyponatraemia when administering intravenous infusions to children - September 2008. http://www.rqia.org.uk/cms_resources/NI%20%20report%20Hyponatraemia%20FINAL%20v%203%200.pdf

## 13. Consultation Process:

This policy is adapted from the

- NPSA Alert 22,
- Northern Ireland Regional Paediatric Fluid Therapy Working Group
- HSC (SQS) 20/2007 and its addendum documentation from the DHSSPSNI.

It has been assured through the Standards and Guidelines committee.

## 14. Equality and Human Rights screening carried out:

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, the Belfast Trust has carried out an initial screening exercise to ascertain if this policy should be subject to a full impact assessment.

√ Screening completed ☐ Full impact assessment to be carried out.
No action required.

## 15. Procedures:

Appendix 1 - Paediatric Parenteral Fluid Therapy wallchart
Appendix 2 - Estimating the percentage dehydration based upon physical examination findings.
Appendix 3 - Paediatric Hospital Acquired Hyponatraemia Audit
- Triggers for potential adverse events
Appendix 4 - Availability of intravenous fluids throughout the BHSCT (500ml bags)
Appendix 5 - Sources of advice regarding Paediatric fluid therapy
Appendix 6 - Areas where it is permitted to stock/order No. 18 Solution* - as of August 2009
Appendix 7 - RQIA independent review - September 2008 - Recommendations

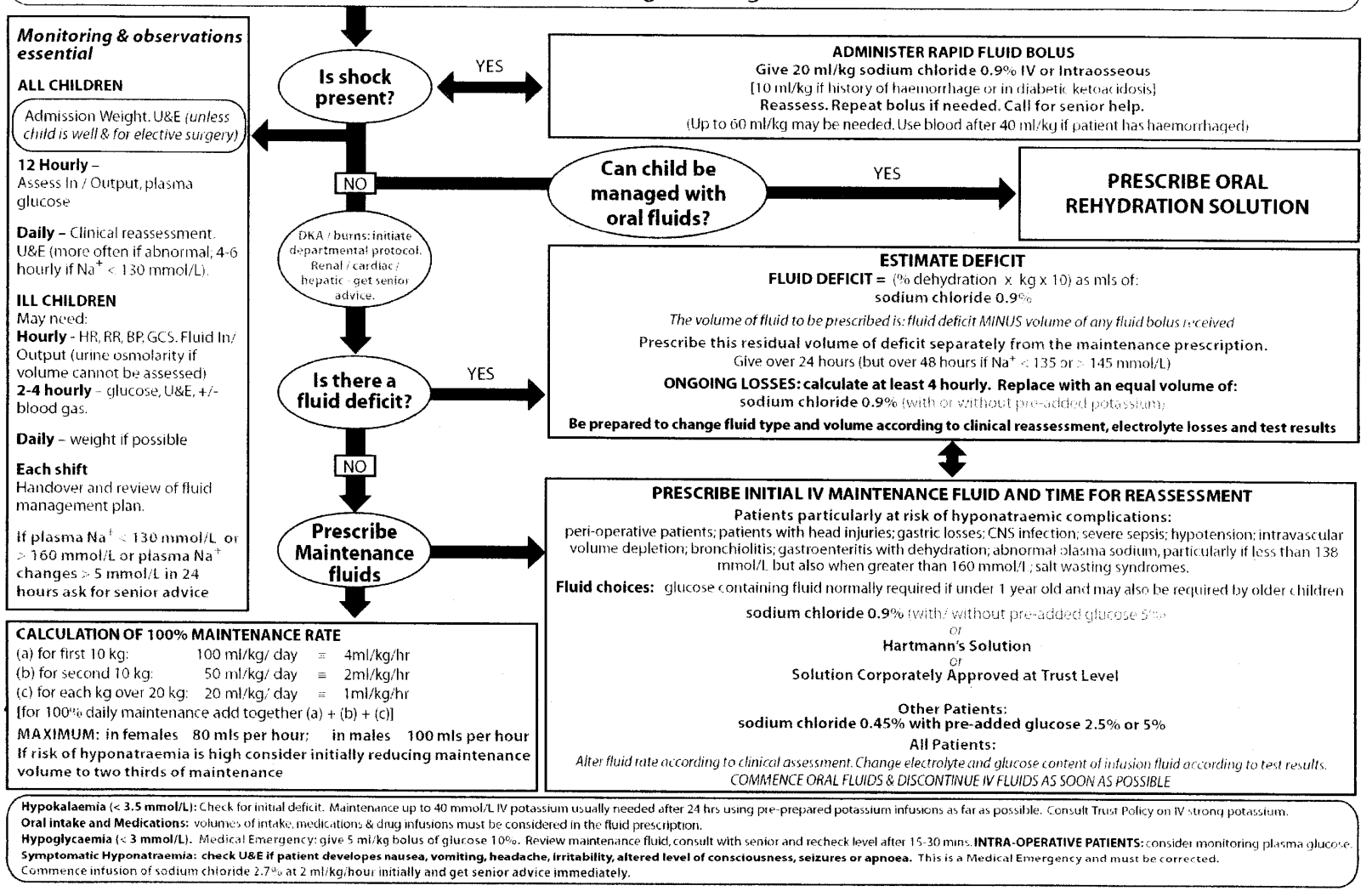
**Chief Executive/ Director**
*(delete as appropriate)*
**Date:** 21/10/09

**Author**
**Date:** 20 October 2009

# PAEDIATRIC PARENTERAL FLUID THERAPY ( 1 month – 16 yrs )

## *Initial* management guideline

Sept 2007




**Hypokalaemia (< 3.5 mmol/L):** Check for initial deficit. Maintenance up to 40 mmol/L IV potassium usually needed after 24 hrs using pre-prepared potassium infusions as far as possible. Consult Trust Policy on IV strong potassium.
**Oral intake and Medications:** volumes of intake, medications & drug infusions must be considered in the fluid prescription.
**Hypoglycaemia (< 3 mmol/L).** Medical Emergency: give 5 ml/kg bolus of glucose 10%. Review maintenance fluid, consult with senior and recheck level after 15-30 mins. **INTRA-OPERATIVE PATIENTS:** consider monitoring plasma glucose.
**Symptomatic Hyponatraemia: check U&E if patient developes nausea, vomiting, headache, irritability, altered level of consciousness, seizures or apnoea.** This is a Medical Emergency and must be corrected.
Commence infusion of sodium chloride 2.7% at 2 ml/kg/hour initially and get senior advice immediately.

Appendix 2

**Estimating the percentage dehydration based upon physical examination findings.**

| Estimated Percentage Dehydration | Physical Examination Findings |
|---|---|
| <3 | History of fluid loss but no findings on physical examination |
| 5 | Dry oral mucous membranes<br>but no panting<br>or pathological tachycardia |
| 7 | Mild to moderate decreased skin turgor,<br>dry oral mucous membranes,<br>slight tachycardia,<br>and normal pulse pressure. |
| 10 | Moderate to marked degree of decreased skin turgor,<br>dry oral mucous membranes,<br>tachycardia,<br>and decreased pulse pressure. |
| 12 | Marked loss of skin turgor,<br>dry oral mucous membranes,<br>and significant signs of shock,<br>pallor, cool peripheries, prolonged capillary refill time, hypotension,<br>confusion. |

Appendix 3

# PAEDIATRIC HOSPITAL ACQUIRED HYPONATRAEMIA AUDIT

**Laboratory Report Details (to be completed by audit dept)**

Patient No. Patient Date of Birth:

Date of specimen: Time of specimen: Result :

**Admission Details**

Date of admission: Time of admission:

Diagnosis: 1.

2.

**Hospital acquired hyponatramia (defn)**

- 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.

1. Is this hospital acquired hyponatraemia? Yes / No

   If no, reason: _____

   If yes, was it acquired whilst in this trust? Yes / No

   If no, patient transferred from: _____

**Treatment and monitoring of hyponatraemia**

2. Was the fluid prescribed appropriate? Yes / No

   If no, details: _____

3. Was IV fluid prescription reviewed 12hrly whilst on IV fluids? Yes / No

4. Were U&E done 24hrly whilst on IV fluids? Yes / No

Following the Na of <130mmol/l,

5. Was appropriate advice sought? Yes / No

   Grade: _____ Speciality: _____

6. Was the frequency of repeat U&Es appropriate? Yes / No

   If No, details: _____

**Recording and communication of incidents (to be completed by Audit dept)**

7. If yes to Q1, was adverse incident form completed? Yes / No

8. Was copy of form sent to other trust if acquired outside BHSCT? Yes / No

**Triggers for potential adverse events related to the administration of intravenous fluids to children (1 month – 16 years old).**
(adapted from Northern H&SCT policy)

CHOICE OF IV FLUID

1. Bolus fluid: use of a solution with serum Na of <131mmol/L for treatment of shock.
2. Deficit fluid: use of a solution with serum Na of <131mmol/L for correction.
3. Maintenance fluid: use of a solution with serum Na of <131mmol/L in a peri-operative patient (24 hours before – 24 hours after surgery).

BIOCHEMICAL ABNORMALITIES

4. Any episode of symptomatic hyponatraemia while in receipt of IV fluids.
5. Any episode of hypoglycaemia (blood glucose <3mmol/L) while in receipt of IV fluids.
6. Any episode of severe acute hyponatraemia (i.e. sodium level dropping from 135mmol/L or above to < 130mmol/L within 24hrs of starting IV treatment).

ASSESSMENT

7. Electrolytes not checked at least once per 24 hours in any patient receiving IV fluids exclusively.
8. Failure to record the calculations for fluid requirements in the case notes/ on the prescription sheet.*
9. Failure to note in the case notes/ prescription sheet a serum sodium of less than 130mmol/L.
10. Failure to document in the case notes the steps taken to correct a serum sodium of less than 130mmol/L.

* = unless child is a young person with no risk factors for hyponatraemia.

( < = less than )

Appendix 4

AVAILABILITY OF INTRAVENOUS FLUIDS THROUGHOUT THE BHSCT (500ML BAGS)

| SITE | RGH | BCH | MPH | MATER |
|---|---|---|---|---|
| **Sodium chloride** | | | | |
| Sodium chloride 0.45% | √ | √ | | √ |
| Sodium chloride 0.9% | √ | √ | √ | √ |
| Sodium chloride 1.8% | √ | √ | √ | √ |
| Sodium chloride 2.7% | √ | | √ | √ |
| **Combined solutions** | | | | |
| Sodium chloride 0.45% Glucose 2.5% | √ | √ | √ | |
| Sodium chloride 0.45% Glucose 5% | √ | | √ | |
| Sodium chloride 0.9% Glucose 5% | √ | | | |
| **Glucose solutions** | | | | |
| Glucose 5% | √ | √ | √ | √ |
| Glucose 10% | √ | √ | √ | √ |
| Glucose 15% | √ | | | |
| Glucose 20% | √ | √ | | |
| **Potassium containing solutions** | | | | |
| Glucose 5% 10mmol Potassium chloride | √ | | | |
| Glucose 5% 20mmol Potassium chloride | √ | √ | √ | |
| Glucose 5% 40mmol Potassium chloride | √ | √ | √ | |
| Glucose 10% 10mmol Potassium chloride | √ | | | √ |
| Glucose 10% Sodium chloride 0.18% 10mmol Potassium chloride* | √ | | | |
| Sodium chloride 0.45% Glucose 2.5% 10mmol Potassium chloride | √ | √ | | |
| Sodium chloride 0.45% Glucose 2.5% 20mmol Potassium chloride | √ | | | |
| Sodium chloride 0.45% Glucose 5% 10mmol Potassium chloride | √ | | | |
| Sodium chloride 0.45% Glucose 5% 20mmol Potassium chloride | √ | | | |
| Sodium chloride 0.9% 10mmol Potassium chloride | √ | | | |
| Sodium chloride 0.9% 20mmol potassium chloride | √ | √ | √ | √ |
| Sodium chloride 0.9% 40mmol potassium chloride | √ | √ | | |

* commonly known as Basic solution

Sites: RGH = Royal Hospitals
BCH = Belfast City Hospital
MPH = Musgrave Park Hospital
MATER = Mater Hospital

Appendix 5

## Sources of advice regarding Paediatric fluid therapy

For help and advice regarding

- management of fluid therapy
- especially to prevent and/or treat hyponatraemia

in all children, but especially for those children aged 13 – 16 years old being managed in adult wards,

please use the following sources of help and advice. Ordinarily, advice should be for complex cases and should be Consultant to Consultant discussions even though contact will often have to be made through trainee on-call rotas.

| Team | | Address | Extension |
|---|---|---|---|
| **RBHSC Paediatricians** | Paediatric On Call Rota | Allen Ward<br>Musgrave Ward | [redacted] |
| **RBHSC Paediatric ICU** | Paediatric ICU | | [redacted] |
| **Musgrave Park** | Orthopaedic theatre – Anaesthesia team during working hours. | | |
| **BCH Dufferin theatres** | ENT theatre – Anaesthesia team during working hours. | | |
| **General Biochemistry** | **Clinical Biochemistry** | | |
| | **Inside working hours** | **Outside working hours** | |
| [redacted] | [redacted] | Contact Medical doctor on call either via the laboratory or via switchboard. | |
| [redacted] | [redacted] | Ext.3216 or<br>Contact Medical doctor on call either via the laboratory or via switchboard | |
| [redacted] | [redacted] | Contact Medical doctor on call either via the laboratory or via switchboard | |

Other sources of help are:

1 APA consensus guideline on perioperative fluid management in Children
http://www.apagbi.org.uk/docs/Perioperative_Fluid_Management_2007.pdf

2 Royal Children's hospital Melbourne Clinical Practice Guidelines
Intravenous fluids
http://www.rch.org.au/clinicalguide/cpg.cfm?doc_id=5203#Other%20Resources

3 Royal Children's hospital Melbourne Clinical Practice Guidelines
Hyponatraemia
http://www.rch.org.au/clinicalguide/cpg.cfm?doc_id=8348

Appendix 6

Areas where it is permitted to stock/order No. 18 Solution* - as of August 2009

| SERVICE GROUP | SITE | SPECIALITY | Stock on Ward | Named patient supply – consultant request only. |
|---|---|---|---|---|
| Clinical Services | RGH, BCH | High Dependency Unit | X | |
| Clinical Services | RGH, BCH, MATER | Intensive Care | X | |
| Clinical Services | Mater, BCH, RGH | Recovery Wards | | X |
| Clinical Services | Mater, RGH | Theatres | | X |
| Clinical Services | BCH | Tower Theatres | | X |
| Clinical Services / OPMS | Mater, RGH, BCH | Day Procedure Units | | X |
| Specialist Serv | RGH | Wards 4E and 4F (Neurosciences) | | X |
| OPMS T&O | MPH | Recovery Ward - Orthopaedics | | X |
| OPMS T&O | MPH | High Dependency Unit | | X |
| OPMS T&O | MPH | Theatres - Orthopaedics | | X |
| SS, Women, family and childcare | RBHSC | Barbour Renal | X | |
| SS, Women, family and childcare | RBHSC | PICU | X | |

* "No. 18 Solution" = sodium chloride 0.18% and glucose 4%

Appendix 7

## RQIA INDEPENDENT REVIEW - SEPTEMBER 2008 - RECOMMENDATIONS

| | |
|---|---|
| Recommendation 1 | All hospitals should monitor the ongoing use of No. 18 solution to enable assurance that infusions are removed from stock and general use in areas that treat children. |
| Recommendation 2 | Where appropriate, hospitals must be able to demonstrate that an active strategy is in place for minimising risk of use in clinical areas that continue to stock No 18 solution and where children are accommodated. For example, provision of additional labelling or separate storage for those No.18 solution bags still stocked in such clinical areas. |
| Recommendation 3 | All hospitals should continue with the ongoing work of disseminating clinical guidelines. This should be undertaken in conjunction with multidisciplinary awareness-raising and education on the use of the guidance and wall chart in all settings where children may be treated. This is particularly important in adult wards where older children are treated. |
| Recommendation 4 | Independent hospitals must be assured that all visiting doctors who may manage patients up to 16 years old use the clinical guidelines when managing children being treated with intravenous infusions. |
| Recommendation 5 | All hospitals should ensure that only the DHSSPS Paediatric Parenteral Fluid Therapy wall-chart *issued by DHSSPS in October 2007* is displayed in clinical areas where children may be treated, with a list of available local fluids available alongside it. All previous versions of the wall chart should be removed from clinical areas. |
| Recommendation 6 | Hospitals should assure themselves that staff have the appropriate skill and knowledge in this clinical area. Competency assessment tools in administration of intravenous infusion to children should be developed, formalised and implemented for all relevant, multi-professional staff. |
| Recommendation 7 | Hospitals should continue to review, collaborate and implement organisation wide policy and guidelines, in relation to intravenous infusion for children. |
| Recommendation 8 | All hospitals should ensure that the development and provision of multidisciplinary education opportunities in administration of intravenous infusion to children and that all relevant clinical staff uptake this education. |
| Recommendation 9 | Hospitals should develop mechanisms to identify the location of patients aged 14-16 years who are in adult wards and ensure staff who care for those children are provided with competency based, assessed education in administration of intravenous infusion to children. |
| Recommendation 10 | All hospitals should make wider use of training sources available such as BMJ E-Learning Module on Hyponatraemia to address different learning styles and devise a mechanism to ensure 100% multi-professional uptake of such learning. |
| Recommendation 11 | Priority must be given to the completion of a Trust-wide review, and implementation of revised paediatric intravenous fluid prescription and |

fluid balance charts in all settings where children may be treated including adult wards where children are treated.

Recommendation 12 All hospitals should develop a culture of incident reporting, analysis and learning generally and specifically in respect of intravenous fluids and hyponatraemia.

Recommendation 13 Plans for development of systems for reporting, analysing and monitoring incidents to assure organisations of safe practice and that actions linked to NPSA Alert 22 should be implemented and regularly audited by all hospitals to ensure adherence to the process.

Recommendation 14 The development of 'trigger lists' that have been adopted by a the Antrim Area Hospital to aid understanding of the types of incidents to be reported should be shared and taken up more widely .

Recommendation 15 The development of an audit tool which may include wider aspects but should address as a minimum aspects of NPSA Alert 22 should continue to be progressed and used at least annually.

Recommendation 16 Trusts should continue to seek approval and funding for a regional audit (GAIN proposal) on the uptake of the Paediatric Parenteral Fluid Therapy guideline and potential unexpected clinical consequences of the guideline.