Witness Statement Ref. No. 369/1

NAME OF CHILD: CONOR MITCHELL

Name: Dr. William McCaughey

Title: Consultant Anaesthetist (Retired)

Present position and institution:

Retired

Previous position and institution: Medical Director, Craigavon Area Hospital
[As at the time of the publication of the Guidance on the Prevention of Hyponatraemia in Children, March 2002]

Membership of Advisory Panels and Committees:
[Identify by date and title all of those between January 1995 -August 2013]

April 1998 – April 2003, Aug 2005 – April 2006
CAH Trust Board
CAH Corporate Business Group
CAH Medical Executive (Chairman)

Clinical Governance Steering Group (Chairman)
Clinical Governance subcommittee, Performance of Doctors (Chairman)

A large number of other committees related to the post of Medical Director.
These are detailed in the attached curriculum vitae (Appendix 1A)

Previous Statements, Depositions and Reports:
[Identify by date and title all those made in relation to the child's death]

None

OFFICIAL USE:
List of previous statements, depositions and reports:

Ref:	Date:	

IMPORTANT INSTRUCTIONS FOR ANSWERING:

Please attach additional sheets if more space is required. Please identify clearly any document to which you refer or rely upon for your answer. If the document has an Inquiry reference number, e.g. Ref: 049-001-001 which is 'Chart No.1 Old Notes', then please provide that number.

If the document does not have an Inquiry reference number, then please provide a copy of the document attached

(1) Please address the following,

(a) As of March 2002 state your medical qualifications and the date you qualified as a medical doctor.

MB, BCh, BAO 8 July 1966
FCARCSI 1969
FRCA 1970
MD 1989

(b) State the date of your appointment to Craigavon Area Hospital, and the role to which you were appointed.

1st July 1972 as Consultant Anaesthetist

(c) On what date were you appointed to the role of Medical Director, and for how long did you perform that role.

April 1998 –5th May 2003;
August 2005 - March 2006 (Acting Medical Director during Dr Humphrey's illness)

(d) Outline your responsibilities and main duties as Medical Director at Craigavon Area Hospital, and provide a copy of your job description. If you do not personally retain a copy of your job description, please take steps to obtain a copy from the Trust.

I do not have a copy, and the Trust has not retained a copy. I have appended the job description prepared for my successor as Medical Director (This a draft dated 2002, which I was asked to review) This (allowing for the developments in the intervening 5 years) would reflect my understanding of my responsibilities as Medical Director. (Appendix 1B).

(e) Describe your career history before you were appointed to Craigavon Area Hospital, and provide an up to date copy of your CV.

JHO Royal Victoria Hospital, 1966 - 1967
NI Anaesthetic training scheme 1967 - 1972 - see attached CV for details

(f) Describe your work commitments to the Craigavon Area Hospital from the date of your appointment, stating the locations in which you worked and the periods of time in each department/location.

Anaesthesia in all theatre locations in Craigavon, and associated ward work; Resuscitation; Intensive Care Unit (2 sessions plus on-call). These duties for extent of employment 1972 - 2006

(2) Describe in detail the education and training you have received in fluid management, the prevention of hyponatraemia and record keeping in relation to fluid balance, to include any particular training relating to fluid management in children, and provide dates and names of the relevant institutions/bodies, by reference to the following:

(a) Undergraduate level.

Queen's University Medical School programme

(b) Postgraduate level.

Queens University / NI Anaesthesia training scheme

(c) Hospital induction programmes.

These did not exist during my training.

(d) Continuous professional development.

In-service training in Theatre and ICU

Author of chapter "Electrolyte balance and parenteral nutrition" in Dundee, Clarke and McCaughey, Clinical Anaesthetic Pharmacology, Churchill Livingstone, 1991

I designed and carried out an Audit of Hyponatraemia in Labour ward, around 1985, the results of which led to change in practice in labour wards throughout the Province.

Royal College of Anaesthetists Core Topics Day 27 September 2006 I Chaired the session on Paediatric Resuscitation and Fluid Therapy (speaker Dr R Bingham, Great Ormond Street)

I completed the BMJ Learning course "Reducing the risk of hyponatraemia when administering IV fluids to children - 3 December 2010

(3) The Chief Medical Officer published 'Guidance on the Prevention of Hyponatraemia in Children' in or about March 2002. The correspondence which explained the purpose of this Guidance was addressed to Medical Directors amongst others (Ref: 007-001-001).

Please address the following matters arising out of this correspondence:

(a) Did you receive a copy of this correspondence in your capacity as Medical Director in Craigavon Area Hospital in March 2002?

Yes - The letter entitled PREVENTION OF HYPONATRAEMIA IN CHILDREN, from the Chief Medical Officer, dated 25 March 2002, was received by me as Medical Director.

(b) If you did not receive a of this correspondence, how was the Guidance brought to your attention and state in particular:

(i) Who brought the Guidance to your attention?

(ii) When was it brought to your attention?

(c) Before the Guidance was published in March 2002, were you made aware in your capacity as Medical Director or otherwise that work was being performed at a regional level in order to provide guidelines to assist clinicians on how to prevent hyponatraemia in children? If so, provide a detailed account of how this was brought to your attention, and what you understood was the reason behind the decision to develop such guidelines?

I do not recall this, but would have been aware of the work of CREST.

(d) Before the Guidance was published in March 2002, was any work done in Craigavon Area Hospital to develop local guidelines or protocols with respect to fluid management and how to prevent hyponatraemia in children? If so, please outline the steps that were taken to develop such guidelines or protocols.

(e) **Yes. Details are appended of training for junior doctors, including fluid balance therapy, and with reference to hyponatraemia, extending from 2001 - 2006. Appendices T1 to T14**

(f) What steps, if any, did you take to ensure that the CMO's Guidance was distributed to, or brought to the attention of relevant staff in March 2002?

The Guidance was forwarded to Clinical Directors in all specialties. The Clinical Directors were to ensure, within the context of Clinical Risk Management in their specialties, as noted below, that appropriate guidance and training was being given, including display of the posters in appropriate clinical areas. (The Trust has searched for but not found copies of this correspondence)

(g) Did you take any steps whether individually or as part of a group to take this Guidance forward within Craigavon Area Hospital, such as by providing training, advice or information in respect of the application and use of the Guidance in clinical and/or nursing practice, and whether to trainees or more established staff?

Since 1998, when I became Medical Director, I had been heading the development of a structure for Clinical Governance in Craigavon Area Hospital. In this I was working closely with the Chief Executive and the Director of Nursing. I have appended a copy of the first report to the Trust Board, in June 2000. (Appendix 1C)

This document details the structures and plans for the development of Governance in the Trust, and also states that **"these may be adjusted as experience is gained and as areas of overlap, or gaps in responsibilities are identified".**

At the outset, it states "Clinical **Risk Management is not specifically represented in this organisational diagram. This will be an integral part of each Directorate's responsibilities."** This resulted from the decision taken (February 2000) by the Clinical Governance Steering Committee, which I chaired, that *"there should be a Risk Management strategy for each of the directorates and that this should be part of regular directorate meetings."*

At this time, sufficient resources had not been obtained for full implementation of the overall plans for Clinical Governance, and the decision to give responsibilities for Clinical Risk to the individual Clinical Directorates meant that this work could continue without delay.

The implementation of the Chief Medical Officer's recommendations on Hyponatraemia was therefore to be taken forward at specialty level, with any problems in implementation to be reported to the Steering Group, through the Clinical Effectiveness subcommittee and where appropriate to Medical Executive Committee. (See Appendix 1D).

If so -

(i) Describe in detail all of the steps that you (or your group) took in order to take the Guidance forward within Craigavon Area Hospital;

The CMO's Guidance was forwarded to the Clinical Directors in all specialties, with an instruction to implement this, as noted above.

(ii) Identify any other person who worked with you on this task;

Having ensured that clinical specialties had received the CMO's Guidance, and an instruction to implement it within their specialty, I did not work on the details of implementation.

Dr Martina Hogan, Consultant Paediatrician, would have coordinated the processes within paediatrics. She had provisionally agreed in January 2002 to take up the post of Director of Clinical Risk, but as funding was not yet available from the SHSSB to establish the support staff, accommodation and equipment needed for this post to function, she did not formally accept the post until July 2002.

(iii) Describe the steps that you took and when you took them.

As stated above, I delegated detailed implementation to the risk groups within directorates.

(h) The CMO's correspondence indicated that the A2 sized poster describing the Guidance should be displayed in all units which accommodated children. Describe the steps which you took, if any, to ensure that the Guidance was displayed in all units which accommodated children in Craigavon Area Hospital.

If no steps were taken by you in this regard, please explain why no steps were taken?

This was delegated to the Clinical Directors in each specialty, and the senior nurse in the specialty, to be included immediately in the Risk Management strategy for the directorate

(i) Insofar as it is within your knowledge, specify the locations within Craigavon Area Hospital where the poster was displayed.

I recall seeing the posters deployed in appropriate clinical areas. I do not at this distance in time have recall of the details.

(j) The CMO's correspondence indicated that local fluid protocols should be developed to complement the Guidance. Describe the steps which you took, if any, to ensure that such protocols were developed?

I am aware that protocols were developed and introduced. I do not recall details.

If no steps were taken by you in this regard, please explain why no steps were taken?

(k) Insofar as it is within your knowledge, describe the protocols that were developed, identify who developed any such protocol, when they were developed and for what purpose?

I do not recall this detail, as I was not involved in implementation at this level of detail.

(l) The CMO's correspondence stated that it would be important to audit compliance with the Guidance and the locally developed protocols. Describe the steps which you took, if any, to ensure that there was an audit of compliance with the Guidance and locally developed protocols?

The Trust participated in a regional audit, published as: "A study of current fluid prescribing practice and measures to prevent hyponatraemia in

Northern Ireland's paediatric departments". McAloon J and Kottyal R 2005 Ulster Medical Journal 74 93-97

If no steps were taken by you in this regard, please explain why no steps were taken?

(m) Insofar as it is within your knowledge, describe the steps that were taken to audit compliance with the Guidance and locally developed protocols, identify who carried out any such audit, the departments/units which were the subject of the audit, when it was carried out and how it was carried out?

The audit referred to above was in Paediatrics, May 2003, Dr M Smith coordinating. I do not have details of other audits.

(4) With reference to the Guidance issued by the CMO in March 2002 the Inquiry has been advised by the Southern Health and Social Care Trust on behalf of the legacy Craigavon Area Hospital Group Trust as follows:

"In March 2002 the Medical Director, Director of Nursing and the Chief Executive would have had the key responsibility for dissemination, implementation and monitoring of the guidelines."

(a) Please state whether you agree that this statement is accurate. If it is inaccurate, explain the respects in which you believe it to be inaccurate.

Yes, with the proviso that details of implementation were appropriately delegated. I have summarised above the Clinical Governance structures which the Trust was developing, and the decision to delegate Clinical Risk to Directorate level at that time, until funding was available for further development.

(b) If you agree that the statement is accurate, and save as has otherwise been described in the foregoing, provide a detailed account of the steps taken by you, the Director of Nursing and the Chief Executive in order to,

(i) Disseminate the Guidance;

(ii) Implement the Guidance;

(iii) Monitor the Guidance.

This was carried out at Directorate / Specialty level, as stated above. Any problems in implementing the Guidance were to be included in feedback through the Clinical Effectiveness Subcommittee or if appropriate to the Medical Executive Committee.

(c) Provide a detailed account of how you in your capacity as Medical Director, the Director of Nursing and the Chief Executive worked in the exercise of any responsibility to disseminate, implement and monitor the Guidance? For example, did you work as a group, or did you delegate the relevant tasks to others to perform?

This was carried out at Directorate / Specialty level, with Clinical Directors and Clinical Specialty Nurses reporting back as appropriate to myself as Medical Director and to the Director of Nursing.

(5) Have you ever received training in the use or application of the Guidance? If so, state,

I do not recall receiving training.

(a) Who provided you with training?

(b) When and on how many occasions have you been provided with such training?

(c) What form did the training take?

(d) What did you learn from the training?

(e) Was the training of an adequate quality or standard for the work that you do?

(6) Have you ever received written information in relation to the use or application of the Guidance? If so, please provide a copy and state,

I have not retained any such documentation

(a) Who provided you with the written information?

(b) When did you receive it?

(c) What did you learn from the written information?

(d) Was the written information which was given to you of an adequate quality or standard for the work that you do?

(7) After the death of Conor Mitchell in the Royal Belfast Hospital for Sick Children on the 12 May 2003 (following his treatment in the Craigavon Area Hospital) did you or anyone else establish any process designed to learn lessons in relation to any issue relating to his fluid management? If so,

At this time I had returned to a purely clinical post in anaesthesia and did not have an input into any such process.

(a) Describe the process which was established.

(b) Who conducted it?

(c) When was it conducted?

(d) What contribution did you make to it?

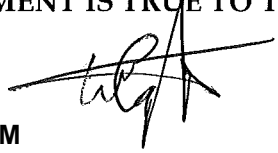
(e) Were you advised of the conclusions that were reached, and if so, what were they?

(8) Provide any further points and comments that you wish to make, together with any documents, in relation to:

(a) The Guidance on the Prevention of Hyponatraemia.

(b) Fluid management.

THIS STATEMENT IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF

Signed:  **Dated:** 2-10-2013

Appendix 1A

Curriculum Vitae (Updated 2013)

Dr William McCaughey

Private Address [redacted]

Specialty Anaesthetics

Date of Birth [redacted]

Date of Medical Registration ..... **8 July 1966**
Date of grading as Consultant ..... **1 July 1972**

Clinical training and experience.

(a) ***Consultant Appointments***:	***Date of Appointment***:
(1) Consultant Anaesthetist, Craigavon Area Hospital	1 July 1972 - 31 March 2006
Locum Consultant	2006 - 2013
(1a) Medical Director, Craigavon Area Hospital Group Trust	1 April 1998 – May 2003
(2) Lecturer (Part-time) in Anaesthetics, Queen's University of Belfast	Sept. 1979 -

(b) ***Training posts***

J.H.O. Royal Victoria Hospital	1966 - 1967
S.H.O. / Registrar in Anaesthetics	1967 - 1970
Senior Registrar in Anaesthetics	1970 - 1971
Senior Tutor / Senior Registrar, Queen's University of Belfast, Department of Anaesthetics	1971 - 1972

Experience Abroad.

University Hospital, Edmonton, Canada	1972
Schaeferziekenhaus, Emmen, Netherlands	1979
Foothills Hospital, Calgary, Canada (Locum posts - total 2 months)	1982

Medical and Academic Qualifications

(a) ***Degrees and other Qualifications***

M.B. B.Ch. B.A.O.	Queen's UniversityJune	1966
M.D.	Queen's University	1982

(Thesis title : "Epidural and Intrathecal Opioid Drugs")

F.F.A.R.C.S. (I)	Royal College of Surgeons in Ireland, Dublin.	1969
F.F.A.R.C.S.	Royal College of Surgeons of England, London	1970

(b) ***Academic distinctions.***

First MB Foundation Scholarship	Queen's University	1961

Teaching Experience :

Senior Tutor, Q.U.B. Department of Anaesthetics.
1971 - 1972

Lecturer (Part time), Q.U.B. Dept. of Anaesthetics.
1979 - 1990

Regular lecturer on courses for undergraduates and for postgraduate Anaesthetic trainees in Queen's University – to present.

Lecturer on Faculty of Anaesthetics, RCSI - courses for Primary and Final FFARCSI, Dublin; Co-ordinator for Part II FFARCSI course 1990-96

Education and Training.

Faculty Tutor for Southern Area, for
Faculty of Anaesthetists,
Royal College of Surgeons of England 1979 - 1986

Linkman for Faculty of Anaesthetists, RCSE 1979 - 1986

Member of Anaesthetics Committee of N.I. 1980 - 1987
Council for Postgraduate Medical Education

Member of Registrar/Senior Registrar Subcommittee
of above 1980 - 1987
Vice-chairman of SHO Appointment Subcommittee 1986 - 1988
Chairman of SHO Appointment Subcommittee 1988 - 1990

Examiner for (Old) Primary FFARCS I
Royal College of Surgeons in Ireland 1980 - 1986

Examiner for Part II FFARCS I
Royal College of Surgeons in Ireland 1986 - 1998

Chairman of Part II FFARCS I Examination
Royal College of Surgeons in Ireland 1992 - 1998

Chairman of New Primary FFARCS I Examination
Royal College of Surgeons in Ireland 1996 – 1998

(Responsible for setting up and running this new examination, under the direction of the Examination Committee of the Board of the Faculty of Anaesthetists, of which I was a member)

Examiner for New Primary FFARCS I Examination 1998 - 2006

Extern Examiner for Faculty of Anaesthetists,
Royal College of Surgeons of England ,
London, 1984, 1990, 1996
Kuwait 1986

Extern Examiner for M.Med. (Anaesthesia) Examination,
Universiti Kebangsaang Malaysia, Kuala Lumpur 1992

Membership of Committees

(See also above, Education & Training)

National /International

Elected Member of Board,	
Faculty of Anaesthetists, Royal College of Surgeons in Ireland	1989 - 1995
(Re-elected)	1996 - 2000
Vice - Dean, Faculty of Anaesthetists	1994 - 1995
Member of Education Committee, Faculty of Anaesthetists	
Member of Examination Committee	1989 – 2000
Chairman of Appeals Committee, College of Anaesthetists, RCSI	1998 - 2001

Provincial

Member of CREST working party on	1992
Intensive Care Services in N.Ireland	1997
Royal College of Anaesthetists NI Advisory Group	2002 –5

Local

Southern Area

Chairman of Anaesthetics Division	1993-95
Member of Area Medical Advisory Committee	1993-95
Chairman of Acute Services Review, Anaesthetics Committee	1997

Craigavon Area Hospital

Medical Director	1998 - 2003
Acting Medical Director	2005 - 2006
Chairman, Anaesthetics Division	1983 - 85
	1992 - 96
Clinical Director, Anaesthetics	1996 - 98
Chairman, Medical Executive Committee	1996 - 2003; 2005-6
Member, Hospital Council	1996 - 2003; 2005-6
Chairman, Medical Records Committee	1993 -
Member of Information Steering Group, CAH	1994 -
Member, Postgraduate Education Committee	1990 – 2003
And see below:	

Committees: as Medical Director / Deputy Chief Executive

Trust Board
Corporate Business Group
Hospital Council
Health Records Committee
Infection Control Committee
Cancer Services Committee
Decontamination Project Board (SHSSB)
Strategic Development Plan Steering Group
Capital Resources Committee
Supply Board Committee

Clinical Governance Steering Committee (Chairman)
- Clinical Governance Working Group (Chairman)
- Quality Steering Gp PG Rms1/2
- Medical Negligence Committee (Chairman)

Theatre Users Committee
SHSSB Acute Pressures Group
Performance Management Group
Waiting List Management Group

Local Task Force Gp for Junior Doctors hours (Chairman)
Consultant Med Staff Gradings Cmtte
Consultants Discretionary Points Committee
Trust negotiating group with LNC

Project groups for STH:
- Minor Injuries Unit

Protected Elective Centre

Clinical Simulator – Implementation Group;
Finance Group
Human Organs Inquiry – chairman of Trust group responding to this.
DHSS Workforce Planning Group

Special Clinical Interests.

Intensive Care

Continuing interest in development of ICU in CAH.
Responsible for introduction to CAH ICU of various new techniques, including Invasive cardiovascular monitoring, Differential lung ventilation, Intraspinal opioids in crushed chest management, etc.

(See Publications)

Obstetric Anaesthesia

Leading involvement with research programme investigating H_2 blockers in prophylaxis of Mendelson's syndrome (See Publications)
This program of investigation in the QUB Department of Anaesthetics led to a worldwide change in practice.

Study of hyponatraemia in Labour Ward

Theatre work

Interests in various aspects - e.g. personally responsible for -
Introduction of Patient-controlled analgesia
Introduction of scavenging of anaesthetic gases
(See Publications)

Membership of Learned Societies - Member of :

Association of Anaesthetists of Great Britain and Ireland

Anaesthetic Research Society

British Association of Medical Managers

British Medical Association

Craigavon Medical Society

Intensive Care Society

Intensive Care Society of Ireland

Northern Ireland Intensive Care Group

Northern Ireland Society of Anaesthetists (President 1999 - 2001)

Obstetric Anaesthetists Association

Research and Publications

Member of panel of Assessors for
British Journal of Anaesthesia 1990 - 2006

Research

Mainly Clinical Pharmacology and ICU topics -
See attached Publications list for research interests

Signed .....

W. McCaughey Publications

W.McCaughey Chapter : Drugs acting on the Gastrointestinal Tract,
W.McCaughey Chapter : Adverse reactions and drug interactions,

In : International Series in Anaesthesiology, eds JPH Fee, JG Bovill,
Harwood Academic Publishers **2003** (In press)

'Anaesthetic Physiology and Pharmacology'

Editors : **W.McCaughey,** R.S.J. Clarke, J.P.H. Fee, W.F.M. Wallace

Churchill Livingstone, Edinburgh, London. **1997**
780 pages

(A textbook of Physiology and Pharmacology for FRCA and FFARCSI examinations)

Joint Editor and author of chapters :

Chapter 1.	Cell physiology	JG McGeown, **W.McCaughey**, WFM.Wallace
Chapter 3	Pharmacodynamic aspects of drug action	**W.McCaughey**
Chapter 4	Pharmacokinetics	**W.McCaughey**
Chapter 40	Drugs acting on the gastrointestinal system	**W.McCaughey**
Chapter 51	Adverse reactions and drug interaction	**W.McCaughey**

WI Campbell, RW Kendrick, P Ramsay-Baggs, **W.McCaughey**
The effect of pre-operative administration of bupivacaine
compared with its postoperative use.
Anaesthesia 1997, 52:1212-1229

W.McCaughey and RK Mirakhur
Drugs in Anaesthetic Practice :

Chapter in *Avery's Drug Therapy*, 4th ed, 1997,
ADIS Press, Auckland

McConaghy P, McCallum J, **McCaughey W**
Contamination of opioids during preparation for regional anaesthesia
Anaesthesia 1996, 51:1079-80

Bhanumurthy S, **McCaughey W**,
Gum elastic bougie for nasotracheal intubation
Anaesthesia 1994, 49:824-5

Grace D, Milligan KR Loughran PG **McCaughey W**
Diclofenac sodium versus fentanyl for analgesia in laparoscopic sterilization.
Acta Anaesthesiologica Scandinavica 1994, 38:342-5

Bhanumurthy S, **McCaughey W**, Graham JL
Deflated tracheal tube cuff with inflated pilot balloon [letter].
Anaesthesia 1993,48:1109-10

McCaughey W and Bhanumurthy S
Laryngeal mask placement in the prone position.
Anaesthesia 1993, 48:1104-5

JPH Fee and **W McCaughey**
Preoperative preparation, concurrent drug therapy and premedication.
Chapter in : General Anaesthesia, Eds. Smith, Nimmo and Rowbotham.
2nd Ed. 1993, Blackwell, London

McCaughey W.
Adverse Effects of Local Anaesthetics.
Drug Safety 1992, 7 : 178-189

McCaughey W.
A wee problem in the dental surgery.
Anaesthesia 1992, 47 : 280

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Clinical Anaesthetic Pharmacology.

(A textbook of Pharmacology for the Fellowship in Anaesthesia)

Ed. Dundee JW, Clarke RSJ, **McCaughey W.**
Churchill Livingstone, London. 1991

Joint Editor & Author of chapters :

Chapter 2	Pharmacodynamics
Chapter 3	Pharmacokinetics
Chapter 4	Sections on Cardiac & Liver disease
Chapter 28	Drugs acting on the Respiratory System
Chapter 30	Hormones
Chapter 33	Electrolyte balance and Parenteral Nutrition
Chapter 34	Adverse reactions and Drug Interaction

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McKeating K, Phillips SA, Orr IA, **McCaughey W.**
The effect of propofol by infusion on the cardiovascular response to skin incision.
European Journal of Anaesthesia 1989, 6:461-2

Dwyer R, **McCaughey W,** McCarthy GJ, Lavery J, Dundee JW
Comparison of propofol and methohexitone as anaesthetic agents for electroconvulsive therapy (ECT).
Anaesthesia 1988, 43 : 459 - 462

Graham JL, Bell PF, **McCaughey W.**
Nalbuphine and pentazocine in an opioid-benzodiazepine sedative technique. A double-blind comparison.
Annals of the Royal College of Surgeons of England 1988, 70 : 200 - 204

Leyden PEF, **McCaughey W,** McKinney MS, Dundee JW.
Computerised measurement of ventilatory response to CO_2 following morphine and nalbuphine.
Irish Journal of Medical Science 1987

Dundee JW, **McCaughey W.**
Intravenous versus inhalational anaesthesia.
in : Recent Advances in Anaesthesia, Pain, Intensive Care and Emergency.
1987, APICE, Trieste

Bell PF, Hawthorne P, Lavery GG, **McCaughey W,** Orr IA, Dundee JW
Influence of fasting on postoperative headache in day-stay patients.
British Journal of Anaesthesia 1987, 59 : 934p

Bell PF, **McCaughey W**, Hawthorne P, Dundee JW
Postoperative headache in day-stay patients undergoing minor gynaecological surgery - a pilot study.
Irish Journal of Medical Science 1986, 155 : 330 - 331

Graham JL, Dundee JW, Orr IA, Bahar M, **McCaughey W.**
Pupil size following epidural morphine.
Eighth World Congress of Anaesthesiologists, Manila 1984
Abstracts, vol II, A248

McAuley DM, Moore J, Dundee JW, **McCaughey W**
Oral ranitidine in labour.
Anaesthesia 1984, 39: 433-438

Johnston JR, Moore J, **McCaughey W,** Dundee JW, Howard P, Toner W, McClean E.
Use of cimetidine as an oral antacid in obstetric anesthesia.
Anesthesia and Analgesia.. Current Researches 1983, 62 : 720-726

McAuley DM, Moore J, **McCaughey W,** Donnelly BD, Dundee JW
Ranitidine as an antacid before elective caesarian section.
Anaesthesia 1983, 38: 108-114

McCaughey W, McAuley DM, Moore J, Johnston JR, Dundee JW.
H_2 receptor blockers in obstetric analgesia.
Sixth European Congress of Anaesthesiology, London 1982,
Proceedings, p 11

McAuley DM, Moore J, Dundee JW, **McCaughey W.**
Preliminary report on the use of ranitidine as an antacid in obstetrics.
Irish Journal of Medical Science 1982, 151 : 91 - 92

McCaughey W and Graham Joan L.
The respiratory depression of epidural morphine: Time course and effect of posture.
Anaesthesia 1982, 37: 990-995

McCaughey W and Graham Joan L.
The respiratory depression of epidural morphine.
British Journal of Anaesthesia 1982, 54: 225p

McAuley DM, Moore J, Dundee JW, **McCaughey W**
Preliminary report on the use of ranitidine as an antacid in obstetrics.
Irish Journal of Medical Science 1982, 151: 91-92

Johnston JR, **McCaughey W**, Moore J, Dundee JW.
A field trial of cimetidine as sole oral antacid in obstetric anaesthesia
Anaesthesia 1982, 37:33-38

Johnston JR, **McCaughey W**, Moore J, Dundee JW.
Cimetidine as an oral antacid before elective caesarian section
Anaesthesia 1982, 37: 26-32

Moore J, Howe JP, Dundee JW, Johnston JR, **McCaughey W.**
Cimetidine in Anaesthetic practice.
Chapter in : Cimetidine in the 80's. ed Baron JH
Churchill Livingstone Edinburgh 1981

Johnston JR, **McCaughey W,** Wright PJ, Gamble JAS, Dundee JW.
Increase in intragastric pH after cimetidine and ranitidine.
British Journal of Anaesthesia 1981, 53: 644p-665p

Dundee JW, Moore J, Johnston JR, **McCaughey W.**
Cimetidine and obstetric anaesthesia
Lancet 1981, ii: 252

Howe JP, McGowan W, Moore J, **McCaughey W**, Dundee JW.
The placental transfer of cimetidine
Anaesthesia 1981, 36: 371-375

McCaughey W, Howe JP, Moore J, Dundee JW.
Cimetidine in elective caesarian section.
Anaesthesia 1981, 36:642

McCaughey W, Howe JP, Moore J, Dundee JW.
Cimetidine in elective caesarian section : effect on gastric acidity.
Anaesthesia 1981, 36: 167-172

Howe JP, Moore J, **McCaughey W**, Dundee JW.
The effect of Cimetidine in reducing intragastric acidity in patients undergoing elective caesarian section.
in: Torsoli A, Luchelli PE, Brimblecombe RW eds.
Further experience with H2 receptor antagonists in peptic ulcer disease and progress in histamine research.
1980,174-184 Exerpta Medica , Amsterdam

Howe JP, Dundee JW, Moore J, **McCaughey W.**
Cimetidine : has it a place in obstetric anaesthesia.
Anaesthesia 1980, 35 : 421 - 422

Graham JL, King R, **McCaughey W**
Postoperative pain relief using epidural morphine
Anaesthesia 1980, 35: 158-160

Johnston JR, **McCaughey W.**
Epidural Morphine: A method of management of fractured ribs
Anaesthesia 1980, 35: 155-157

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The effectiveness of cimetidine given prior to elective caesarian section.
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APPENDIX 1.B.
FACULTY RATE.
Q1.D.

CRAIGAVON AREA HOSPITAL GROUP TRUST

JOB DESCRIPTION

JOB TITLE: Medical Director

REPORTS TO: Chief Executive

JOB PURPOSE: To lead the development of a culture in the Trust that embraces radical change in the configuration and delivery of its clinical services. Also to share responsibility, as an Executive Member of the Trust Board, for the quality of clinical services provided, the strategic direction and financial well-being of the Trust while providing professional advice on medical issues.

KEY ACCOUNTABILITIES

1. To be responsible for medical staffing issues in the Trust. In particular, to oversee and ensure that the Trust is in compliance with all its obligations in respect of:

   - Junior Doctors, including New Deal targets, training and performance appraisal.
   - Medical staff appointments, personally acting as a management representative on advisory appointment committees.
   - Performance Appraisal of Consultant and Career Grade Doctors – personally appraising Clinical Directors and agreeing their job plans.
   - Continuing medical education and development of the Trust's medical staff, where appropriate in association with other clinical professions.
   - Undergraduate education.
   - Clinical research.

2. To ensure that appropriate systems are in place within the Trust for familiarising all medical staff with both Trust procedures and the GMC guidance 'Duties of a Doctor'.

3. To ensure the implementation of an effective process of professional self-regulation for doctors employed by the Trust.

4. To take the lead in all medical disciplinary matters.

5. To ensure, in conjunction with Clinical Directors, that every Consultant employed by the Trust has an accurate and up-to-date job plan. To lead the introduction of the new Consultant Contract in the Trust, in the event of this being agreed nationally.

6. To assist the Trust in determining its expenditure on clinical services and to give advice on medical workforce policy including staffing levels, changes in working patterns and skill mix which will ensure the delivery of effective and efficient clinical services to patients.

7. To assist in the future selection of Clinical Directors, leading them in managing clinical services, assisting them with their development needs and supporting them in their role.

8. To develop and support clinical colleagues, generally helping them to understand how the environment has changed and will continue to change, to strive for quality and effectiveness in their clinical work and to become more aware and involved in the management of services.

9. To give effective leadership in all areas relating to clinical governance including clinical standards and risk management, quality of clinical care, clinical performance of the medical workforce, complaints and litigation and processes for performance improvement. In particular, to ensure that a clinical risk management strategy is developed and implemented, within the Trust.

10. To participate in the appropriate committees set up within the Trust to determine the allocation of discretionary points and to advise on merit awards.

11. To take overall responsibility for liaison with the public, other Trusts and Commissioners where clinical issues are involved. In particular, to foster collaborative working relationships.

12. To contribute to the formulation and delivery of the Trust's corporate strategy and service delivery plans.

13. Any other duties as may be required.

14. General Requirements

- All duties to be carried out with full regard to the Trust's Equal Opportunities Policy.
- The implementation of the Trust's Health & Safety arrangements to be fully co-operated with and accidents/incidents, work equipment defects or inadequate safety arrangements to be reported in keeping with Trust Policy.
- The Trust's Policy on Smoking to be complied with.
- All people dealt with in the course of work, to be treated in a courteous manner.

It should be noted that this job description will be subject to review in the light of changing circumstances and should be regarded as providing guidance within which the individual works rather than being seen as rigid and inflexible.

October 2002

EMPLOYEE PROFILE: Medical Director

Factors	Essential	Desirable
Skills and Abilities	Good Interpersonal Skills. ▪ Able to communicate effectively. ▪ Good listener. ▪ Strong Negotiator. ▪ Able to influence others in a positive matter. Able to work effectively within a team including within a Corporate Management Team. Able to help shape a vision for the Trust. Able to lead other clinicians – rather than act as their representative/able to lead in a multi-professional environment. Able to create an environment of openness, integrity and clarity of direction.	Financially aware.
Experience	Some experience of tackling difficult issues and taking difficult decisions. Some experience of medical management. Some experience of achieving change through influence, leadership and persuasion. Some evidence of radical and innovative thinking in respect of the shape of clinical services.	Some experience of thinking strategically.
Qualifications/ Training	Full registration with the GMC. On the GMC specialist register.	Some exposure to management education/training.
Knowledge	Good understanding of the issues relating to clinical governance. Good understanding of the changing environment for healthcare and its implications in terms of the need for new ways of working across organisational boundaries. Good appreciation of the Medical Director's role.	

H

CRAIGAVON AREA HOSPITAL GROUP TRUST

Statement of Main Terms and Conditions of Employment for Senior Managers

This statement is issued by Craigavon Area Hospital Group Trust, (68 Lurgan Road, Portadown, Craigavon BT63 5QQ) giving particulars of the main terms and conditions on which the Trust is employing the undermentioned.

NAME OF EMPLOYEE:

DATE OF ISSUE:

EMPLOYMENT COMMENCES ON:

PREVIOUS CONTINUOUS SERVICE

Previous employment with the National Health Service and the Health and Personal Social Services immediately prior to joining the Trust will count as part of your period of continuous employment for the purposes of a number of Trust Conditions of Service as detailed in the Trust Handbooks which may be inspected at the Human Resources Department. The handbooks will be incorporated in and form part of this contract.

PLACE OF EMPLOYMENT

You are contracted at present to work at Hospital. The Trust may however for operational reasons require you, upon reasonable notice, to change your place of employment, on a permanent or temporary basis, to one of the other hospitals in the Group.

JOB TITLE

You are employed as a . However, depending on the operational needs of the Trust you may be required to undertake such other duties as may reasonably be required of you, commensurate with your level in the Trust.

DUTIES OF THE POST

The duties of the post are contained in the attached Job Description. In addition objectives will be set from time to time between you and your Director in accordance with the Trust arrangements for individual performance review.

REMUNERATION

Your post is subject to the provisions for Senior Managers posts as determined by the Trust's Remuneration Committee. Your commencing salary will be per annum paid monthly. Payment will be made on the third last banking day of each month, by the Bank Automatic Clearing System (BACS). In addition you will be eligible for increases under the Trust arrangements for Performance Related Pay.

PROBATIONARY PERIOD

This appointment is subject to a probationary period, during which time your progress will be monitored. The period of probation will usually be 6 months although this may be extended in circumstances where progress has not been entirely satisfactory and there is reason to believe an extension could provide an opportunity to achieve the required standard. Provided a satisfactory standard is achieved and maintained your employment will be confirmed. In the event of unsatisfactory progress, despite appropriate counselling, your employment will be terminated with one week's notice either during or at the end of the probationary period.

The Grievance and Disciplinary Procedure will not apply to decisions taken to extend the period of probation or to terminate employment on the grounds of inadequate performance during or at the end of that period.

CONTINUATION OF APPOINTMENT

Continuation of your appointment under this Contract is subject to satisfactory performance. Your performance of the duties of the post and your progress in achieving a set of objectives will be reviewed at intervals of not more than twelve months in accordance with the individual performance review arrangements for Senior Managers. The primary aim of this will be to help you achieve the best performance. Unsatisfactory performance, as assessed under the individual performance review arrangements, may be regarded as grounds for disciplinary action which may include dismissal.

Nothing in the foregoing paragraph removes or restricts the Trust's right to take appropriate action including dismissal, in the case of gross misconduct or gross neglect of duty.

HOURS OF DUTY

Managers are expected to work such hours as are necessary for the full performance of their duties including such cover as may be necessary to sustain the management of the Trust in the absence of colleagues.

HOLIDAYS

The Trust recognizes 12 customary holidays each year, details of which are available from your Director.

The leave year runs from 1 April to 31 March each year. If you are in the service of the Trust on 1 April in any year you will be entitled to **???** days annual holiday. If you join the Trust after 1 April you will be entitled in that leave year to annual holidays with pay, proportional to your length of service in the remainder of the leave year. On termination of your employment with the Trust, you will be entitled to annual holidays with pay or pay in lieu thereof, based on your length of service in that leave year less any holidays already taken. Where holidays have been taken in excess of accrued entitlement at the date of termination of employment such excess will be deducted from monies due.

HOLIDAY ARRANGEMENTS

All holiday dates must be approved in advance by your Director. In your own interest you should not make any holiday bookings until you receive such approval.

SICK PAY

Payment will be made for unavoidable absence from work due to sickness or injury in accordance with the provisions contained within the relevant Trust Handbook. Your attention is drawn specifically to the Absence Notification and Certification Procedure which requires you, in the event of illness preventing you from reporting for duty, to notify your Director accordingly, as soon as possible on the first day of illness. If your absence continues after the third day, the submission of a self certification certificate is required and after the seventh day, the submission of medical certificates is required in accordance with the terms of the scheme. It is very important that you familiarize yourself with this procedure and act in accordance with it.

Your entitlement or otherwise to Statutory Sick Pay will be in line with the appropriate regulations and payment will be in accordance with those regulations.

You are required to comply with any reporting requirements and procedures which the Trust may issue from time to time. Failure to do so will affect entitlement to sick pay. Receipt of sick pay does not affect any right which the Trust may have to dismiss on grounds of ill health.

MEDICAL FITNESS

Your appointment is subject to a satisfactory medical report and in this respect you will be required to undergo an initial medical screening. During the course of your employment you may be required to have periodic medical checks which will be in your own interests and those of the Trust.

PENSION

The Trust is a contributor to the HPSS Superannuation Scheme. You have the right to choose how you prepare for your retirement. This means that you have the option of deciding whether or not to contribute to the HPSS Superannuation Scheme. If you do

not advise the Salaries and Wages Department that you will be opting out of this scheme it will be assumed that you are willing to contribute and contributions will automatically be deducted from your salary. To opt out of the scheme you will be required to complete Form SD502 which is available from the Human Resources Department.

RETIREMENT

It is the policy of the Trust to require its employees to retire at age 65. Occupational Pension arrangements are effective from age 60, however it may be possible to retire with superannuation benefits from age 50 onwards. Further information is provided in the Scheme Guide.

TERMINATION OF EMPLOYMENT

Following successful completion of your probationary period, the minimum period of notice you are entitled to receive from the Trust is 4 weeks. After 5 years continuous service you will receive 1 additional week's notice for each completed year up to a maximum of 12 weeks.

You are required to give the Trust 4 weeks' notice of your intention to terminate your employment.

For acts of gross misconduct, employment will be terminated without notice and without payment in lieu of notice.

Where an employee without permission fails to work out his/her notice period (whether notice is given by the employer or employee) he/she will forfeit a sum equivalent to wages for the unworked period from any arrears of wages and/or holiday pay which have not been paid. This applies regardless of the fact that these monies have already been earned.

CONFIDENTIALITY

Through the course of your employment you may become aware of information concerning patients, staff and the business and financing of the Trust. All such information must be treated as confidential. Breach of this confidence will result in action under the Disciplinary Procedure and may lead to dismissal. In the case of information held on computer systems, you will be held personally liable at law if you in any way contravene the appropriate terms of the Data Protection Act.

DISCIPLINARY PROCEDURE

If it is ever necessary to take disciplinary action against you this will be carried out in accordance with the agreed procedure, full details of which are available from your Director or from the Human Resources Department.

GRIEVANCE PROCEDURE

Any grievance relating to your employment should, in accordance with the agreed procedure, be raised initially with your Director. Details of the procedure are available from your Director, or from the Human Resources Department.

EQUAL OPPORTUNITIES POLICY

The Trust is committed to equal opportunities and all employees must adhere to the Trust Equal Opportunities Policy. The aim or our policy is to ensure that no job applicant or employee receives less favourable treatment on the grounds of sex, marital status, disability, religious belief or political opinion. Selection criteria and personnel procedures will be reviewed regularly to ensure that individuals are recruited, promoted and treated in all ways purely on the basis of merit and ability to do the job for which they have applied.

SECONDARY EMPLOYMENT

Should you wish to undertake secondary employment you must ensure that this does not conflict with your employment within the Trust. In such circumstances you should consult the Human Resources Department.

CRIMINAL CONVICTIONS

You are required to immediately notify your Director if you are charged or convicted of any criminal offence.

HEALTH AND SAFETY AT WORK

It is your responsibility to comply with the Trust's Health and Safety policies and procedures and to establish a local Health and Safety policy specific to your area at work through a departmental Health and Safety Committee. You must also identify staff training and induction needs and ensure relevant Health and Safety information is brought to the attention of all staff in your area of responsibility.

POLICY ON SMOKING

It is a condition of your employment that you comply with the Trust's 'Policy on Smoking', details of which will be explained to you at your Departmental Induction.

OTHER POLICIES AND PROCEDURES

You are required to comply with any policies and procedures issued by the Trust from time to time.

CHANGES IN TERMS AND CONDITIONS

The Terms and Conditions applicable to your employment are as specified by the Trust Remuneration Committee. You will be consulted before any amendment is put into force.

CLAIMS FOR DAMAGES AGAINST A THIRD PARTY

If you are absent as a result of an accident caused by a third party, any payments made under the Trust's Sick Pay Scheme are to be refunded out of damages received.

I confirm that I have read and understand this statement along with the attachments and agree to abide by the conditions laid down. I hereby accept the appointment offered on the terms set out above and I authorize the Trust to deduct from my final wages a sum to offset any excess holiday pay received and also up to 1 month's salary if I terminate my contract without giving proper notice.

Signed _____ **Date** _____

NAME
ADDRESS

APPENDIX 1C

CRAIGAVON
AREA HOSPITAL
GROUP TRUST
Caring Through Commitment

Clinical Governance

First Report to Trust Board - June 2000

Clinical Governance

First Report to Trust Board - June 2000

Introduction

Clinical governance [1] is a system through which NHS organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish [2].

This is a complex area covering many aspects of Quality Control, Clinical Performance Assessment, Clinical Effectiveness, Audit, Risk Management, Continuing Education for Medical, Nursing and other Professionals, Complaints and Medical Negligence. It will have considerable medico-legal and funding implications.

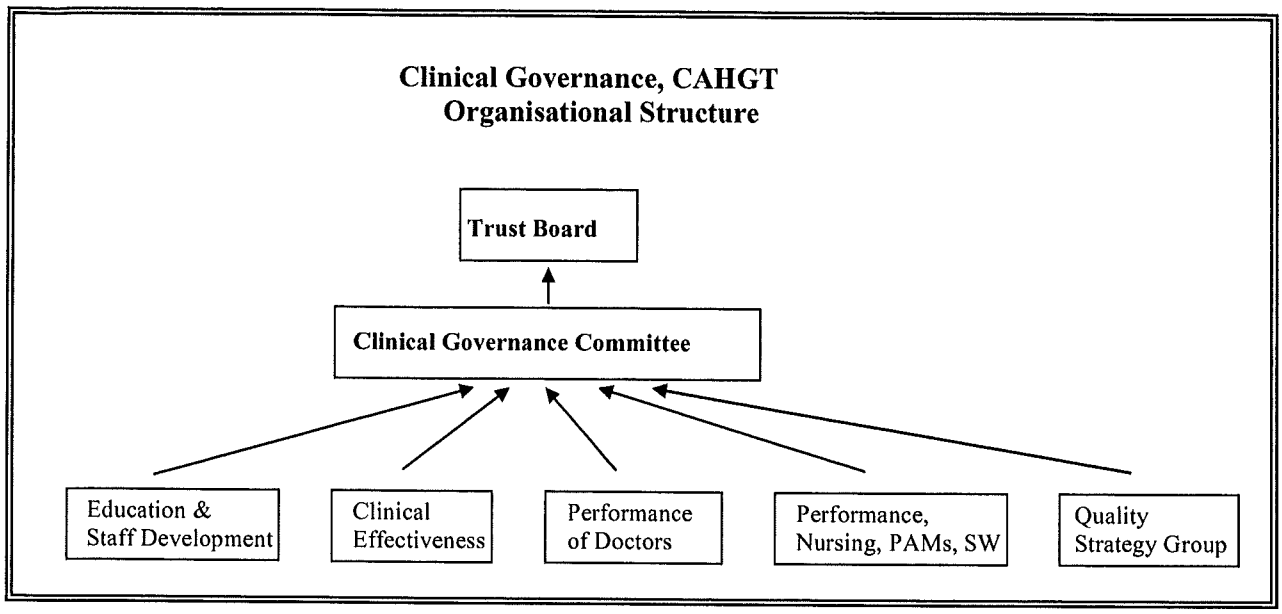
Government guidelines and legislation are still in preparation, and no Trust has a full system in place. In the Northern Ireland context, the Chief Medical Officer has convened a committee, chaired by Dr Ian Carson, to produce appropriate local guidelines for implementation of Clinical Governance. This will produce its first report in the summer.

This Trust has however moved forward in setting in place the main structures needed for implementation, and these have begun to function during the past year. A number of the most important components of an effective system were already well established within the Trust, and have been incorporated.

The organisational structures and reporting pathways which have been agreed, are outlined on the next page. However these may be adjusted as experience is gained and as areas of overlap, or gaps in responsibilities are identified. It is not immediately apparent from this diagram, but is detailed in sections on the sub-groups in the Clinical Governance structures that, so far as possible, the existing Directorate structure of the Trust will be used for the practical implementation of Clinical governance issues.

Clinical Risk Management is not specifically represented in this organisational diagram. This will be an integral part of each Directorate's responsibilities.

1. Governance is an old word - the Oxford English Dictionary has several pages giving examples. The OED also gives four main definitions, of which the third is relevant - *"The manner in which something is governed or regulated; method of management, system of regulations. In Pecock often: A rule of practice, a discipline"* , and its examples go back to 1660 - *"R. Coke Power & Subj. 207 To enquire of the Foundation, Erection, and Governance of Hospitals."*
2. Clinical governance and the drive for quality improvement in the new NHS in England G.Scally, L.J.Donaldson BMJ 1998;317:61-65



Reports to Trust Board:

Monthly - 'Exclusion' reporting of any significant actual or anticipated problems in Clinical Governance (Confidential section of Trust Board meeting)

Six Monthly - Report from Clinical Governance Committee incorporating reports from five individual groups.

1. Clinical governance and the drive for quality improvement in the new NHS in England G.Scally, L.J.Donaldson BMJ 1998;317:61-65

Clinical Governance Subgroup 1:
Education and Staff Development

The first meeting of the Education and Staff Development Committee took place in March 1999.

Following extensive discussion regarding the remit of the Committee it was agreed that their primary focus must be on getting the necessary systems put in place for ensuring that staff have adequate opportunity for personal and professional development.

The members of the Committee agreed that it is vitally important for the Trust to move to a position where: -

- all staff have access to appropriate education and training, whatever their position in the organisation.

- education and learning to meet personal needs is linked as far as possible to what is required to meet the organisation's needs.

The Committee agreed that there is a need for further consideration to be given to its composition. In particular there was a view that it would prove difficult for the Post Graduate Tutor to be involved in such meetings on an ongoing basis given her clinical commitments and also bearing in mind her view that most of the education and development issues in relation to medical staff are already adequately catered for.

It was felt that in due course the Committee would need to be expanded to take account of other staff groups such as Pharmacy, Laboratory, Radiography, Support Staff and Management as well as such issues as I.T. skills.

The Committee also identified that there is a lack of information regarding training within the Trust and therefore proposed that a baseline audit needs to be carried out to establish: -

- what money is spent on training and how that money is used.

- how training needs are currently identified for different staff groups.

- who currently has responsibility for ensuring training needs are met.

- the extent to which necessary training is self funded for different staff groups.

The work which has been identified has not yet been undertaken due to difficulties with resources. It is, however, hoped that the first stage of the baseline audit will be carried out before the end of July and a follow up meeting of a reconstituted Education & Staff Development Committee held by the end of August.

Clinical Governance Subgroup 2: Clinical Effectiveness

This is a key sub-group in ensuring effective Clinical Governance. It was therefore decided that it should be led by a clinician with specific responsibility and dedicated time, who would be known as Director of Clinical Effectiveness. The group includes the Clinical Audit Manager and works closely with the Clinical Audit Department. In initial discussion of the structures for Clinical Governance, two groups were envisaged, dealing with Medical and with Nursing and PAMs issues respectively. It has now been decided that these should all be covered by a single multi-disciplinary group.

The responsibilities of this group include:

- Setting standards for clinical practice;
- Identifying national standards –
  - Guidelines from Royal Colleges;
  - GMC Guidelines;
  - Audits including:
    - Triennial Reports on Maternal Deaths;
    - National Confidential Enquiry into Perioperative Deaths (CEPOD);
    - National Confidential Enquiry into stillbirths and deaths in Infancy (CESDI);
    - Intensive Care National Audit (ICNARC);
    - Existing Area and Hospital audits.
- Setting local standards where none exist nationally;
- Directing and coordinating Clinical Audit in concert with the Directorates to define problem areas, recommend appropriate change and evaluate the effects of changes;
- Ensuring that Audit will provide the basis of an early warning / reporting system for inadequate performance.

Progress report from the Clinical Effectiveness Group - April 2000

The Clinical Effectiveness Sub-Group has continued to focus attention on the main areas of responsibility described below, and has:

- Further developed the organisational framework for implementing Clinical Governance at Trust level.
- Established clear lines of responsibility/accountability and reporting/monitoring arrangements at directorate level.

- Developed a framework to facilitate directorates in implementing a co-ordinated approach to managing several aspects of clinical practice e.g. clinical risk management, adverse events/near misses, complaints, evidence-based practice, clinical audit, complaints, clinical effectiveness, etc.

- Identified the need for support at directorate level to:

  a) facilitate developing and monitoring a clinical improvement programme.

  b) cascade and collate information for inclusion in the reports to the Clinical Governance Steering Committee.

- Established a multi-disciplinary screening group.

- Developed a protocol for requesting assistance from staff in the audit department in order to ensure that resources are focused on the most effective projects.

- Facilitated the ongoing monitoring on the appropriateness of audit relating to Effective Health Care Bulletins.

- Liaised with the Lead Consultant Haematologist in the establishment of a Blood Transfusion Committee.

- **Workload is listed in Appendix 2. Two specific multi-disciplinary projects are mentioned here, as they indicate the needed change in direction of Audit to areas which have a high impact on clinical outcome.**

  a) Developed an action plan on the management and outcome of all cardiac arrests. This project included a comparative audit with the results from the national Bresus study.

  b) Developed an action plan arising from the Trust wide audit on the management of patients who suffered a cardiac arrest outside the CCU.

Short Term Goals

By March 2001 the Director of Clinical Effectiveness and Clinical Audit Manager will work towards:

- Ensuring that the framework at directorate level has been implemented.
- Seeking nominations from directorates regarding the appointment of co-ordinators and (based on timely nominations) ensure that the co-ordinators have undergone a dedicated training programme.
- Outlining an action plan in conjunction with directorate co-ordinators to assist in developing an initial clinical improvement programme.
- Working towards developing a tool to facilitate directorates in undertaking a baseline assessment.
- Ensuring the co-ordination of information for inclusion in the Trust's first Clinical Effectiveness Sub-Group's report.
- Ensuring that awareness of clinical governance is incorporated into induction/mandatory training programmes for all Clinical staff.
- Implementing a hospital wide critical incident reporting system.
- Working with others towards ensuring that action plans arising from clinical effectiveness projects are formally incorporated into manager's appraisals system .

Clinical Governance Subgroup 3:
Conduct, Performance and Health of Doctors

The remit of this sub-group is to look at Performance of Doctors, in terms of their professional conduct, performance and health.

The Conduct, Performance and Health Sub-Group has begun to establish the framework and will monitor the progress through review. Most of the sub-group's time will be spent on prevention, rather than investigating problems that have happened.

In relation to the Performance of Doctors the role of the sub-group will be to:

- ensure that doctors skills and training are recorded and their areas of expertise are defined, and formalise mechanisms for these;
- have evidence of what doctors are capable of performing;
- have a review of what work doctors are actually undertaking to ensure they are working within their area of expertise;
- record doctors expertise and training as well as their compliance with continuing professional development (CPD) as defined by their Royal Colleges;
- look at any area of a doctor's performance that is not falling within appropriate limits;
- ensure that sub-group will become aware of developing problems with doctors conduct, performance and health i.e.
  - concerns highlighted by audit (Clinical Effectiveness Sub-Group);
  - complaints or clinical negligence claims;
  - BMA notification to Medical Director as defined in document - any notification received from protection societies;
  - notification from someone who has concerns within the Trust.

The key to the effective operation of this subgroup will be a system of annual appraisal for all consultants and all other non-training grade medical staff. (Trainees have already in place appraisal systems administered by their Royal Colleges).

Appraisal in this context encompasses performance review and feedback, identifying personal and organisational needs and meeting these through CPD, and is meant to be supportive rather than punitive. The system for appraisal (which has also been described as an 'annual job planning programme') will serve the needs both of the Trust, in the context of Clinical Governance, and of the individual, in the context of revalidation.

The appraisal system for Consultants and other medical staff will involve meetings between each individual and their appraisor at appropriate intervals (not less than annually), at which the

performance, needs and aspiration of the individual doctor are explored under a number of headings -

- Clinical
- Research and Teaching
- Education
- Audit
- Management

These meetings will be non-confrontational and the agenda for discussion will be chosen by both appraisor and appraisee. The meeting will include setting of targets for the next year, and discussion of the achievement of targets set for the current year. This will give opportunity to identify individual or organisational problems. Appraisal will be carried out largely by Clinical Directors, and in larger specialties by Lead Clinicians.

Training in Appraisal skills is essential. For the Trust, training is being organised by Mr R Peyton, FRCS (who is a trainer for the Royal College of Surgeons). Two workshops have already taken place (in March and May 2000) for Clinical Directors and Lead Clinicians.

This scheme has been agreed by Medical Staff, and the first series of appraisals will commence in September 2000.

At the present time, the Royal Colleges are drafting their schemes for monitoring consultants' performance and their CPD. At the same time the General Medical Council is also developing its proposals for revalidation. The Trust's Appraisal Scheme will use criteria laid down by individual Royal Colleges in the appraisal and assessment of doctors, and will inform the GMC revalidation scheme.

Clinical Governance Subgroup 4:
Performance of Nursing PAMs and Social Services

The Performance of Nursing PAMs and Social Services Group is a sub-group of the Clinical Governance Steering Group. The remit of this group is to develop a framework, which will address the issues relating to Clinical Governance within the professions of Nursing and those allied to Medicine and Social Services. The main areas of work which have been considered are :-

- Professional Regulation
- Clinical Standards
- Clinical Risk Indicators
- Scope of Professional Practice
- Education and Training
- Mechanisms of early warning signs
- Guidance of Professional Bodies
- Care Pathways
- Audit and Communication

It was agreed that the Group should meet two monthly. To date this has been achieved. It was also agreed that the group would work through three sub-groups.

- Profession Policy & Planning Group (Nursing)
- PAMS Group
- Social Service Group

Areas that were identified as being important to all the groups were:-

- Framework for Regulating the Scope of Professional Practice
- Assessment of Competencies/Guidelines

Work has commenced in these areas. The framework for regulating the scope of practice for Nurses has been finalised and agreed. Competence assessment is operational for Social Workers. Work in relation to a framework for the regulation of practice and assessment of competence will be undertaken for the PAMS Group.

The remit of the group originally encompassed the two areas of Performance and also Clinical Effectiveness of Nursing, PAMs and Social Work. A review of the Clinical Governance Structure within the Trust has been undertaken and a decision has been taken to combine Clinical Effectiveness Nursing, PAMS and Social Services Group with the Clinical Effectiveness Medical Group. The Performance of Nursing PAMS and Social Work Group has now been established. The remit of this group will now focus on:

- Professional Standards
- Scope of Professional Practice
- Education and Training.

The aim of group will be to ensure that mechanisms are in place to enable Nurses PAMS and Social Workers to achieve a high standard of performance thereby contributing to the quality of care delivered to patient in Craigavon Area Hospital. This will require that appropriate education and training is available and accessible to all staff. A review of staff appraisal and performance will be undertaken for Nursing staff, PAMS and Social Workers.

Clinical Governance Subgroup 5:
Quality Strategy Group

The Quality Strategy Group is a sub-group of the Clinical Governance Steering Group. The remit of this group is to develop a quality culture within the organisation and to formulate a quality strategy for the Trust.

The strategy will reflect the views of the key stakeholders both internal and external to the Trust. It will provide a framework that will facilitate quality plans at different levels of the organisation. The group is inclusive of a wide representation from the Trust, Primary Care and the users.

The Trust is committed to the principle of total quality, which requires services to be delivered to the highest possible standard making best use of available resources.
The aim of the strategy is to provide a framework for the provision of high quality services to all patients, relatives and the wider community.

Quality is everybody's business and staff must accept that quality is a fundamental part of their approach to care and is incorporated in their day to day practice.

The Quality Strategy Group function will mainly be strategic, the provision of advice, support and monitoring.

The main areas of work for this group are:-

- Developing a quality culture
- Evaluating the views of users
- Evaluating the views of Primary Health Care Team
- Continuous quality improvement
- Quality accreditation.

It was agreed that the Quality Strategy Group would meet 4 time per year. The group has met on 3 occasions. A draft Quality Strategy has been formulated. It has been circulated to the members of the group requesting comments on the document. These comments have been considered and a second draft has been circulated to members of the group. Following this it is planned to have the final document completed for presentation to the Trust Board.

Following a half-day workshop in November 1999 facilitated by a Senior Consultant, Beeches Management Centre, an action plan was drawn up covering a wide range of issues that required to be addressed. It was the opinion of the Quality Strategy Group that this action plan required to be more focused. The action plan is being reviewed at present and it is planned to concentrate on two or three issue with projected outcome within a set time frame.

Areas of progress to date:-

- Two areas with the Trust have made application and are making preparations for Charter Mark.
- Baby Friendly Initiative.
- Recommendations of the Deaf Project Group are being implemented. Training for all grades of staff is on going.
- Compliance with Disability Act. Training and an awareness programme is due to commence in the near future.
- Audit on Nursing documentation has been completed and issues identified are being addressed. A staff Nurse has been seconded for 1 year to take forward this project.
- In compliance with the Complaints Procedure all complaints will be recorded at Ward/Department level.

Appendix 1 : Membership of Clinical Governance Committees

Clinical Governance Steering Group

Membership:	Dr W McCaughey	-	Medical Director (Chairman)
	Dr C McAllister	-	Director of Clinical Effectiveness
	Miss B Foy	-	Acting Director of Nursing & Quality
	Mrs M Richardson	-	Director of Human Resources
	Dr AM Telford	-	Director of Public Health, SHSSB
	Dr C Ritchie	-	Clinical Tutor – Postgraduate Centre
Secretariat:	[redacted]	-	Administrator – Office of the Medical Executive

Education and Training Sub-Group

Mrs M Richardson	-	Director of Human Resources (Chairman)
Mr B Beattie	-	PAMs representative
Mr Graham Coulter	-	Finance representative
Mr G Martin	-	Senior Nurse Practice Development
Dr C Ritchie	-	Postgraduate Clinical Tutor

Clinical Effectiveness Sub-Group

Dr C McAllister	-	Director of Clinical Effectiveness (Chairman)
Mrs A Quinn	-	Clinical Audit Manager
Dr NN Damani	-	CD - Laboratory
Dr S Hall	-	CD - Radiology & Imaging
Dr J Lee	-	CD - General Medicine
Dr I Orr	-	CD - Anaesthetics
Mr WJI Stirling	-	CD - Surgery
Mr D Lowry	-	CD - Obstetrics & Gynaecology
Dr C Humphrey	-	CD - Cancer Services
Mrs E O'Rourke,	-	CSM Medicine
Miss N O'Donnell	-	CSM Surgery
Mrs M Hynes	-	CSM O&G
Mrs R Corvan	-	Quality Co-ordinator
Mrs M McCaffrey	-	CSM Anaesthetics & Theatres
Mr B Beattie	-	PAMs representative
Mrs I Cullen	-	Social Work representative
Dr L Doherty	-	SHSSB representative

Conduct, Performance and Health of Doctors Sub-Group

Dr W McCaughey	-	Medical Director (Chairman)
Dr NN Damani	-	CD - Laboratory
Dr S Hall	-	CD - Radiology & Imaging
Dr J Lee	-	CD - General Medicine
Dr I Orr	-	CD - Anaesthetics
Mr WJI Stirling	-	CD - Surgery
Mr R Wallace	-	Chair, Medical Staff
[redacted]	-	Administrator - Office of the Medical Executive

Appendix 1 : Membership of Clinical Governance Committees. (Continued)

Performance, Nursing, PAMs and Social Work Sub-Group

Miss B Foy	-	Director of Nursing
Mrs E O'Rourke	-	CSM (Medical)
Miss N O'Donnell	-	CSM (Surgical)
Mrs M Hynes	-	CSM (O&G)
Mrs M McCaffrey	-	Theatre Manager
Mrs H Neill	-	Outpatients Manager
Mrs I Cullen	-	Head of Social Services
Mr G Martin	-	Senior Nurse Practice Development
Mr B Beattie	-	PAMs Manager
Miss E Corr	-	Quality Co-ordinator
Mrs A Quinn	-	Clinical Audit Manager
Miss J Agnew	-	Pharmacy

Quality Strategy Group

Miss B Foy	-	Acting Director of Nursing
Dr W McCaughey	-	Director of Medical Services
Mr LA Stead	-	Director of Finance
Mr P Legge	-	Director of Estates
Miss A Friel	-	Head of Pharmacy
Miss E Corr	-	Quality Co-ordinator
Mr B Beattie	-	Head of Physiotherapy
Mr S Magee	-	Chief Officer, SHSSC
Mrs A Quinn	-	Clinical Audit Manager
Mrs H Walker	-	Human Resources Manager
Dr C Humphrey	-	Clinical Director - Cancer Services
Mrs M Doran	-	Health Visitor - Coalisland
Mrs G Maguire	-	Health Promotion Manager
Mrs H Neill	-	Outpatients Manager
Dr R Logan	-	General Practitioner
Mr T Gervan	-	Laboratories, STH
Sr. M Wright	-	Delivery Suite, CAH
Mrs I Cullen	-	Senior Social Worker, CAH
Mrs E O'Rourke	-	CSM - Medicine
Mr J Doran	-	Non-Executive Director
Dr C Ritchie	-	Postgraduate Clinical Tutor
Dr M Davidson	-	General Practitioner, Lurgan
Dr P Beckett	-	General Practitioner, Armagh

Appendix 2

Workload Sheet for Audit Department 1999 - 2000

Appendix 1D.

CRAIGAVON AREA HOSPITAL GROUP TRUST

CLINICAL GOVERNANCE STEERING COMMITTEE

Minutes of the meeting of the Clinical Governance Steering Committee held on Monday 7th February 2000 at 3.30pm in Room 3, Postgraduate Centre, CAH.

Present:	Dr W McCaughey	-	Medical Director (Chair)
	Dr C McAllister	-	Director of Clinical Effectiveness
	Miss B Foy	-	Acting Director of Nursing & Quality
	Mrs M Richardson	-	Director of Human Resources
	Dr AM Telford	-	Director of Public Health
	Dr C Ritchie	-	Clinical Tutor – Postgraduate Centre
Secretariat:	[redacted]	-	Administrator – Office of the Medical Executive

CG1/00 MINUTES

The Minutes of the meeting held on 27th January 1999 were approved by the Committee.

CG2/00 MATTERS ARISING FROM THE MINUTES

(i) Remit of the Sub-groups

Dr Telford enquired whether the Committee was aware if the sub-groups under its control were focused and working within an appropriate remit. It was accepted that this group should have formal remits from the sub-groups to check and ensure they are undertaking and dealing with the right issues.

(ii) Timescale

The Chairman pointed out that Dr I Carson, MD at RVH, had stated at the recent Trust Medical Director's meeting that if structures were up and running by April 2000, this was all that was required at present.

CG3/00 REPORTS FROM SUB-GROUPS

- *Risk Management*

This group met once in March 1999. Members on this group had questioned whether Risk Management should come under the auspices of the Clinical Governance Steering Committee, since the issues being dealt with were non-clinical. It had also been felt that the area of Controls Assurance should be dealt with outside the Clinical Governance area. The Risk Management Group considered it should be reporting to an overall Corporate Governance Group which was non-clinical.

The DHR advised that the CX had asked her to provide him with proposals on how to deal with Controls Assurance. She explained that Controls Assurance within the Health Service, was to make best endeavours to look at risks and potential problems. The Government have stipulated that Controls Assurance should be applied across all aspects of work. Mrs Richardson explained that a statement would have to be provided covering all internal controls from 1999/2000. Work undertaken nationally, identified a whole range of non-clinical Controls Assurance areas where standards would be required. Measures would have to be introduced to assess where the Trust stands with regard to Controls Assurance and mechanisms put in place. In the Annual Report the Trust will be required to state that it was addressing Controls Assurance and making best endeavours to comply with necessary standards.

Following discussion it was decided that the Risk Management Sub-group should not be part of 'clinical governance'. However, a system was required whereby the Trust had confidence that advice was being given and that action was being taken to ensure clinical critical incidents were dealt with and do not re-occur. It was recommended there should be a Risk Management strategy for each of the directorates and that this should be part of regular directorate meetings. It would be necessary to focus the minds of the Clinical Directors and through them, to other staff at grass roots level. This practice would require a shift in culture.

Mrs Richardson agreed to undertake additional background reading on Controls Assurance. The issue would be discussed at the Corporate Business Group and possibly at Hospital Council level. The matter would then be raised again at this Committee to consider what modifications required to be undertaken.

- *Education and Staff Development*

The DHR confirmed that this sub-group had met once. She and Dr Ritchie had also met at the beginning of February 2000 to discuss the role of the sub-group and how it should embark on education and staff development work, taking account of the impact this would have on Dr Ritchie's time. Other members assigned to this sub-group had since left the Trust and its membership was well depleted.

Dr Ritchie questioned whether there was a need for her to be on such a group. She explained that the education and training of junior medical staff was under control i.e. each doctor had a contract with the Trust, links with the Postgraduate Council, received guidance for their training and there was an appraisal system in place. Continuing Professional Development for Consultants and Performance of Doctors was the remit of the Medical Director. Miss Foy confirmed that nursing education was the responsibility of Mr G Martin in the Trust. Appraisal of consultants would be introduced within the Trust in the next few months. The Medical Director would undertake the appraisal of Clinical Directors; Clinical Directors would appraise the consultants within their directorate. Within a large directorate, Lead Consultants would also be involved in the appraisal process. From a professional point of view clinical governance provides a mechanism which pulls together and monitors the systems that ensure the service meets quality standards as laid down by Royal Colleges and professional bodies.

The Group decided that the professionals should not be included in the Education and Staff Development Sub-group. Mrs M Richardson was asked to enquire what process had

been established in other Trusts. In the meantime, the DHR felt there were wider issues about training within the Trust that required to be tackled as well as the funding that would be needed. She felt the option of retaining the Education and Staff Development Group should remain in order to consider such issues.

- *Clinical Effectiveness*

Dr McAllister reported there had been one meeting of the Clinical Effectiveness Sub-group to discuss clinical teams developing audit at directorate level. Consideration was given to two Trust wide projects which were proposed, to obtain consensus from Clinical Directors, on the appropriateness of these.

It was proposed to establish a Screening Group consisting of Dr C McAllister, Mrs E O'Rourke and Mrs A Quinn. A pro forma had been drawn up which project leaders would complete. The proposal of a Screening Group would be to assess the appropriateness of support from the Audit Department.

Dr McAllister reported that the important message was –

(i) to have structures in place that were robust and would stand up to scrutiny;
(ii) to await the report from the Department of Health on quality;
(iii) there needs to be an efficient transfer of information within directorates and transmission of information back out from directorates through Clinical Directors to Clinical Effectiveness Sub-group;
(iv) the collection of medical, nursing, and PAMS information to ascertain whether there was a critical risk pattern emerging.

There should be a co-ordinator appointed within each directorate to transmit concerns both downwards and upwards. CSMs should collect the information and draw up a report on patterns developing. Information should be fed in and fed up from grass roots level. Staff must be encouraged to let the co-ordinator know of any incidents they consider worthy of reporting. It was felt the majority of co-ordinators should be nursing except in the Laboratory and Radiology Support Services. Time would require to be allocated to them for training. This was the proposal for the Trust's monitoring of critical incidents.

Dr Telford enquired if monitoring of critical incidents would be a regular part of a directorates meeting. Members agreed there should be a Risk Management Strategy for each of the directorates which would focus the minds of the CDs and through them, down to grass roots level. The Committee considered this would require a shift in culture.

The Committee decided that a document required to be drawn up on the changes required in culture if the Trust wished to have a 'no blame' critical incident reporting system in place. This would be difficult with the changeover of junior medical staff.

In order to make the Clinical Effectiveness Sub-group more effective and responsive to all professional groups within the Trust, it was recommended by the MD and Dr C McAllister that the Clinical Effectiveness Sub-group should have a wider area of responsibility. The Committee was circulated with a revised Organisational Structure Chart dated February 2000 which formalised the relationships and communication pathways.

The Clinical Effectiveness Sub-group when originally established had a strong medical representation. It was now considered to be more appropriate to focus the Clinical Effectiveness role through directorates and this required the membership to change to include nursing and PAMS as well as medical. The recommendation put forward by the MD and Dr McAllister for the membership of the Clinical Effectiveness Group was Dr C McAllister (Chair), three Clinical Services Managers, Mrs A Quinn (Audit Manager), six Clinical Directors, SHSSB Representative and two PAMS Representatives i.e. Mr B Beattie; Mr B Magee. It was felt the Quality Co-ordinator was no longer required on the Clinical Effectiveness Sub-group, but should continue to be a member on the Quality of Patient Care Sub-group.

There was also the concept that between the sub-groups and directorates there required to be a Screening Group to co-ordinate the day to day activities and pull together the information obtained from directorates and the other sub-groups. All Clinical Effectiveness issues would now be dealt with by the Clinical Effectiveness Sub-group. Consideration was also given as to whether the sub-group should be called Clinical Effectiveness and Risk Management, taking account of all clinical categories, but it was felt this was an issue that would require to be discussed at a later stage, when the overall Clinical Governance picture became more focused.

The Committee asked to be furnished with the proposed membership of the Clinical Effectiveness Group

- *Performance of Doctors*

The MD advised that this sub-group had met on two previous occasions and it was hoped to have a a further meeting in a fortnight's time. The sub-group would be implementing a basic structure for consultant appraisal based on the Leicester Royal Infirmary. Dr McCaughey had invited Mr R Peyton to the next meeting. Mr Peyton was a tutor for Continuing Professional Development for the Royal College of Surgeons and had expertise in the Consultant Appraisal System. Mr Peyton would be asked to help with training for undertaking consultants' appraisals. A database would have to be developed and it was hoped in two years time to have reached GMC standards. Once the appraisal system was in place, Continuing Professional Development would follow.

Mrs Richardson pointed out the difficulty in making appraisal work effectively and advised that appraisal training was crucial to a successful outcome.

- *Performance, Nursing, PAMS, Social Work*

This sub-group has had six meetings. A draft framework for clinical competence had been drawn up within nursing, speech therapy, occupational therapy, physiotherapy and social work. It was noted that staff within Professions Allied to Medicine were looking to their professional bodies for guidelines and social work staff were looking towards the Inspectorate of Social Work for their guidelines. In the areas of clinical risk and near misses, consideration had been given to education and action plans, with the agreement also that there should be a 'no blame 'culture introduced.

Miss Foy stated that people must be 'accountable and responsible' and incidents should be looked at anonymously.

- *Quality Strategy*

  This sub-group has had two meetings, the second meeting was a half day session to brain storm about quality strategy. The first draft document on strategy has been drawn up and circulated for consultation.

CG4/00 STRUCTURE

The Committee accepted that modification and evolution of the structure was not yet complete. There has been restructuring but links need time to evolve.

CG5/00 REPORT TO THE TRUST BOARD

The Committee agreed that the Chairman should draft a report to the Trust Board for April 2000. This should contain the initial structure established, the modifications proposed at today's meeting, a resumé of the various sub-groups and their membership and the work being undertaken within each area and how potential problems would be dealt with. The Chairman agreed to forward each member of the Committee with a draft copy of the report for their comments before this was forwarded to the Trust Board.

Non-clinical Risk Management would report separately to the Trust.

CG6/00 ANY OTHER BUSINESS

(i) Change in Culture

How would this be achieved? It was agreed there should be a pro forma standardised across the Trust, there should be clarification for staff on what was expected from them, it should be explained that monitoring would be undertaken with anonymity, discuss factors that put people at risk, how critical incidents would be investigated and the possible use of disclosable documents and what the nurse/doctor would be expected to officially notify. Each directorate would require advice on how to go about achieving this change.

It was recommended that educational supervisors should be responsible for ensuring that junior medical staff sign documentation confirming that they have received and read the information provided to them on maintaining standards.

CG7/00 DATE OF NEXT MEETING

It was agreed the next meeting should take place on Monday, 18th September 2000 at 3.30pm.

Southern Health and Social Care Trust

Overview of Information Contained in Appendices

T1 INTRAVENOUS FLUIDS IN CHILDREN

Appendix	Document Type	Document Created	Document Title	Document Purpose
T 2	Power Point	November 2000	Paediatric Anaesthesia	Talk given to theatre & recovery nurses, and also anaesthetic trainees over a number of years.
T 3	Written Information	September 2001	Hyponatraemia in children	Information included in trainee anaesthetist induction packs.
T 4	Excerpt from CAH Department of Anaesthetic Orientation Manual (page 51)	August 2002	Paragraph entitled IV Fluids	Given to Anaesthetic Trainees
T5	Seminar Programme	August 2002	Friday Seminars 2003-2004	Included in a seminar for anaesthetic trainees in October 2003 Electrolytes/ Blood Components
T 6	Seminar Programmes	N/A	Medical SHO Tutorials 2001 - 2006	Seminar Programme
T 7	Power point	2003	Hyponatraemia	Included in the medical induction programme
T8	Power point	2004	The Good Prescribing Guide.	Included in Generic Induction Programmes
T 9	Power point	2003 - 2006	IV Fliud Management	Included in F1 Induction Programme
T10	F1 Induction Programme	2003, 2005,2006	Induction Programme for junior doctors	Appendix 8 was presented as part of the induction programme
T11	Generic Induction Programmes	2004 -2006	Generic Medical Induction Programmes	Induction Programme
T 12 WORD	Minutes	29th March 2004	Clinical Services Manager/Sisters Meeting	Point 19 refers to the Management of Hyponatraemia
T 14	Power point	July 2001	Water Water Everywhere – and Not a Drop was Drunk	Friday lunchtime postgraduate clinical meeting (open to all Drs in the hospital)

T13 ULSTER MED JOURNAL.

T 1

Appendix 1

Intravenous Fluids in Children

Dilutional hyponatraemia has been documented in otherwise healthy children following routine elective surgery. It occurs in (often female) children 3-10 years of age and is associated with "stress" such as postoperatively.

A fluid for children recommended for many years as a standard is 0.18 NaCl in 4% Glucose. It contains 40 mmol/l of sodium which when administered at the calculated rate (4 mls/kg/hour for the first 10 kgs body weight) provides the daily requirement of sodium and glucose.

0.18 NaCl in 4% Glucose is **isotonic** *in vitro* ie has the same osmotic potential so will not cause fluid shifts within the body. However in the catabolic (sick) child the glucose is metabolised rapidly causing the fluid to become ***hypotonic*** thereby leading to massive fluid shifts. At the same time because of the loss of fluid from the circulation often combined with a degree of dehydration a potent anti-diuretic hormone (ADH) response causes the kidneys to retain water resulting in a low volume concentrated urine, high in sodium. This may be compounded by the administration of a "fluid challenge" to elicit an improved urinary output.

This is a "double whammy" excess free water is administered and excess free water is retained. Water is drawn across blood capillaries into the interstitial and intracellular spaces. The child will become "puffy" looking and of greater consequence the brain will swell with the shift of water, leading to seizures and herniation of the tentorium and death. Therefore to prevent hyponatraemia we must limit the free water component of intravenous fluids AND monitor urine output and serum chemistry.

Recommendations:

1. Regular measurement of blood biochemistry, including a baseline measurement and measurements following each intervention, eg, fluid resuscitation or surgery.

2. Maintenance fluids should be calculated separately from "replacement" fluids. The rate of maintenance fluid is critically dependent on body weight, which should be accurately measured or estimated by a professional with substantial paediatric experience.

3. DO NOT give GLUCOSE containing intravenous fluids for fluid resuscitation. This is in keeping with APLS recommendations (use 0.9% NaCl, Normal Saline or other salt solution). You MUST measure blood sugar and administer a GLUCOSE bolus if there is hypoglycaemia (< 3 mmol/L).

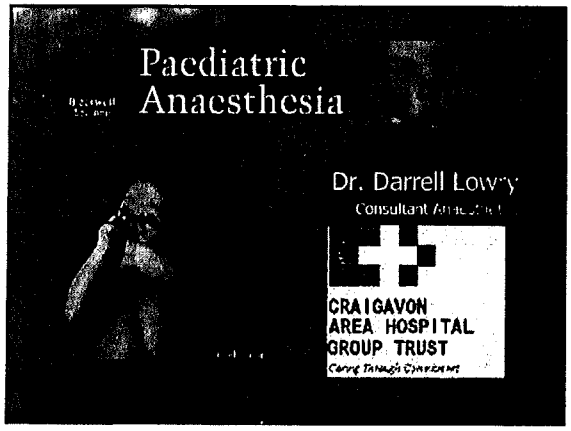
AVOID albumin as an immediate fluid bolus unless there are specific indications. Fresh Frozen Plasma (FFP) is indicated if there are infection or coagulopathy problems.

The usual resuscitation volume is 10-20mls/kg bolus over 15-60 minutes depending on the clinical state.

4. Maintenance fluid should contain at least 0.45%NaCl in 2.5% Glucose. A balanced salt solution such as Normal Saline or Hartmann's does not contain glucose. Regular, 12 hourly, blood sugar estimation is required and must be documented.

T2.

26/09/2013



Paediatric Anaesthesia

- Children are NOT 'small adults'
- Anatomy
- Physiology
- Pharmacology
- Equipment
- Miscellaneous

Anatomy

- Large head c/w body
- Large tongue
- Anterior larynx
- Floppy 'U' shaped epiglottis
- Neonates are nasal breathers
- Narrow, collapsible airways

Estimated weight of child

Weight (kg) = [age (yrs) x 2] + 8

Physiology

High BMR
Desaturate rapidly
Small FRC
Cardiac output is 'heart rate driven' (CO = HR X SV)

Temperature Regulation

Babies have high BMR
Large BSA
Lose heat rapidly
Non-shivering thermogenesis (brown fat) until > 2yrs

Temperature Regulation (2)

Keep covered
Increase ambient temperature
Warming mattress, hot air warmers

Fasting Guidelines (ASA 1999)

2 hrs Clear Fluids

4 hrs Breast Milk

6 hrs Solids

Bolus I.V. Fluids

20 mls / kg crystalloid (N Saline or Hartmanns)
Replace half fasting deficit + maintenance fluid during first hour of surgery

Maintenance I.V. Fluids

4 ml / kg / hr for 1st 10 kg

2 ml / kg / hr for next 10 kg
(+ 40 mls /hr)

1 ml / kg / hr for weight over 20 kg
(+ 60 mls / hr)

Crystalloids

Hartmann's solution

Normal Saline

No. 18 solution (0.18% Na Cl in 4% dextrose) - maintenance only

10% dextrose (neonates)

NO place for 5% dextrose

Beware hyponatraemia due to stress response

Colloids

To replace plasma volume eg. Trauma, laparotomy

HPPF (4% albumin) N.B. Cochrane database meta-analysis

20% albumin only for neonates

Gelofusine / Haemacell / Hespan unlicensed & not well studied in kids although are used elsewhere

Pharmacology

- Most drugs used in paediatrics are 'outside product licence'
- Most work done on older drugs
- OK if major body of opinion supports their use
- Our benchmark is RBHSC

Premedication

- Pre-op visit
- EMLA (**Eu**tectic **M**ixture of **L**ocal **A**naesthetics - lignocaine & prilocaine)
- Ametop (amethocaine)
- Midazolam syrup (0.5 mg/kg)

Induction - Inhalational

- Sevoflurane : non-irritant, rapid onset / offset (insoluble)
- Halothane: cheap, arrhythmias

Induction - Intravenous

Propofol: pain on injection

Thiopentone: more 'hangover'

Ketamine: good analgesic, nightmares

Parental presence at induction

Widespread in UK

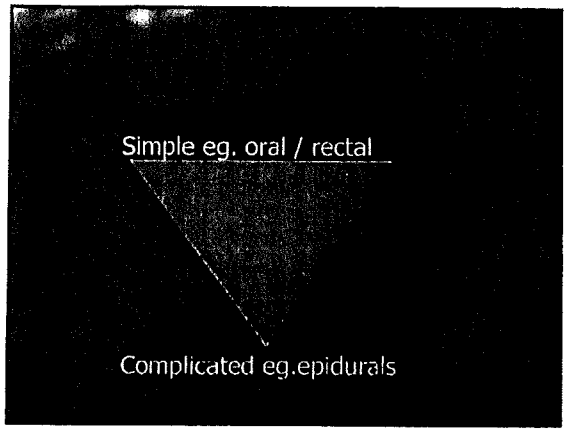
Only 50% of US paed anaes allow parents

? Benefits

Adequate parental escort necessary

? NOT in emergencies, < 1yr, anxious parent

Analgesia



Analgesia

- Multimodal
- Paracetamol PO / PR 15 20 mg / kg
- Diclofenac PO / PR 1 mg/kg
- Opioids (depending on severity of surgery) eg. Codeine, morphine, pethidine
- LA if feasible
- Morphine infusion / PCA (>6 yrs)

Morphine Infusions

- Dedicated infusion pump
- Separate I.V. line or 'one-way valve'
- Morphine bolus 0.1 mg/kg I.v. intra-op
- Morphine dose = 0.5 mg/kg in 500 mls N Saline
- Run at 10 mls/hr
- If inadequate analgesia increase to 20 or 30 mls/hr (30 mls/hr maximum)

Patient Controlled Analgesia (PCA)

- Children > 6yrs
- Graseby pump
- Morphine 20 mcg/kg bolus
- 5 minute lockout
- No background or 5 mcg/kg/hr
- Nursing observation chart

Nurse Controlled Analgesia (NCA)

- Younger children < 6 yrs
- Principle is background morphine infusion 10 mcg/kg/hr
- Nurse controlled boluses if analgesia inadequate
- 30 minute lockout
- Close supervision necessary

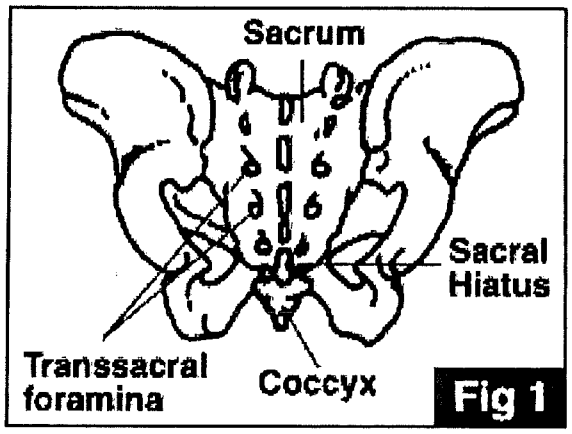
Regional Anaesthesia

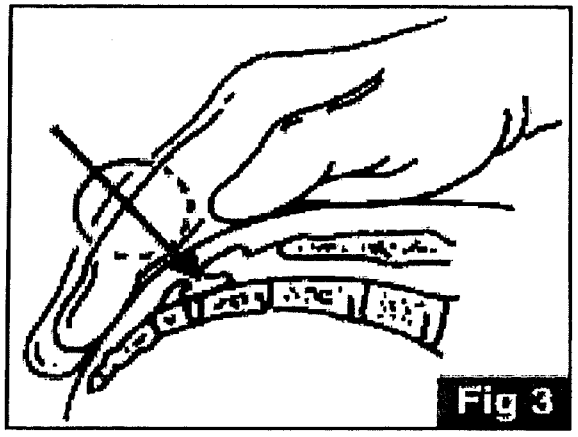
Advantages
- excellent analgesia
- allow lighter GA
- faster wake-up times
- rapid, pain-free recovery

Disadvantages
- need GA
- extra pair of hands
- special training
- risks & complications of GA + LA

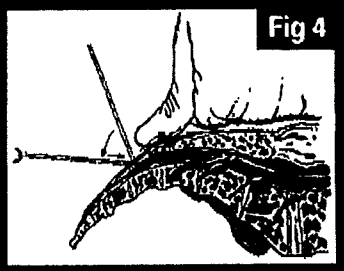
Caudal Block

- Epidural injection through sacro-coccygeal membrane
- Suitable for sub-umbilical procedures
- Aseptic or 'no-touch technique'
- Bupivacaine 0.125% 1 ml/kg minimises risk of motor block, urinary retention
- Adjuncts eg. Clonidine, Ketamine





Caudal Block



Epidurals

Lumbar or thoracic
In babies can insert caudal catheter & feed up to appropriate level
Reserve for major surgery eg. Urology
Need High Dependency nursing care

Peripheral Nerve Blocks

Depend on type of surgery
Nerve stimulator (Stimuplex) useful
Examples: femoral n. block
axillary block
ilio-inguinal block
penile (dorsal nerve) block
Significant learning curve

PONV

Risk factors	Prevention
previous history	hydration
female	slow mobilisation
age > 1yr	discourage early post op oral fluids
type of surgery tonsillectomy, 'bat ears', squint, orchidopexy	Ondansetron 0.1 mg/kg best drug (lack of side effects)

Airway Equipment

Face masks (clear, appropriate size, flavoured eg. strawberry)

Oropharyngeal airways (Guedel)

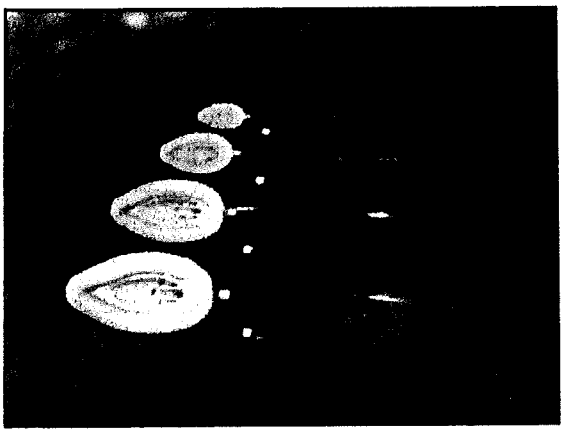
Nasopharyngeal airways

LMA (sizes 1, 2, 2.5, 3)

ETT - uncuffed (<12 years)
standard, RAE, nasal

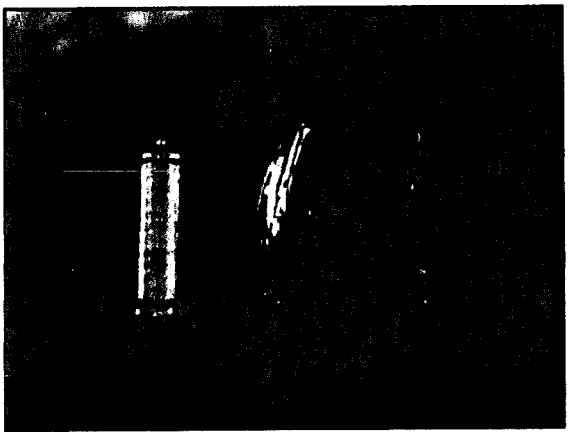
Laryngeal Mask Airway

Size	Weight (kg)	Cuff vol (ml)
1	< 10 kg	5
2	10 - 20	10
2.5	20 – 30	15
3	> 30	20



Airway equipment (2)

- Size of ETT = age / 4 + 4
- Length = 'black line' or age / 2 + 12
- Tapes (pre-cut)
- Laryngoscopes - straight blade (neonates) vs Mackintosh
- Stilette / introducer

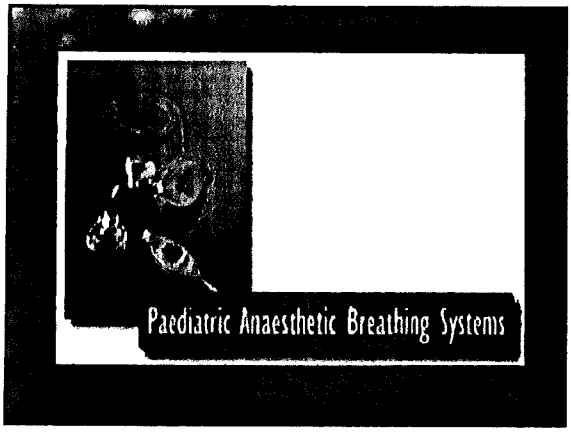


Breathing Circuits

Ayre's T piece - no valves, low resistance, no scavenging, need FGF > 3 l/min

Humphrey ADE - low flow possible

Circle system (Cato, Ohmeda) - >20 kg, narrow bore tubing, low flow



Ventilators

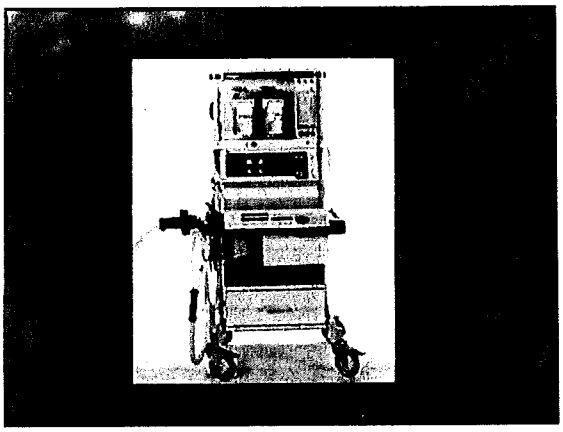
Provide low tidal volumes eg. 20 mls

Pressure controlled (because of leak)

'Old style' Penlon Nuffield (with Newton valve for < 20 kg)

Cato is able to ventilate neonates without changing bellows

Ohmeda needs paediatric bellows



Monitoring

Pulse oximeter (non-invasive, well tolerated)
ECG
NIBP
ETCO2 / Agent
Praecordial stethoscope
Temperature
Invasive - ABP, CVP (femoral)

Special problems

Child with a 'cold'
Child with a murmur
Ex-premature infants (post conceptual age < 60 weeks at risk of apnoea)
Asthma

Day Case Surgery

Induction: Sevo or Pro (3-4 mg/kg)
Maintenance: Sevo / N_2O / O_2
Facemask or LMA
Caudal (1 ml/kg 0.125% bupivacaine) or Nerve Block (ilio-inguinal, penile etc.)
Diclofenac 1 mg/kg PR
KEEP IT SIMPLE

Pyloric Stenosis

Healthy babies
4-6 weeks old
More common in boys
NOT an emergency
Metabolic disturbance due to vomiting

IV infusion
Ryles tube
RSI
Infiltrate wound with Bupivacaine + Paracetamol PR
No longer a place for 'occasional' paediatric practice

Other Locations

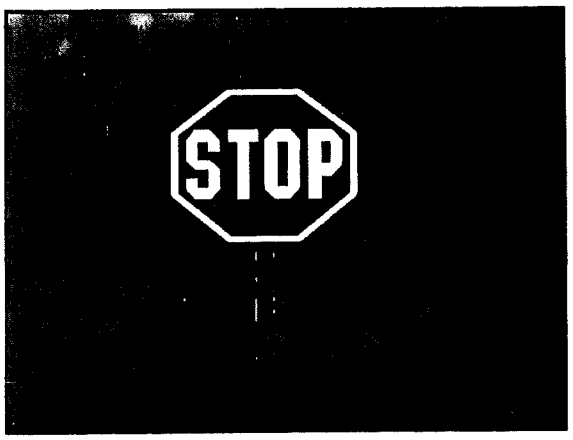
Radiology - oral Midazolam (sedation protocol); occasional G.A. / IV Sedation (CT scanner, ? MRI)
A&E - Resus; Fracture reductions (IV Ketamine + Midazolam)
Ward (3 North) - resuscitation & assessment

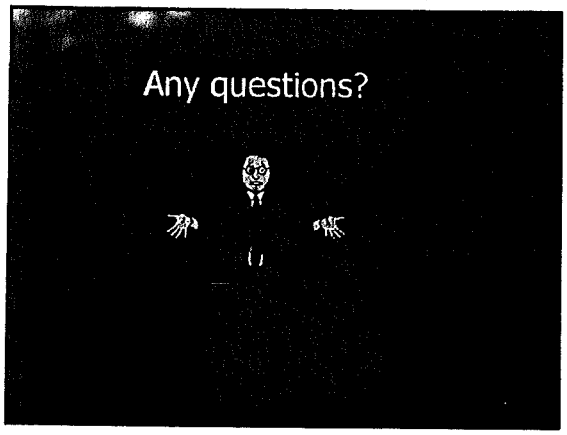
Transfers

- Usually to PICU (RBHSC)
- ? Transfer team in the future
- Must stabilise before transfer
- Intubate / Ventilate / Sedate
- Secure IV access, ?arterial line
- Ventilators - 'Sputnik' Seachrist for neonates (from NNU)
- BabyPac portable transport ventilator

Ideally....

- Child friendly environment
- Dedicated children only lists
- Children's recovery ward
- Named Consultant Paediatric Anaesthetist
- Consultant Surgeon with interest in paediatrics




Any questions?

T3

Appendix 3

Hyponatraemia in children

Dilutional Hyponatraemia has been documented in otherwise healthy children following routine elective surgery. It occurs in often female children 3-10 years of age and is associated with "stress". Risk factors include; Hypernatraemia, dehydration (>7%), Stress; Nausea, pain, anxiety, certain drugs, disturbances of the Central Nervous System and Metabolic and Endocrine disorders.

A fluid for children recommended for many years as a standard is 0.18 NaCl in 4% Glucose. It contains 30 mmol/l of sodium which when administered at the calculated rate (4 mls/kg/hour for the first 10 kgs body weight) provides the daily requirement of sodium and glucose.

0.18 NaCl in 4% Glucose is **isotonic** *in vitro* ie has the same osmotic potiental so will not cause fluid shifts within the body. However in the catabolic (sick) child the glucose is metabolised rapidly causing the fluid to become ***hypotonic*** thereby leading to massive fluid shifts. At the same time because of the loss of fluid from the circulation often combined with a degree of dehydration a potent anti-diuretic hormone (ADH) response causes the kidneys to retain water resulting in a low volume concentrated urine, high in sodium. This may be compounded by the administration of a "fluid challenge" to elicit an improved urinary output.

This is a "double whammy" excess free water is administered and excess free water is retained. Water is drawn across blood capillaries into the interstitial and intracellular spaces. The child will become "puffy" looking and of greater consequence the brain will swell with the shift of water, leading to seizures and herniation of the tentorium and death. Therefore to prevent hyponatraemia we must limit the free water component of intravenous fluids AND monitor urine output and serum chemistry.

Halberthal M et al studied 23 patients studied with acute hyponatraemia. All received hypotonic fluids (plasma Na+ < 140 mmol/l). 16 (70%) received excessive maintenance fluids (>50%). 13 (57%) were postoperative patients and 18 (78%) developed seizures. 5 (22%) Died (Brainstem death), 1 severe neurological deficit.

Appendix 3

Recommendations to prevent Acute
Hyponatraemia in Children

To prevent the uncommon but serious problem of dilutional hyponatraemia the free water component of intravenous fluids must be limited. Acute hyponatraemia is often unheralded, therefore care must be taken in the prescription and administration of intravenous fluids. Finally surveillance of the patient receiving intravenous fluids is vital.

1. **Body weight** must be accurately measured or estimated by a professional with substantial paediatric experience. The estimation of body weight can be made using the child's age; **Body weight = (AGE+4) x 2**
This weight should be plotted on a Centile Chart as a cross check. If the weight is beyond the 3rd or 97th Centile range then the weight must be re-examined.

2. **Fluid Calculation.** Maintenance fluids should be calculated carefully.
An accepted guide to maintenance fluid administration is;

For the first 10 kgs body wt give 4 mls / kg / hour *(40 mls/hr for a 10 kg infant)*
For the second 10 kgs body wt give 40 + 2 mls / kg / hour *(60 mls/hr for a 20 kg child)*
For each subsequent 1 kg body wt give 60 + 1 ml / kg / hour *(70 mls/hr for a 30 kg child)*

3. **Maintenance fluid** should contain **at least** 0.45%NaCl in 2.5% Glucose.

4. **Chemistry.** A baseline blood sample must be sent for Na+, Urea and blood sugar. Regular Na+ and blood sugar estimation is required and must be documented. This will mean at least once and often twice daily samples. An indwelling heparinised cannula or capillary sample will avoid sampling difficulties in the anxious child or those with poor veins. Do not take samples for the same limb as the intravenous infusion.

5. **Other Fluids.** DO NOT give GLUCOSE containing iv fluids for fluid resuscitation. This is in keeping with APLS recommendations (use 0.9% NaCl, Normal Saline or other salt solution). Give 5 mls/kg 10% GLUCOSE bolus if there is hypoglycaemia (< 4 mmol/L). Care must be exercised when additional fluids are administered. Intravenous antibiotics, oral fluids or contrast media are commonly forgotten additional fluids.

6. **Fluid balance.** Measurement of urine output or body weight is mandatory. Daily body weight measurement will accurately assess free fluid but is not feasible in the surgical bed bound child with acute pain. Urine output must be measured and clearly documented. An experienced doctor must assess fluid balance at least twice daily and take appropriate action to correct fluid loss or retention. If measurement of urine output is problematic a urinary sodium, potassium and urea should be measured.

7. **Correction of hyponatraemia.** A Child with a serum Na+ < 130 mmol/l needs urgent referral to a hospital with a Paediatric ICU (Asymptomatic hyponatraemia). Correction of hyponatraemia is potentially dangerous and requires experience

Appendix 3

Intravenous Fluid Prescription

Infants less than 1 year of age.

Dilutional Hyponatraemia does not appear to be a common problem in this age group. Blood chemistry and monitoring of fluid balance is as described above.

For normal serum sodium (Na+ 135-145 mmol/l)
Give 0.18% NaCl in 4% Glucose at a rate of 4 mls per kg body weight per hour. *Eg For a 5 kg infant this is 20 mls per hour.*

For low or high sodium expert advice should be sought.

Children greater than 1 year of age.

Dilutional Hyponatraemia is well documented in this age group. Blood chemistry and monitoring of fluid balance is as described above.

For normal serum sodium (Na+ 135-145 mmol/l)
Give 0.45% NaCl in 2.5% Glucose at a rate as above.

For low or high sodium expert advice should be sought.

REFERENCES

Arieff AI. Postoperative hyponatraemic encephalopathy following elective surgery in children. Paediatric Anaesthesia 1998:8:1-4

Halberthal M et al, Acute hyponatraemic in children admitted to hospital. BMJ 2001;322:780-2

T4

Appendix 4

This extract was taken from :
Craigavon Area Hospital, Department of Anaesthesia, Orientation Manual, August 2002

IV Fluids

The myth that children should only be given No.18 solution is exactly that - **a myth**. Under no circumstances give a child hypotonic fluids (eg. No. 18 solution, half-normal saline or 5% dextrose) perioperatively in theatre, post-op on the wards or in A&E for resuscitation. Children have an exaggerated stress response to anaesthesia, surgery and illness - this leads to production of vasopressin (ADH) which causes water retention and relative hyponatraemia. If you give hypotonic fluids to these children their plasma sodium can fall to dangerous levels leading to nausea, drowsiness, fitting and even death. This is not a theoretical risk - a child recently died after an appendicectomy in a local hospital because they were given No. 18 solution postoperatively. Please use Hartmann's solution or Normal Saline - 20 mls/kg for resuscitation and the '4,2,1' regimen for maintenance (4 mls/kg/hr for first 10 kg + 2 mls/kg/hr for next 10 kg + 1 ml/kg/hr for remaining weight above 20 kg). For resuscitation albumin (despite the controversial Cochrane meta-analysis) is still appropriate; alternatively Gelofusine (although unlicensed) can be used.

T5

Appendix 5

Friday Seminars 2003 - 2004

Date	Topic	Organiser
Sep-05	No Class	
Sep-12	QUB Primary Revision Course	[redacted]
Sep-19	Acute Renal Failure	[redacted]
Sep-26	CVS Physiology	[redacted]
Oct-03	Electrolytes / Blood components	[redacted]
Oct-10	Exam practice	[redacted]
Oct-17	Obstetrics	[redacted]
Oct-24	Nutrition etc.	[redacted]
Oct-31	RCA Study Day on Wed 29th Oct	[redacted]
Nov-07	MH / Allergy	[redacted]
Nov-14	TBA	
Nov-21	Difficult Airway	[redacted]
Nov-28	Head Injury	
Dec-05	TBA	[redacted]
Dec-12	TBA	[redacted]
Dec-19	No Class - Theatres Xmas Dinner	
Dec-26	No Class	

T6

MEDICAL SHO TUTORIALS 2001 / 2002
Main Hall, Postgraduate Centre
THURSDAY ~ 12.30 pm – 1.30 pm SHARP

Sept	20	[redacted]	Breathlessness
	27		Polymyalgia and Cranial Arteritis
Oct	4	[redacted]	Management of Stroke
	11		Headaches
	18	Dr Sharpe	Hyponatraemia
	25	[redacted]	Adrenal Disease
Nov	1	[redacted]	Acute Confusional States
	8		The Single Hot Joint
	15		Autoimmune Liver Disease
	22		Asthma
	29		Acute Coronary Syndromes
Dec	6	[redacted]	Dermatology
	13	Dr McAllister	Assessment and Management of Shock
Jan	3	[redacted]	Heart Failure
	10		Diabetes – Diagnosis and Complications
	17		Diarrhoea
	24		Assessment of Anaemia
	31		
Feb	7	Dr Humphrey	Management of Complications of Chemotherapy
	14	[redacted]	Liver Failure/Portal Hypertension
	21		Acute Renal Failure
	28		Arrhythmias
Mar	7	[redacted]	Advances in Therapy in Rheumatology
	14		Falls and Deterioration in Mobility
	21		Inflammatory Bowel Disease
	28		Pulmonary Embolism
April	4	[redacted]	Coagulation and Anticoagulation
	11	Dr Sharpe	Hypercalcaemia
	18	[redacted]	Hypertension
	25		Connective Tissue Diseases
May	2	[redacted]	Palliative Care
	9		Dermatology
	16		Thyroid Disease
	23		Respiratory Failure
	30		Lung Function

MEDICAL SHO TUTORIALS 2002/2003

Seminar Room, Postgraduate Centre, CAH
THURSDAY – 12.30pm – 1.30pm **SHARP**

Sept	12	[redacted]	Polymyalgia and Cranial Arteritis
	19		Resuscitation Training (11.00am – 1.00pm)
	26		Management of Stroke
Oct	3	[redacted]	Asthma
	10		Adrenal Disease
	17		Autoimmune Liver Disease
	24		The Single Hot Joint
	31		Pulmonary Embolism
Nov	7	Dr Sharpe	Hyponatraemia
	14	[redacted]	ECG Basics
	21		Coeliac Disease
	28	Dr McAllister	Assessment and Management of Shock
Dec	5	[redacted]	Assessment of Anaemia
	12		Dermatology
	19		Palliative Care
Jan	9	[redacted]	Diarrhoea
	16		Acute Renal Failure
	23		Management of Complications of Chemotherapy
	30		Falls and Deterioration in Mobility
Feb	6	[redacted]	Liver Failure/Portal Hypertension
	13		Inflammatory Bowel Disease
	20		Acute Coronary Syndromes
	27		Advances in Therapy in Rheumatology
Mar	6	[redacted]	Arrhythmias
	13		Diabetes: Diagnosis and Complications
	20		Coagulation and Anticoagulation
	27		Hypertension
April	3	Dr Sharpe	Hypercalcaemia
	10	[redacted]	Connective Tissue Disease
	17		Dermatology
	24		Thyroid Disease
May	1	[redacted]	Acute Confusional State
	8		Respiratory Failure
	15		Parkinsons Disease
	22		Urinary Incontinence

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Revised 3-12-3

MEDICAL SHO TUTORIALS 2003/2004

THURSDAY – 12.30pm – 1.30pm SHARP

Seminar Room, Postgraduate Centre, CAH

Sept	11	[redacted]	Polymyalgia and Cranial Arteritis
	18		Resuscitation Training (11.00am – 1.00pm)
	25		Management of Stroke
Oct	2	Dr Sharpe	Hyponatraemia
	9	**COLLEGE DAY - RAMADA**	
	16	[redacted]	Acute Coronary Syndromes
	23		The Mental Health Order
	30		Dementia
Nov	6	[redacted]	Asthma
	13		Dermatology
	20		Coeliac Disease
	27	Dr McAllister	Assessment and Management of Shock
Dec	4	[redacted]	Heart Failure
	11		Diarrhoea
	18		Palliative Care
Jan	8	[redacted]	Assessment of Anaemia
	15		Acute Renal Failure
	22		Falls and Deterioration in Mobility
	29		Adrenal Disease
Feb	5	[redacted]	Liver Failure/Portal Hypertension
	12		Inflammatory Bowel Disease
	19		Pulmonary Embolism
	26		Advances in Therapy in Rheumatology
Mar	4	[redacted]	Arrhythmias
	11		Diabetes: Diagnosis and Complications
	18		Coagulation and Anticoagulation
	25		Hypertension
April	1	Dr Sharpe	Hypercalcaemia
	8	[redacted]	Osteoporosis
	15		Indications/ interpretation of cardiac investigations
	22		Thyroid Disease
	29		The Single Hot Joint
May	6		
	13	[redacted]	Respiratory Failure
	20		Parkinsons Disease
	27		Acute Confusional State

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MEDICAL SHO TUTORIALS 2004/2005

THURSDAY ~ 12.30pm – 1.30pm SHARP

Tutorial Room 1, 1st Floor, Medical Education Centre, CAH

Sept	9	[redacted]	Polymyalgia and Cranial Arteritis
	16		Arrhythmias
	23		Management of Stroke
	30		Epilepsy
Oct	7	Dr Sharpe	Hyponatraemia
	14	[redacted]	Dementia
	21		Acute Coronary Syndromes
	28		The Mental Health Order
Nov	4	[redacted]	Asthma
	11		Dermatology
	18		COPD
	25	Dr McAllister	Assessment and Management of Shock
Dec	2	[redacted]	Heart Failure
	9		Diarrhoea
	16		Acute Renal Failure
Jan	6	[redacted]	Assessment of Anaemia
	13		Palliative Care
	20		Adrenal Disease
	27		Falls and Deterioration in Mobility
Feb	3	[redacted]	Liver Failure/Portal Hypertension
	10		Inflammatory Bowel Disease
	17		Pulmonary Embolism
	24		Advances in Therapy in Rheumatology
Mar	3	[redacted]	Arrhythmias
	10		Diabetes: Diagnosis and Complications
	17	**Bank Holiday**	
	24	[redacted]	Hypertension
	31		The Single Hot Joint
April	7		
	14	[redacted]	Osteoporosis
	21		Indications/ interpretation of cardiac investigations
	28	Dr Sharpe	Hypercalcaemia
May	5	[redacted]	Jaundice
	12		Thyroid Disease
	19		Parkinsons Diseasshae
	26		Acute Confusional State

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MEDICAL SHO TUTORIALS 2005/2006

THURSDAY – 12.30pm – 1.30pm SHARP

Tutorial Room 1, 1st Floor, Medical Education Centre, CAH

Sept	1	[redacted]	Osteoporosis
	8		Arrhythmias
	22		Management of Stroke
	29		Epilepsy
Oct	6	[redacted]	Acute Coronary Syndromes
	13		Dementia - CANCELLED
	20	Dr Sharpe	Hyponatraemia
	27	[redacted]	Dermatology
Nov	3	[redacted]	Polymyalgia and Cranial Arteritis - CANCELLED
	10		Hypertension
	17		COPD
	~~24~~	~~Dr McAllister~~	~~Assessment and Management of Shock~~
Dec	1	[redacted]	Heart Failure
	8		Diarrhoea/IBD
	15		Palliative Care
Jan	5	[redacted]	Adrenal Disease
	12		Acute Renal Failure
	19		Assessment of Anaemia
	26		Falls and Deterioration in Mobility
Feb	2	[redacted]	Liver Failure/Portal Hypertension
	~~9~~		~~Coagulation and Anticoagulation (sick)~~
	~~16~~		~~Pulmonary Embolism (unavailable)~~
	~~23~~		~~Advances in Therapy in Rheumatology (cancelled)~~
Mar	2	[redacted]	Arrhythmias
	9		Diabetes: Diagnosis and Complications
	16		Headache
	23		
	30	[redacted]	The Single Hot Joint
April	6	Dr Sharpe	Hypercalcaemia
	13	[redacted]	Indications/interpretation of cardiac investigations **1pm start**
	20		Asthma
	27		Thyroid Disease
May	4	[redacted]	Jaundice
	11		Respiratory Failure
	18		Parkinsons Disease
	25		Acute Confusional State

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MEDICAL SHO TUTORIALS 2006/2007

THURSDAY – 12.30pm – 1.30pm SHARP

Tutorial Room 1, 1st Floor, Medical Education Centre, CAH

Sept	7	[redacted]	Osteoporosis
	14		Arrhythmias
	21		Management of Stroke
	28		Epilepsy
Oct	5	[redacted]	Acute Coronary Syndromes
	12		Dementia
	19	Dr Sharpe	Hyponatraemia
	26	[redacted]	Dermatology – **Dr O'Hagan DNA**
Nov	2	[redacted]	COPD
	9		Polymyalgia and Cranial Arteritis
	16		Pulmonary Embolism
	23	Dr McAllister	Assessment and Management of Shock
	30	[redacted]	Heart Failure
Dec	7	[redacted]	Diarrhoea/IBD
	14		Palliative Care
Jan	4	[redacted]	Adrenal Disease
	11		Acute Renal Failure
	18		The Mental Health Order
	25		Falls and Deterioration in Mobility
Feb	1	[redacted]	Liver Failure/Portal Hypertension – **Dr Murphy SICK**
	8		Coagulation and Anticoagulation - **CANCELLED**
	15		Hypertension
	22		Advances in Therapy in Rheumatology - **CANCELLED**
Mar	1	[redacted]	Arrhythmias
	8		Diabetes: Diagnosis and Complications
	15		Headache
	22		Antibiotic Prescribing - **CANCELLED**
	29		The Single Hot Joint
April	5	Dr Sharpe	Hypercalcaemia
	12	[redacted]	Indications/interpretation of cardiac investigations -**CANCEL**
	19		Asthma
	26		Thyroid Disease
May	3	[redacted]	Jaundice
	10		Respiratory Failure
	17		Acute Confusional State
	24		Parkinsons Disease
	31		Assessment of Anaemia (moved to 7th June – then 14th June – Cancelled as no attendees turned up)

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Hyponatraemia

Dr Peter Sharpe, MD, FRCP, FRCPath
Consultant Chemical Pathologist

Used at Medical Inductions in Craigavon 2003 onwards.

Hyponatraemia

- Most common electrolyte disturbance in hospitalised patients.
- Mild hyponatraemia (Na 120-134 mmol/l) : can progress rapidly to severe.
- Severe hyponatraemia (Na < 120 mmol/l) : substantial morbidity and mortality.
- Complex

4 Categories

1 Water excess states (usually euvolaemic) primary water disturbance.

- Acute water overload : ↑ fluid intake and ↓ renal free water clearance. Over infusion of low salt solutions (e.g. 5% dextrose).
- Chronic water overload : normal fluid intake and ↓ renal free water clearance (e.g. SIADH).

2. Salt depletion states (patients are hypovolaemic) primary sodium disturbance
   e.g. Addisons
   Diuretics
   GI losses
   Salt losing nephropathy
3. Combination of water excess and salt depletion states (euvolaemic or mildly hypovolaemic)
4. Water and salt excess (water excess > salt excess) e.g. secondary hyperaldosteronism

Symptoms and Sequelae of Hyponatraemia

- Depend of the category of presentation.
- Acute water intoxication : pronounced CNS signs and symptoms.
- Chronic water overload : Asymptomatic.
- Signs and symptoms evident when serum sodium < 125 mmol/l.
- Brain cells particularly vulnerable to cellular swelling.

a. Confusion
b. Nausea and vomiting
c. Headaches
d. Seizures
e. Coma
f. Respiratory arrest

Clinical Guidelines for Evaluation of Hyponatraemia

1. Document
   a) Fluid losses (V + D, NG aspirate, fistula)
   b) Drug history (diuretics, anticonvulsants, antidepressants, antipsychotics, sulphonylureas, omeprazole)
   c) Fluid intake.

2. Assess volume status (hypovolaemia, euvolaemia, oedematous).
   document pulse rate and BP (lying & standing)

3 Measure
   a) U&E (urea ↑ in salt depletion, ↓ in SIADH)
   b) Serum osmolality to confirm hypoosmolality (hyperosmolality → hyperglycaemia)

4 Measure urine Na and osmolality
   a) Urine osmolality > 200 mOsm/kg inappropriately high in presence of hyponatraemia.
   b) Random urine sodium > 20 mmol/l inappropriate (due to SIADH, diuretics, Addisons, salt-losing nephropathy).

5 Request other tests to help identify specific cause for hyponatraemia

- Thyroid function tests
- Cortisol (synacthen)
- CXR
- Intracranial pathology should be considered

Appropriate Therapy

1. Acute symptomatic hyponatraemia (Acute water intoxication)

   - Correction is required with hypertonic saline (Aim serum sodium rise 1 -2 mmol/hr)

   Amount of Sodium (mmol/L per hour)
   = 0.6 x body weight (kg) x correction rate

For 70kg man and correction rate 1 mmol/hr
= 0.6 x 70 x 1 = 42 mmol/hr
= 135 ml/h of 1.8% saline
= 81 ml/hr of 2.7% saline

Target serum sodium = 125 mmol/l

In elderly patients use slower infusion rate and add furosemide to enhance renal free water clearance.
Check serum Na every 4 hours.

2. Chronic asymptomatic hyponatraemia (Chronic water overload, SIADH)
   - Asymptomatic / mildly symptomatic
   - Rapid correction is dangerous (CPM)
   - Fluid restriction 750 mls – 1000 mls / day
   - Demeclocycline can be added

3. Hypovolaemic hyponatraemia (salt depletion)
   - Rapid infusion of N. Saline
   - Addisons → Hydrocortisone 100 mg IV QID

4. Hypervolaemic hyponatraemia (oedematous states)
   - Heart failure, cirrhosis, nephrotic syndrome (secondary hyperaldosteronism)
   - Excess total body salt and water
   - Water > sodium excess → hyponatraemia
   - Salt and water restriction
   - Diuretics (spironolactone)

Case 1

72 year old lady found unconscious at home
On Admission she was semiconscious
Left hemiparesis
Known hypertension
Chlorothiazide 500 mg TID

Na	128
K	2.4
Cl	83
HCO_3	36
Urea	11.6
Creatinine	125

Urine Na 46 mmol/l

Cause of Hyponatraemia?

Case 2

64 year old man

2 day H/O ↑ confusion, disorientation

Smoker 30/day for 50 years

Na	113
K	4.7
Cl	81
HCO_3	25
Urea	3.0
Creatinine	90
Osmol	233
Urine Na	76
Osmol	698

1. What are the possible diagnoses?
2. What investigations should be performed?
3. What is the most likely diagnosis?
4. How would you manage the patient?

Causes of SIADH

Tumours
- Carcinoma : bronchus, prostate, thymus, pancreas
- Brain neoplasia : glioma, meningioma

Brain Pathology
- Tumours glioma, meningioma
- Trauma
- Infection : encephalitis, meningitis, abscess
- Cerebrovascular accident

Pulmonary Pathology
- Tumours : carcinoma of bronchus
- Infection : pneumonia, tuberculosis
- Pneumothorax

Miscellaneous Disorders
- Guillain-Barre syndrome
- Acute intermittent porphyria
- Acute alcohol withdrawal syndrome

Case 3

45 year old man
Alcoholic liver disease
Ascites
Splenomegaly
Varices

LFTs

Alb	21g/L
ALP	292 U/L
ALT	170 U/L
AST	222 U/L
gamma GT	476 U/L
BIL	190 umol/l
Na	119 mmol/l
K	2.4
HCO_3	19
Urea	2.3
Creat	100
Urine Na <	10

a) What is the cause of the hyponatraemia?

b) How would you manage the patient?

Case 4

58 year old lady
↑ confusion, drowsiness

Na	119
K	6.3 (checked)
HCO_3	17
Urea	12.2
Creat	141
Urine Na	122 mmol/L

1. What is the differential diagnosis?
2. What is the most likely diagnosis?
3. How would you confirm this diagnosis?
4. What treatment would you give?

The effects of stress on fluid and electrolyte balance

Recovery phases

- Corticoid withdrawal phase
  - (Day 3-7 routine post-op)
  - Diuresis associated
- Regaining muscle strength (2-5 weeks)
- Replacement adipose tissue

Complications of expansion of interstitial space

- Measurements of IVS but fluid mainly in ISS
- Pulmonary oedema
- Less efficient reabsorption of proteins by lymphatics
- Impaired oxygen exchange due to increased diffusion distance
  - Delayed wound healing

Practical guidelines

- Largely empirical
- 2-3 L of salt containing solution per day
- Body's own homeostatic mechanisms
  - Thirst
  - Renal function
  - Normal GIT

Content of crystalloid solutions

	Na	K	Ca	Mg	Cl	Lactate	dextrose	osmolal/l
0.9% saline	154	-	-	-	154	-	-	308
Hartmann	131	5	1	1	112	29	-	280
5% dextrose	-	-	-	-	-	-	50 g/100 ml	287
plasma	140	3.7	1.2	0.8	102	1		

Electrolyte composition of body fluid compartments

Electrolyte	ICF	ECF: Plasma	ECF: Interstitial
Na	10	140	145
K	155	3.7	3.8
Cl	3	102	115
HCO_3	10	28	30
Ca^+	<0.01	1.2	1.2
Mg	10	0.8	0.8
PO_4	105	1.1	1.0

Units=mmol/l

Sodium

Principal cation of ECF

85% Na in ECF

Western Diet-150mmol/day

Urinary loss <1 to >240 mmol/day

Renal adjustment for altered load takes 3-4 days

CREST Guidelines for Hyponatraemia

- Most common electrolyte abnormality in hospital
- Usually results from retention of water secondary to impairment in free water excretion

Hyponatraemia- increased risk

- Women
- Post op patients
- Psychiatric polydipsic patients
- Children
- Alcoholics
- Malnourished
- Burn patients

Signs and symptoms

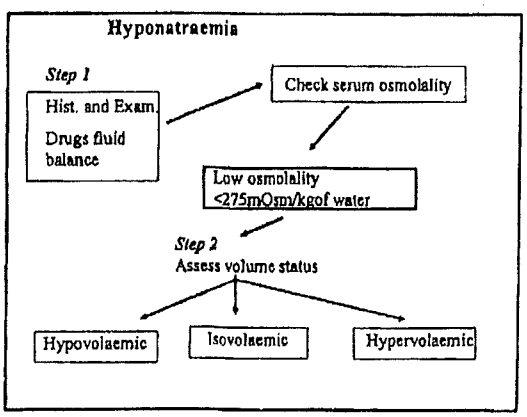
- CNS-Cerebral oedema
- Early-anorexia,nausea lethargy apathy
- Late- agitation, seizures, impaired reflexes focal neurology Cheyne-Stokes Respiration, coma
- Symptoms depend on speed and degree of drop

Signs and symptoms

- Acute symptomatic hyponatraemia can cause cerebral oedema. Rapid correction
- Chronic –if corrected too quickly can cause osmotic demyelination.

Diagnosis and monitoring

- History and exam.
- Serum osmolality, urine osmolality urine sodium
- Observations-CNS, fluid balance
- Monitor above plus U+E every 2-4 hours



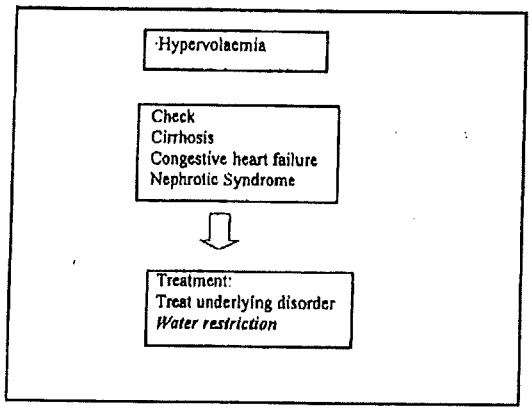
Normal/high osmolality?

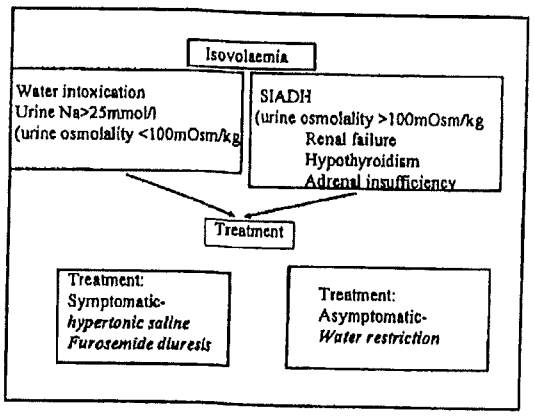
- "275-290 mOsm/kg of water"

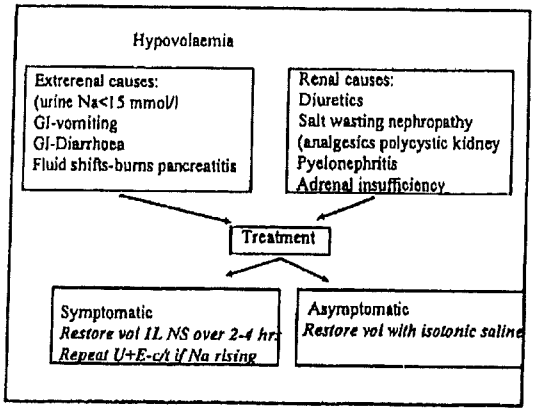
Exclude:
Hyperglycaemia
Hypertonic infusions (glycerol/glycine/mannitol)
Hyperlipidaemia
hyperproteinaemia

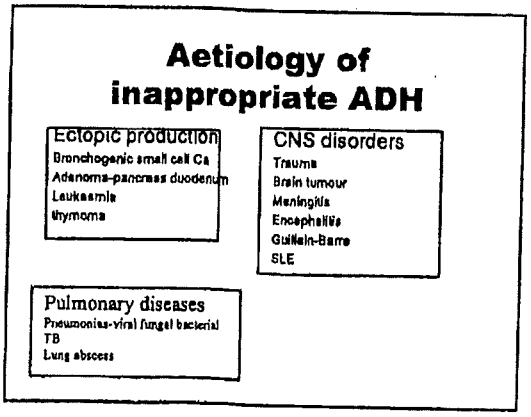
Low osmolality

- "<275mOsm/kg of water"
  - ?Hypervolaemia
  - ?Isovolaemia
  - ?Hypovolaemia









Hypernatraemia

- >145mmol/l
- Always acssociated with hypertonicity
- Caused by
  - excessive Na salts
  - Water depletion
  - Excess Na and Water loss

Hypernatraemia

- Clinical-155+ mmol/l
  - Pyrexia, restlessness
  - Irritability
  - Drowsiness
  - Lethergy
  - Confusion
  - Coma
  - Rarely convulsions
  - Pre-renal failure due to hypovolaemia

Hypernatraemia

- Treatment
- Give water
  - oral ,
  - 5%dextrose
  - hypotonic saline
- Risk of cerebral oedema
- No greater than 2mmol/hr

Hypernatraemia-causes

- Water depletion
  - Extrarenal loss
    - Exposure
  - GIT
  - Renal loss
    - Diuretics
  - Diabetes insipidus
    - Neurogenic
    - Nephrogenic
- Salt gain
  - Hypertonic saline or Sodium Bicarbonate

Potassium

- ICF osmotic provider
- Muscle and nerve tissue
- 90% of K is intracellular
- Daily intake in western diet 40-150 mmol
- Urinary loss 30-150 mmol/l

Potassium

- Acidosis promotes shift K from ICF to ECF
- Alkalosis promotes the reverse
- Hyperkalaemia stim insulin release, which promotes shift of Kinto ICF
- β_2 receptors promote cellular uptake of K
- A agonists shift K fromICF to ECF
- Aldosterone increases renal excretion of K

Hypokalaemia

- Inadequate dietary intake (urine K<20 mmol/l)
- Abnormal losses (urine <20 mmol/l)
- GIT vomiting NG tube Diarrhoea villous adenoma of colon laxative abuse
- Renal (Urine K>20mmol/l)
- Conns Syn
- Cushungs
- Bartter
- Ectopic ACTH
  - Small cell Ca Lung
  - Pancreatic Ca
  - Thymus Ca
- Drugs
  - Diuretics
  - Corticosteroids
  - Carbenicillin amphotericin
  - Gent
  - cisplatin

Magnesium deficiency

Alkalosis

Hypokalaemia

- Symptoms
  - Weakness
  - Hypotonicity
  - Depression
  - Constipation
  - Ileus
  - Vent. Failure
  - VT
  - Coma

Hypokalaemia

- Treatment:
- IV or oral

- Max 40mmol/hr
- Regular measurement of level

Hyperkalaemia

- >5.0mmol/l
- Excessive intake
- Severe tissue damage
- Decreased excretion
- Body fluid compartment shift

Hyperkalaemia-causes

- Haemolysed sample
- Excessive intake
  - Blood transfusion
- Tissue damage
- Decreased renal excretion
- Drugs
  - Spironolactone
  - Triamterine
  - Amiloride
  - Indomethacin
  - Captopril
- Renal failure
- Addisons
- Compartmental shift
  - Acidosis
  - Insulinin sufficiency
  - Digoxin OD
  - Suxamethonium

Clinical features

- Tingling paraesthesia
- Weakness
- flacid paralysis
- hypotension
- Bradycardia

- ECG-
  - peak T waves
  - flattening of p wave
  - Long pr interval

Treatment

- Medical emergency!
- Dextrose 50ml 50 % 20 units Actrapid
  - 0.5-1.5 mmol drop onset20 min lasts few hrs
- $NaHCO_3$ 50-100 mmol iv
- $CaCl_2$ 5-10 ml 10% (cardioprotective)
- Oral or rectal resonium
- Salbutamol nebulised
- Loop diuretics
- haemodialysis

Others

- Calcium-ionised form physiologically activeCorrect for albumin
- Magnesuium
  - Intracellular
  - Neurological signs
  - Resistent hypokalaemia or hypocalcaemia

Summary

IV fluids need thought

Daily electrolyte measurement

Hartmans the most physiological crystalloid

High Na= not enough water } Usually!

Low Na= too much water }

If not sure, do not guess-ASK

Any questions?

T8

The Good Prescribing Guide

Drugs and Therapeutics Committee

Drugs and therapeutics committee

- Role : to promote good , safe and cost effective prescribing.
- To assess new drugs (consultant must submit request)
- Audit of prescribing
- Medicines governance
- Advise via Drugs and Therapeutic newsletter

How to be a safe and effective prescriber

- Write legibly PRINT names of drugs
- Never write up a drug you are unfamiliar with ,without consulting the BNF
- "see Kardex" is inadequate as a drug history
- Record the nature of allergies to drugs on the Kardex and in the notes
- Drugs given by IV infusion and drugs with separate administration records eg Warfarin should be on the Kardex

How to be a good prescriber

- Sign your initial and surname
- Use the antibiotic guidelines, and the anticoagulant guidelines
- You do not have freedom to prescribe what you like ..... no one does (Nor is seeing drug reps part of your job plan)
- The clinical pharmacists provide excellent advice and help Use them

How to be a good prescriber

- Take particular care with discharge prescriptions e.g. sedatives, PPIs, controlled drugs ,unusual drugs ,drugs that need monitoring.
- Pharmacists can help educate patients about their drugs, on admission and discharge
- It is helpful to GPs to note, in the text of discharge letters ,the changes which have been made in medications

Drug Charts

- Use the generic names
- Do not use abbreviations eg ISMN (isosorbide mononitrate) misread as ISTIN (amlodipine)
- Write in block capitals
- Write units (not u or iu) eg 71 units of insulin given when 7iu Actrapid prescribed
- Don't write HOLD if something is to be witheld. Cross out and write reminder to restart.

Drugs Charts

- Do not use trailing zeros 5.0 can be misread as 50
- Make amendments by rewriting the item
- Signatures must be legible. Initials only are not acceptable. If your signature is not legible print your name with your signature in the comments area on the side of the kardex
- It is unacceptable to write "see kardex" in the drug history section of the admission notes

Recurrent problems with prescribing

- Non Generic prescribing
- Wrong doses of antibiotics eg 1g Cefotaxime iv bd, Amoxicillin 250 mg qid
- Too much iv ciprofloxacin
- Inadequate recording of the nature of drug allergies
- Too many antibiotics leading to a lot of C.Difficile - big problem at present

Recent Issues

- Antibiotic audits
- Guidelines on anticoagulation and use of low molecular weight heparins
- Policy on use of strong potassium solutions
- Introduction of activated protein C for use in ICU for septic shock
- New drug kardex being designed and introduced
- BANs to rINNs see BNF and posters

Recent Issues

- New guidelines on alcohol withdrawal -on wards and intranet
- I.V. paracetamol now available for patients who need it(where oral or rectal route unsuitable eg ICU patients, not routine post-op patients)
- IT policy

Intravenous Potassium Solutions

- Trust policy in response to National Patient Safety Agency alert (July 2002)
- Concentrated solutions are (a) potassium chloride 15% (b) Addiphos
- These solutions are stocked only by Pharmacy and "Critical Areas" (ICU, CCU, NNU, theatres, A&E)
- Conc. potassium solutions are treated as controlled drugs

Intravenous Potassium Solutions

- A range of ready to use potassium infusions are available on the wards
- If a different solution is needed, contact Pharmacy Ext 2294 or on-call pharmacist
- Guidelines for the treatment of hypokalaemia and hypophosphataemia are in the Policy

Warfarin

- Prescribe 1mg and 3 mg tablets only (Pharmacy stock these strengths only)
- Take particular care about discharge prescription of Warfarin. When and where is the next INR check? If GP, speak to him. Use anticoagulant record books and referral forms to anticoagulant clinic
- Use Trust guidelines for the use of anticoagulants

Methotrexate

- Methotrexate for non malignant conditions is given ONCE a WEEK
- The maximum dose for these conditions is usually 25mg
- Prescriptions must specify the DAY of the week on which the dose is taken – avoid Monday
- Additional checks and a register kept in Pharmacy

Clopidrogel (Plavix®)

- Remember this is an anti-platelet agent
- For patients undergoing elective surgery where the anti-platelet effect is not desirable stop clopidrogel 7 days before surgery

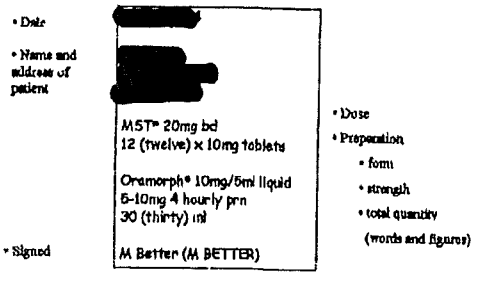
Documenting Allergy Status

- Allergy status must be recorded on the drug chart as well as on the admission sheet
- If the patient reports allergy, record the nature of the reaction
- Use the generic name of the drug when recording allergies

Discharge Prescriptions

- "As before" and "No change" must not be used
- This should be a complete and accurate record of the patients medication on discharge
- Specify morning or night rather than daily
- The accuracy of the discharge prescriptions is audited every 6 months. **Results for each prescriber will be available and will be used in appraisal**

Controlled Drug Prescriptions



Pharmacy

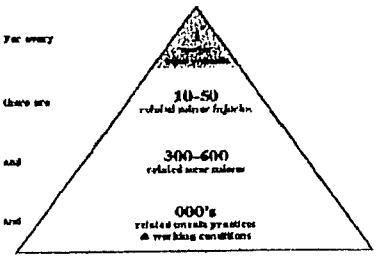
- 8.30 – 4.30 Monday to Friday
  10.00 – 12.00 Saturday
  10.00 – 11.00 Sunday
- On-call pharmacist available via switchboard, outside these hours
- Dispensary Ext: 2294
- Medicines Information Ext: 2709

Medication Incidents

- A medication incident is any preventable medication related event that could have or did lead to patient harm, loss or damage.
- Medication incidents are the most common preventable cause of patient injury.
- Medication incidents should be reported routinely using the Trust Medication Incident Report form.
- Forms are usually at the nurses station / on notes trolley. Completed by person involved or who notices the incident.

Why report?

'Heinrich's Pyramid'



BBC NEWS

"A teenager has died after a cancer drug was injected into his spine by mistake at a Nottingham hospital"

Feb 2001

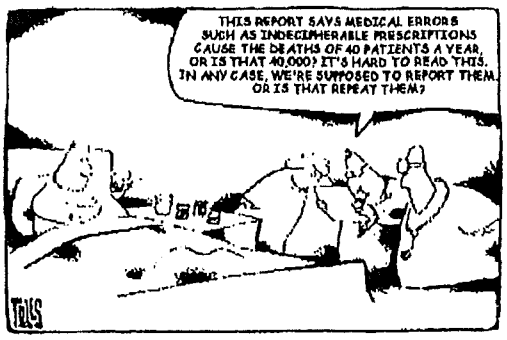
(Patient's photograph released by family)

Trust Policy for the administration of IT chemotherapy

- only staff who have completed an approved training program and whose names appear on the Trust register can prescribe, dispense or administer IT chemotherapy

Common types of prescribing incidents

- Over/under dose
  - Ten fold / decimal point
- Incorrect drug
  - Look alike / Sound alike
- Omission of therapy on admission
  - Drug history taking
- Duplication of therapy
  - NSAIDs, PPIs, statins, beta-blockers



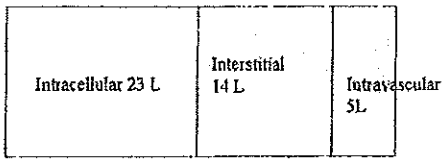
Fluid and Electrolyte management

Dr C Clarke
Consultant Anaesthetist
Intensive Care Unit
Craigavon Area Hospital

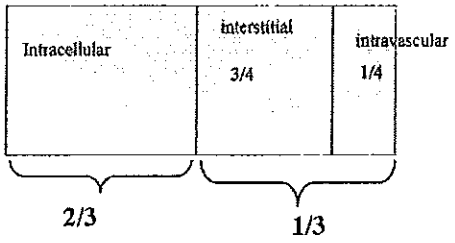
Fluid composition of the body

- Average 70 kg male
- 40 L of water
- Distributed through 3 compartments
- Intravascular space (IVS) } Extracellular fluid (ECF)
- Interstitial space (ISS) } Extracellular fluid (ECF)
- Intracellular space (ICF)

Distribution of body water in a 70 kg man



Distribution of body water in a 70 kg man- approximate proportions



Total body water

- Can be measured by tracer-dilution techniques (eg Deuretium oxide or tritium oxide)

75% of body wt. At birth.
50% of body wt. At 85yrs
Obese patients have less water

Approximate water content

Males	%
1-5	65
10-16	60
17-39	60
40-59	55
60+	50

Females	%
1-5	65
10-16	60
17-39	50
40-59	47
60+	45

Clinical assessment

- Intravascular volume-difficult to accurately measure with isotopes etc.,
- Therefore reliance on indirect measurements.

Clinical assessment

- Blood pressure
- Fall is usually late-especially the young
- Blood volume can increase with no change in BP
- Labile CVS makes BP a better marker

Clinical assessment

- Central venous pressure
- Influenced by many factors
  - RV function
  - Tone of capacitance vessels
  - Acute pulmonary pathology

Clinical assessment

- Pulmonary artery wedge pressure
- Similar confounding factors as CVP
  - LV function
  - Assumptions of what the pressure reflects

Clinical assessment

- Heart rate
- Best simple haemorrhage in young
- Many confounding factors
  - Pain
  - anxiety
  - Drugs
  - heart block

Clinical assessment

- Urine output
- Good guide to intravascular volume
  - Aim 0.5ml/kg/hour
  - Urine/Plasma osmolality to differentiate renal and prerenal
- Confounding factors
  - Drugs
  - Underlying Renal disease

Clinical assessment

- Peripheral perfusion
- Simple but very useful
- Confounding factors
  - Sympathetic tone
  - Cardiogenic shock

Clinical assessment

- Cardiac output
- Indirect guide at best

Clinical assessment

- Haematocrit
- Initially normal with acute haemorrhage
- Influenced by many factors

Clinical assessment- interstitial and intracellular space

- Most info on the smallest space- IVS

- Fluid balance charts
- History see table
- CXR
- Skin turgor and dry mucous membranes

Clinical assessment

- Serum Sodium
- Hyponatraemia usually indicates excessive TBW

- Hypernatraemia usually indicates insufficient TBW
- *Serum Na is the most important clinical indication of TBW status*

Body fluid composition and volume

	Volume/ 24hrs (Litres)	Sodium mmol/l	Potassium mmol/l	pH
sweat	0.5-1	50	10	-
CSF	0.1-0.16	150	3	7.32-7.4
saliva	1-2	60	20	6-7
bile	.5-.75	145	5	7.8
pancreatic	1	141	4	8-8.3
gastric	2.5	60	9	1-3.5
Upper small ileum	2-3	105	5	7.8-8
	1	117	5	8.5-8
colon	0.15	50		
diarrhoea	0.5+			

Clinical assessment

- Measuremaent of interstitial space pressure
  - Experimental

Summay-clinical assessment

- Although most of the fluids used in clinical practice are distributed mainly to the interstitial (crystalloids) or intracellular (dextrose or water) our clinical measurements of those spaces are almost non-existent

Intravascular fluid

- Small but crucial component of body fluid
- Carriage and delivery of substrates,metabolites and gases needed for cellular function.
- Confined by endothelial cells which largely confine the circulating protein particles which in turn generate a colloid oncotic pressure

Interstitial fluid

- Exists in the form of gel filling the spaces between cells
- The gel cannot move freely and holds the fluid in place
- Prevents free flow to dependent areas
- Facilitates transport between capillaries and cells

Interstitial fluid-Lymph

- IF that flows in the lymphatics
- Valves at the terminal ends of the lymphatics facilitate trapping of protein which would otherwise accumulate
- Rapid removal of protein creates a negative pressure in the ISS (~ -6mmHg)

Interstitial fluid-Lymph

- Negative pressure essential to integrity of cellular structure
- Lymph flow can increase 10-50 times
- Most compensation before oedema appears.
- Different tissues have different compliance

Intracellular fluid

- The milieu for cellular function
- Volume of the cell is critical for electrolyte concentrations and pH levels

Maintenance of body fluid spaces

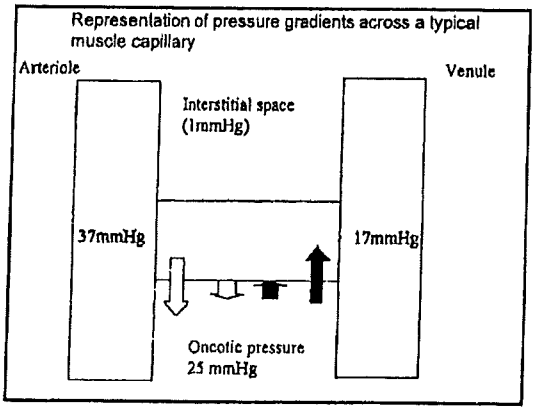
- Basic mechanisms of control of ECF are osmolality and volume
- Directly sensed and operated through ECF
- Indirect influence on ICF

Maintenance of body fluid spaces

- Osmolality largely adjusted by water retention or elimination
- Volume is adjusted by Sodium retention or elimination
- Overlap.

Maintenance of body fluid spaces

- Capillary endothelial cells divide ISS and IVS
- Relatively impermeable to protein molecules therefore oncotic pressure higher in capillaries.
- Lymph drainage important
- Starling's Forces



Starling's Forces

- Variable between tissues
  - filtration coefficient
    - Very small in brain and muscle
    - Larger in subcutaneous tissue
    - Very large in intestine and liver

- Intracellular and extracellular fluids are isotonic
- All cell walls are freely permeable to water
- Principles of osmosis guarantee isotonicity

- Na^+ concentration is prime determinant of ECF osmotic pressure (OP)
- K^+ concentration prime determinant of ICF OP

Osmolality

- Osmoreceptors in Ant. Hypothalamus
  - Thirst
  - ADH (Vasopressin)

  - Serum osmolality tightly controlled 275-295 mosmol/L
  - Urine osmolalities vary 15-1400mosmol/L

Volume

Receptors mainly intravascular

Na retention which is distributed throughout ECF

ISS ¾ v's IVS ¼

Na retention affects mainly ISS and is inefficient and long-term control IVS

Sympathetic NS vital for immediate control

Volume

- The retention and excretion of water, although largely determined by ECF osmolality, is also affected by baroreceptors and affects the volume of TBW as well as individual body fluid compartments in a proportional manner

Sodium Na

- Major extracellular cation

- 4000mmol is total in body
- Average daily intake 150 mmol
- Plasma Na concentration is maintained mainly by changes in water content while the Na balance is influenced mainly by intake and renal regulation of excretion

Renal regulation of Na

- Renin-angiotensin-aldosterone axis
- Intrarenal factors
- Atrial natriuretic peptide

Intravenous fluids

- Blood
- Blood products
- Colloids
- Crystalloids
- Isotonic solutions

} nasty

Intravenous fluids

- Colloids
  - Albumin
  - Dextrans
  - Modified gelatins
  - Hydroxyethyl starch

Intravenous fluids

- Crystalloids
- Isotonic solutions
  - N saline
  - Hartmans
  - 5% dextrose (free water)
  - Combination of dextrose and hypotonic salt solutions

Crystalloids-N saline/hartmans

- No colloid particles-similar electrolyte composition to ECF
- Distributed between intravascular and interstitial
- Ratio 1 IVS: 3 ISS

Dextrose

- Free water
- Distributed throughout Total body water
- 40 L water ave. 70 kg male
- 5/40 (1/8) will be in IVS
- 125ml from 1 L in IVS

Colloids

- Osmotically active particles.
- All stays in IVS

Clinical basis for fluid administration

- Which body fluid compartment will our fluid expand?
- How much?
- How often?
- In practice The fluid challenge

The fluid challenge

- Measure as much as possible-BP pulse urine etc..
- Give 250ml bolus of fluid quickly
- Repeat measurements
- Repeat whole process until normal intravascular volume restored

Principles of fluid and electrolyte management

- Urgently correct hypovolaemia
- Then correct potassium
- Then water and other electrolyte abnormalities-Na, Mg, PO_4, Ca.

The effects of stress on fluid and electrolyte balance

Injury phase

- Adrenergic and adrenocortical hormone release
  - Salt and water retention
  - Potassium loss
  - Protein catabolism
- Phase prolonged in sepsis, necrosis etc..

The effects of stress on fluid and electrolyte balance

- Salt and water retention early post-op
- 600ml-1000ml water generated from catabolism
- ADH
- Aldosterone

- Giving extra salt and water in this setting??

The effects of stress on fluid and electrolyte balance

- BUT
- Stress response modified by adequate fluid loading
- Early goal-directed therapy in sepsis
  - (Rivers NEJM)

2003-2006

T10

IV fluid management

[redacted]

Fluid composition of the body

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} Extracellular fluid (ECF)

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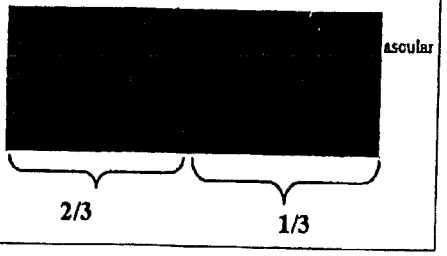

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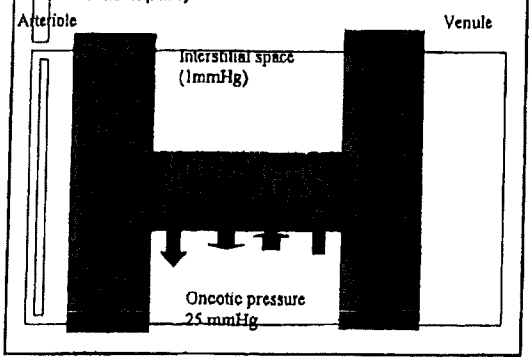
bile	0.5-0.75	145	5	7.8
pancreatic	1	140	4	8-8.3
gastric	2.5	60	9	1-3.5
Upper small	2-3	105	5	7.8-8
ileum	1	117	5	6.5-8
colon	0.15	50		
diarrhoea	0.5+			

Representation of pressure gradients across a typical muscle capillary



Starling's Forces

- Variable between tissues
  - filtration coefficient
    - Very small in brain and muscle
    - Larger in subcutaneous tissue
    - Very large in intestine and liver

Intravenous fluids

- Blood
- Blood products
- Colloids
- Crystalloids
- Isotonic solutions

} oncotic activity

Intravenous fluids

- Colloids
  - Albumin
  - Dextrans
  - Modified gelatins
  - Hydroxyethyl starch

Intravenous fluids

- Crystalloids
- Isotonic solutions
  - N saline
  - Hartmans
  - 5% dextrose (free water)
  - Combination of dextrose and hypotonic salt solutions

Crystalloids-N saline/hartmans

- No colloid particles-similar electrolyte composition to ECF
- Distributed between intravascular and interstitial
- Ratio 1 IVS: 3 ISS

Dextrose

- Free water
- Distributed throughout Total body water
- 40 L water ave. 70 kg male
- 5/40 (1/8) will be in IVS
- 125ml from 1 L in IVS

Colloids

- Osmotically active particles.
- All stays in IVS

Clinical basis for fluid administration

- Which body fluid compartment will our fluid expand?
- How much?
- How often?
- In practice The fluid challenge

The fluid challenge

- Measure as much as possible-BP pulse urine etc..
- Give 250ml bolus of fluid quickly
- Repeat measurements
- Repeat whole process until normal intravascular volume restored

Principles of fluid and electrolyte management

- Urgently correct hypovolaemia
- Then correct potassium
- Then water and other electrolyte abnormalities-Na, Mg, PO_4, Ca.

Principles of fluid and electrolyte management

- Urgently correct hypovolaemia
- Then correct potassium
- Then water and other electrolyte abnormalities-Na, Mg, PO_4, Ca.

The effects of stress on fluid and electrolyte balance

Injury phase

- Adrenergic and adrenocortical hormone release
  - Salt and water retention
  - Potassium loss
  - Protein catabolism
- Phase prolonged in sepsis, necrosis etc..

Practical guidelines

- Largely empirical
- 2-3 L of salt containing solution per day
- Body's own homeostatic mechanisms
  - Thirst
  - Renal function
  - Normal GIT

Content of crystalloid solutions

	Na	K	Ca	Mg	Cl	Lactate	dextrose	osmolality
0.9% saline	154	-	-	-	154	-	-	308
Hartmans	131	5	1	1	112	29	-	280
5% dextrose	-	-	-	-	-	-	50 g/100 ml	287
plasma	140	3.7	1.2	0.8	102	1		

Electrolyte composition of body fluid compartments

	ICF	ECF: Plasma	ECF: Interstitial
Electrolyte			
Na	10	140	145
K	155	3.7	3.8
Cl	3	102	115
HCO_3	10	28	30
Ca^+	<0.01	1.2	1.2
Mg	10	0.8	0.8
PO_4	105	1.1	1.0

Units=mmol/l

Sodium

Principal cation of ECF
85% Na in ECF
Western Diet-150mmol/day
Urinary loss <1 to >240 mmol/day

Renal adjustment for altered load takes 3-4 days

CREST Guidelines for Hyponatraemia

- Most common electrolyte abnormality in hospital
- Usually results from retention of water secondary to impairment in free water excretion

Hyponatraemia-increased risk

- Women
- Post op patients
- Psychiatric polydipsic patients
- Children
- Alcoholics
- Malnourished
- Burn patients

Signs and symptoms

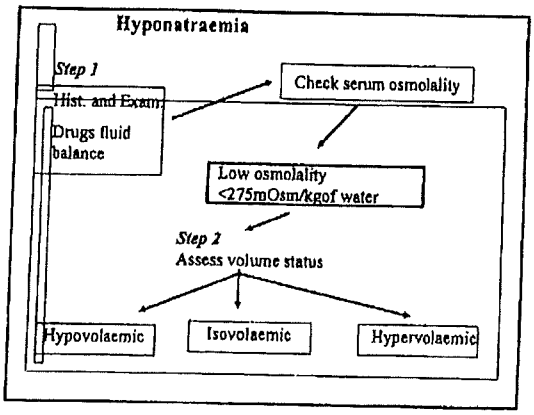
- CNS-Cerebral oedema
- Early-anorexia,nausea lethargy apathy
- Late- agitation, seizures, impaired reflexes focal neurology Cheyne-Stokes Respiration, coma
- Symptoms depend on speed and degree of drop

Signs and symptoms

- Acute symptomatic hyponatraemia can cause cerebral oedema. Rapid correction
- Chronic –if corrected too quickly can cause osmotic demyelination.

Diagnosis and monitoring

- History and exam.
- Serum osmolality, urine osmolality urine sodium
- Observations-CNS, fluid balance
- Monitor above plus U+E every 2-4 hours



Normal/high osmolality?

- "275-290 mOsm/kg of water"

Exclude:
Hyperglycaemia
Hypertonic infusions (glycerol/glycine/mannitol)
Hyperlipidaemia
hyperproteinaemia

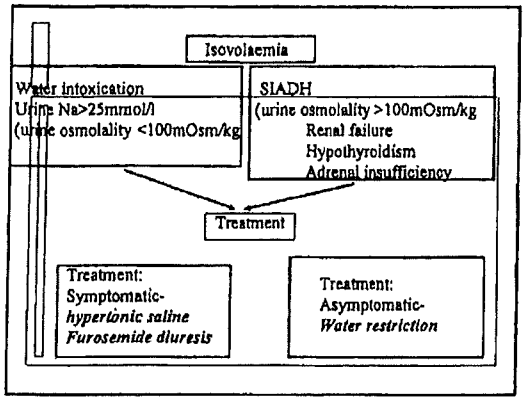
Low osmolality

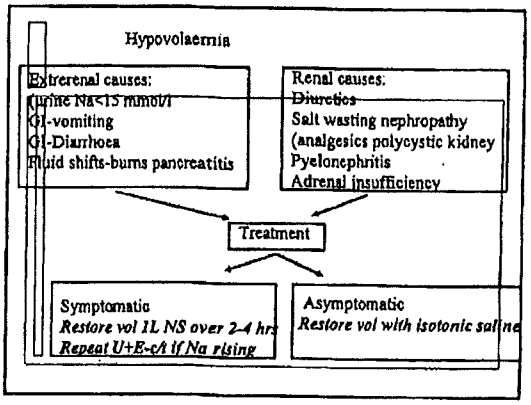
- "<275mOsm/kg of water"
  - ?Hypervolaemia
  - ?Isovolaemia
  - ?Hypovolaemia

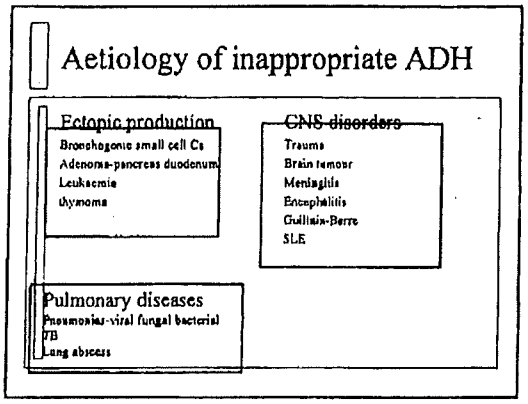
Hypervolaemia

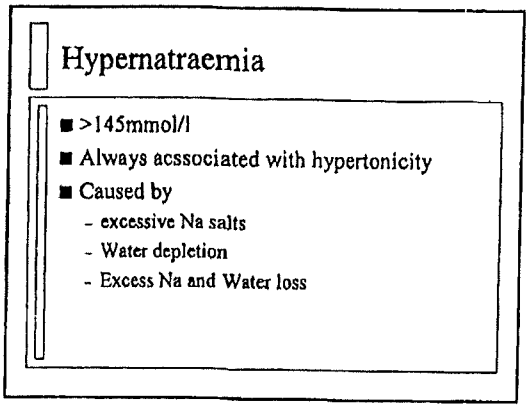
Check
Cirrhosis
Congestive heart failure
Nephrotic Syndrome

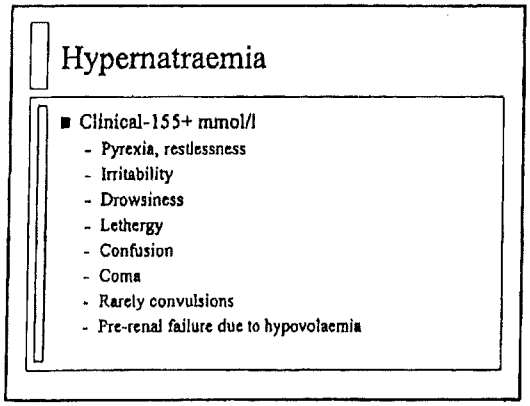
Treatment
Treat underlying disorder
Water restriction

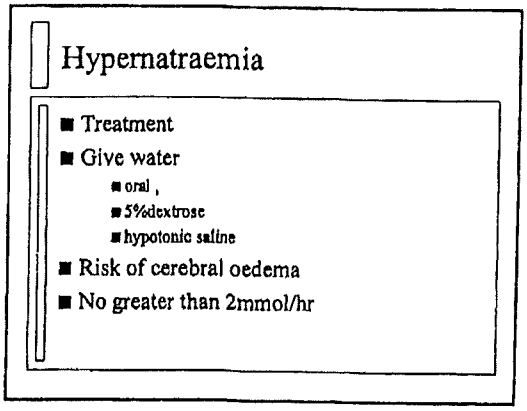

Isovolaemia
Water intoxication
Urine Na>25mmol/l
(urine osmolality <100mOsm/kg
SIADH
(urine osmolality >100mOsm/kg
Renal failure
Hypothyroidism
Adrenal insufficiency
Treatment
Treatment:
Symptomatic-
hypertonic saline
Furosemide diuresis
Treatment:
Asymptomatic-
Water restriction


Hypovolaemia
Extrarenal causes:
(urine Na<15 mmol/l
GI-vomiting
GI-Diarrhoea
Fluid shifts-burns pancreatitis
Renal causes:
Diuretics
Salt wasting nephropathy
(analgesics polycystic kidney
Pyelonephritis
Adrenal insufficiency
Treatment
Symptomatic
Restore vol 1L NS over 2-4 hrs
Repeat U+E-c/t if Na rising
Asymptomatic
Restore vol with isotonic saline


Aetiology of inappropriate ADH
Ectopic production
Bronchogenic small cell Ca
Adenoma-pancreas duodenum
Leukaemia
thymoma
CNS disorders
Trauma
Brain tumour
Meningitis
Encephalitis
Guillain-Barre
SLE
Pulmonary diseases
Pneumonias-viral fungal bacterial
TB
Lung abscess


Hypernatraemia
>145mmol/l
Always acssociated with hypertonicity
Caused by
- excessive Na salts
- Water depletion
- Excess Na and Water loss


Hypernatraemia
Clinical-155+ mmol/l
- Pyrexia, restlessness
- Irritability
- Drowsiness
- Lethergy
- Confusion
- Coma
- Rarely convulsions
- Pre-renal failure due to hypovolaemia


Hypernatraemia
Treatment
Give water
oral ,
5%dextrose
hypotonic saline
Risk of cerebral oedema
No greater than 2mmol/hr

Hypernatraemia-causes

- Water depletion
  - Extrarenal loss
    - Exposure
  - GIT
  - Renal loss
    - Diuretics
  - Diabetes insipidus
    - Neurogenic
    - Nephrogenic
- Salt gain
  - Hypertonic saline or Sodium Bicarbonate

CREST guidelines for management of hyperkalaemia

- 1-10 % of hospitalised patients
- Angiotensin converting enzyme inhibitors or angiotensin II receptor blockers in conjunction with:
  - Spironolactone
  - Pre-existing or new renal failure

Hyperkalaemia

- Most others:
- K supplements
- Diuretics/drugs with K sparing properties

Pseudohyperkalaemia

- Prolonged tourniquet time
- Test tube haemolysis
- Marked leucocytosis and thrombocytosis (measure plasma and not serum concn. In these states)
- Sample from limb with K containing drip

Aetiology

- Transcellular shift
  - Acidosis
  - Drugs
    - Digoxin poisoning
    - Suxamethonium
    - Arginine
    - B blockade

Aetiology

- Renal causes
  - Renal failure acute or chronic
  - Hyperkalaemic renal tubular acidosis (type IV)
  - Mineralocorticoid deficiency (hypoaldosteronism states)

Renal causes

- Drugs
- K excretion
  - amiloride spironolactone
- Renin-angiotensin system
  - ACE inhibitors
  - ATII receptor blockers
  - NSAIDS
  - Heparin

Aetiology

- Increased circulating K
- Exogenous
  - Supplements
- Endogenous
  - Tumour lysis
  - Rhabdomyolysis
  - Trauma
  - Burns

Assessment

- Is it a true finding?
- Repeat test urgently
- MUST not ignore or assume it is "artifact"

Severity

- 5.5-6.0 mild
- 6.1-6.9 moderate

>7.0 severe

Severe if ECG changes or symptoms (muscle weakness, flacid paralysis palpitatons paraesthesias)

Severity

Rapid rises and hypoxia

cardiac conduction defects

- Mild hyperkalaemia often well tolerated with Chronic RF

Urgent Treatment?

- >7.0 mmol/l
- Or hyperkalaemia (5.5-7.0) accompanied with ECG changes or symptoms

Why hyperkalaemic?

- Renal disease
- Drugs
- Fluids
- Bladder distension
- Prostatic hypertrophy
- Urinary catheter

monitoring

- 12-lead ECG *mandatory*
  - Absent p waves
  - Long PR interval
  - Widened QRS
  - Sine wave QRST
  - AV dissociation
  - Asystole
  - Peaked T waves-often difficult to judge

monitoring

- U and E
- Glucose
- Creatine kinase
- Arterial blood gas

Treatment

- Drugs-stop all of these-if possible
  - Ace
  - ATII blockers
  - Spironolactone
  - Amiloride
  - NSAIDS
  - K containing laxatives Movicol, Klean-prep, fybogel
- ß blockers, digoxin (efficacy of Rx impaired)

treatment

- Low K diet
  - fruit juice
  - Fruits
  - Chocolate
  - Fruit gums
  - Biscuits
  - Coffee
  - potatoes

avoid

Treatment

- **Protect Cardiac membrane**
- 10ml Ca Gluconate 10% IV over 2 min
- Repeat every 10 min until ECG normalises
  - (may need up to 50 ml)
- Lasts for 30 min
- Care if digoxin present-(give over 20 min)

Treatment

- **Shift K into cells**
- 10 units Actrapid
- 50ml 50% glucose
- IVI over 5 mins.
- *Check Insulin with senior nurse.*
- *Use Insulin syringe*

Dextrose /insulin

- Onset 15 min
- Lasts 4-6 hrs
- 0.6-1 mmol drop
- If BM >15 insulin only
- Measure |BM's 30 after start then 1hourly up to 6 hrs

Treatment

- **10mg nebulised salbutamol**
- 0.5-1mmol
- Onset 15 min
- Lasts at least 2 hrs
- 20 mg if no cardiac disease
- Additive but not instead of dextrose/insulin

Sodium Bicarbonate not recommended

Treatment

- **Removal of K from body**
- Haemodialysis-severe >7.0 or ECG changes /symptoms
- *Takes time to organise think of this early*
- Gut-Calcium resonium

Ca Resonium

- Calcium polystyrene sulphonate resin
- Enema 30g-retain 9hrs then irrigate to remove from bowel
- Regular 15g PO qid with lactulose
- Slow onset (>2Hrs)
- One gram exchanges 1mmol/l Na for 1mmol/l K

NB

- Always consult senior doc
- Always stop drugs,fluids and food that contains K
- Cardiac monitoring and repeated blood mandatory (glucose)
- Negative ECG does NOT rule severe toxicity
- Digoxin toxicity can increase K

NB continued

- Most treatments only buy to time to arrange definitive treatment.

IV fluids

- Daily electrolytes
- LOOK at the results every day
- NEVER prescribe without
  - U+E
  - Fluid balance
  - Reason for fluid
  - clinical assessment

IV fluids

If simple things are not working

The patient is sick

Get senior assistence

Any questions

?

T11

GENERIC INDUCTION PROGRAMME
(for junior medical staff)

WEDNESDAY 4TH FEBRUARY 2004

SEMINAR ROOM, POSTGRADUATE CENTRE, CRAIGAVON AREA HOSPITAL

9.30 am – 9.40 am	Introduction Study Leave	[redacted] Clinical Tutor
9.40 am – 10.00 am	Drug Prescribing Policy	[redacted] Consultant Physician
10.00 am – 10.15 am	**COFFEE**	
10.15 am – 11.30 am	Cross Infection and Sharp's Policy Antibiotic Policy Use of Pathology Services inc requesting Post Mortems & consent Transfusion Policy Death Certification	[redacted] Dr Sharpe & Colleagues
11.30 am – 11.40 am	Fire Safety	[redacted]
11.40 am – 11.50 am	Obtaining Valid Consent	[redacted]
11.50 am – 12.05 pm	ICU – Criteria for Referral	[redacted]
12.05 pm – 12.25 pm	Contractual responsibilities, Rotas, Hours of Work (inc Monitoring)	[redacted]
12.25 pm – 1.30 pm	Signing On and Salary Details	[redacted]
2.00 pm	**SPECIALITY INDUCTIONS**	

CRAIGAVON AREA HOSPITAL GROUP TRUST

GENERIC INDUCTION

DATE: Friday 6th August 2004

TIME: Snack Lunch 12.00 pm
Induction 12.30 pm – 2.00 pm

VENUE: **Seminar Room,**
Postgraduate Centre, CAH

[redacted] – Study Leave & Obtaining Valid Consent
[redacted] – Referral Criteria for ICU
Dr CM Ritchie & Mrs S Brownlee – Prescribing Issues

Sponsored By: [redacted]

CRAIGAVON AREA HOSPITAL GROUP TRUST

GENERIC INDUCTION

DATE: Friday 13th August 2004

TIME: Snack Lunch 12.00 pm
Induction 12.30 pm – 2.00 pm

VENUE: **Seminar Room,**
Postgraduate Centre, CAH

LABORATORY SERVICES

Pathology Services – An Overview
Obtaining Valid Consent for Post Mortem's
Histopathology & Autopsy
Blood Transfusion Policy
Antibiotic Policy
Infection Control & Management of Sharp Injuries

Sponsored By: [redacted]

CRAIGAVON AREA HOSPITAL GROUP TRUST

GENERIC INDUCTION

DATE: Friday 20th August 2004

TIME: Snack Lunch 12.00 pm
Induction 12.30 pm – 2.00 pm

VENUE: **Seminar Room,**
Postgraduate Centre, CAH

[redacted] – Contractual Responsibilities
[redacted] – Trust HR Policies
[redacted] – Fire Safety & Waste Management
Introduction

Sponsored By: [redacted] **~ Medical Defence Union**

GENERIC INDUCTION PROGRAMME
(for junior medical staff)

WEDNESDAY 2ND FEBRUARY 2005

LECTURE THEATRE, MEDICAL EDUCATION CENTRE, CRAIGAVON AREA HOSPITAL

9.30 am – 9.40 am	Introduction Study Leave	[redacted]
9.40 am – 9.50 am	Fire Safety	[redacted]
9.50 am – 10.10 am	Drug Prescribing Policy	Dr CM Ritchie Consultant Physician
10.10 am – 10.30 am	**COFFEE**	
10.30 am – 11.~~45~~ am SS	Cross Infection and Sharp's Policy Antibiotic Policy Use of Pathology Services inc requesting Post Mortems & consent Transfusion Policy Death Certification	[redacted] Dr Sharpe & Colleagues
11.45 am – 11.55 am	~~Obtaining Valid Consent~~	~~Mr C Weir Consultant Surgeon~~
11.55 am – 12.15 pm	ICU – Criteria for Referral	[redacted]
12.15 pm - 12.35 pm	Contractual responsibilities, Rotas, Hours of Work (inc Monitoring)	[redacted]
12.35 pm – 12.50 pm	Lessons from the Past	[redacted]
12.50 pm – 2.00 pm	Signing On and Salary Details	Human Resources
2.00 pm	**SPECIALITY INDUCTIONS**	

F1 INDUCTION PROGRAMME

FRIDAY 29th JULY OS

Immediate Life Support
Postgraduate Centre , CAH

MONDAY 1ST AUGUST OS

9:30am – 10:30 am	Human Resources - Signing On	[redacted]
10:30am	Rotas and monitoring, sick leave policy	
10:45am	Educational Requirements / Educational Supervisors	[redacted]
11am	Coffee - Meet the staff	
11:30am	Pain Management	[redacted]
12:00 noon	CAH Antibiotic Prescribing Guidelines	[redacted]
12:30 pm	MCQ – What have I learned ?	
1pm	LUNCH	
2pm	How can we improve this year ?	[redacted]
2:30pm	The Inside Track – current PRHO views. Work out rotas.	
3:00pm	MCQ Feedback – Revision (if required)	

TUESDAY 2ND AUGUST 2005

8:30am / 9 am Commence Work on Ward –
Proper Handover ward rounds with New Team / Ward

3pm approx Bleep Handovers from old PRHOs to F1s.

GENERIC INDUCTION PROGRAMME

In addition to the F1 Induction Programme above, there is a Generic Hospital Induction Programme for all new doctors , usually held on Friday around lunchtime.

These are also **compulsory** and your attendance record will be given to you to keep in your portfolio.

CRAIGAVON AREA HOSPITAL GROUP TRUST

GENERIC INDUCTION

DATE: Friday 5th August 2005

TIME: Snack Lunch 12.00 pm
Induction 12.30 pm – 2.00 pm

VENUE: **Seminar Room,**
Postgraduate Centre, CAH

[redacted] - Study Leave & Obtaining Valid Consent
[redacted] – Referral Criteria for ICU
[redacted] – Prescribing Issues

Sponsored By:

GENERIC INDUCTION PROGRAMME
AUGUST 2005

Lecture Theatre, Medical Education Centre, CAH

Friday 5th August 2005 **Eilish Humston - AstraZeneca**		
12.30pm	Study Leave & Obtaining Valid Consent	[redacted]
1.00pm	Fire Safety	[redacted]
1.15pm	Prescribing Issues	Dr CM Ritchie & Pharmacy
1.45pm	Surviving Sepsis Campaign	[redacted]
2.00pm-2.15pm	Lessons from the Past	[redacted]
2.15pm-2.30pm	Use of Laboratory Services & Management of Hyponatraemia	Dr P Sharpe

Friday 12th August 2005 **Allen Bell - Bayer**		
12.30pm – 2.00pm	**LABORATORY SERVICES** Pathology Services – An Overview Obtaining Valid Consent for PMs Histopathology & Autopsy Blood Transfusion Policy Antibiotic Policy Infection Control & Management of Sharp Injuries	

Friday 19th August 2005 **Jim McManus - NAPP**		
12.30pm	Contractual Responsibilities & Trust HR Policies	[redacted]
1.00pm	Referral Criteria for ICU	Dr C Clarke
1.15pm	IV Fluid Management	Dr C Clarke
1.30pm	Security Issues	[redacted]
1.45pm-2.00pm	Introduction / Role of Resuscitation Officer	

CRAIGAVON AREA HOSPITAL GROUP TRUST

GENERIC INDUCTION

DATE: Friday 12th August 2005

TIME: Snack Lunch 12.00 pm
Induction 12.30 pm – 2.00 pm

VENUE: **Seminar Room,**
Postgraduate Centre, CAH

LABORATORY SERVICES

Pathology Services – An Overview
Obtaining Valid Consent for Post Mortem's
Histopathology & Autopsy
Blood Transfusion Policy
Antibiotic Policy
Infection Control & Management of Sharp Injuries

Sponsored By:

CRAIGAVON AREA HOSPITAL GROUP TRUST

GENERIC INDUCTION

DATE: Friday 19th August 2005

TIME: Snack Lunch 12.00 pm
Induction 12.30 pm – 2.00 pm

VENUE: **Seminar Room,**
Postgraduate Centre, CAH

[redacted] – Contractual Responsibilities
[redacted] – Trust HR Policies
[redacted] – Fire Safety & Waste Management
Introduction

Sponsored By:

[redacted]

GENERIC INDUCTION PROGRAMME
(for junior medical staff)

[redacted]

WEDNESDAY 1ST FEBRUARY 2006

LECTURE THEATRE, MEDICAL EDUCATION CENTRE, CRAIGAVON AREA HOSPITAL

9.00am – 9.10am	Introduction Study Leave	[redacted] Clinical Tutor
9.10am – 10.00am	Drug Prescribing Policy	[redacted] Consultant Physician
10.00am – 10.30am	**COFFEE**	
10.30am – 1.00pm	Cross Infection and Sharp's Policy Antibiotic Policy Use of Pathology Services inc requesting Post Mortems & consent Transfusion Policy Death Certification Hyponatraemia & Hyperkalaemia Management	[redacted] Dr Sharpe & Colleagues
1.00pm - 1.45pm	**LUNCH**	
1.45pm – 2.00pm	ICU – Criteria for Referral	[redacted]
2.00pm - 2.30pm	Lessons from the Past	[redacted]
2.30pm-2.45pm	Security Issues	[redacted]
2.45pm - 3.15pm	Contractual responsibilities, Rotas, Hours of Work (inc Monitoring)	[redacted]
3.15pm	Signing On and Salary Details	Human Resources

F1 INDUCTION PROGRAMME

FRIDAY 28TH JULY 06

Immediate Life Support Course
[redacted] Resuscitation Officer
Medical Education Centre, CAH

MONDAY 31ST JULY 06

10:00am	Rotas and monitoring, sick leave policy	[redacted]
10:30am	Educational Requirements / Educational Supervisors	[redacted]
11:00am	**Coffee - Meet the staff**	
11:30am	Pain Management	[redacted]
12:00noon	CAH Antibiotic Prescribing Guidelines	[redacted]
12:15pm	Access to Radiology	[redacted]
12:30pm	MCQ – What have I learned ?	
1:00pm	**LUNCH**	
2:00pm	Respiratory Issues	[redacted]
2:30pm	The Inside Track – current PRHO views Work out rotas	
3:00pm	MCQ Feedback– Revision (if required)	
3:30pm	Human Resources - Signing On	[redacted]

F1 INDUCTION PROGRAMME

TUESDAY 1ST AUGUST 2006

8:00am – 9:00am	Commence Work on Ward – Proper Handover ward rounds with New Team / Ward
2:00pm – 3:00pm	Bleep Handovers from old F1s to new F1s

GENERIC INDUCTION PROGRAMME

In addition to the F1 Induction Programme above there is a Generic Hospital Induction Programme for all new doctors, usually held on Friday around lunchtime. This year, Mr Weir is trying to get this compiled as a web based programme, but there may still be the occasional lecture that must be attended.

These are also **compulsory** and your attendance record will be given to you to keep in your portfolio.

F1 INDUCTION PROGRAMME

Wednesday 25th July 2007 – Monday 30th July 2007

Lecture Theatre
Medical Education Centre,
Craigavon Area Hospital

WEDNESDAY 25TH JULY 2007

1:30 pm	Signing on – Human Resources	[redacted]
2:05 pm	Welcome to F1 year	[redacted]
2:15 pm	Intravenous Fluid Management MEWS	[redacted] Lead Clinician ICU
3:00 pm	Pain Management	[redacted]
3:30 pm	Respiratory Issues	[redacted]
4:00 pm	The Inside Track – current PRHO views Work out rotas	

THURSDAY 26TH JULY 2007

ALERT Course
Beeches Training Centre, CAH

FRIDAY 27th JULY 2007

Immediate **L**ife **S**upport
Beeches Training Centre, CAH

MONDAY 30th JULY 2007

8:45 am	Welcome and Introduction	
9:00am	Rotas and monitoring, sick leave policy	[redacted]
	Educational Requirements / Educational Supervisors	[redacted]
9:45am	Cardiology	[redacted]
10.00am	Access to Radiology	[redacted]
10.20am	Introduction to Pharmacy Programme	
10:25am	Drug History Taking	[redacted]
10.50am	Drug Kardex	
11.15am	COFFEE BREAK – meet the staff	
11.30am	Discharge Prescriptions (inc. controlled drugs)	[redacted]
12.00noon	Warfarin / Enoxaparin Prescription	
12.30pm	Management of the Diabetic Patient Medical / Surgical	[redacted]
1.00pm	LUNCH	
2.00pm-5.00pm	Pharmacy Workshop	

TUESDAY 31st JULY 2007

Arrangements to follow – start work

GENERIC INDUCTION PROGRAMME

In addition to the F1 Induction Programme above there is a Generic Hospital Induction Programme for all new doctors.

It is hoped by the Deanery to have an electronic induction package for some of your training needs.

MEDICAL TUTORIALS 2007/2008

THURSDAY – 12.30pm – 1.30pm SHARP

Lecture Theatre, Ground Floor, Medical Education Centre, CAH

Sept	6	Royal College Physicians Study Day
	13	Osteoporosis
	20	~~Arrhythmias~~
	27	The Mental Health Order
Oct	4	~~Management of Stroke~~
	11	Epilepsy
	18	Acute Coronary Syndromes (cancelled due to lack of no's-4)
	25	Dementia
Nov	1	COPD
	8	Dermatology - CANCELLED
	15	~~Hyponatraemia~~
	22	Polymyalgia and Cranial Arteritis
	29	Assessment and Management of Shock
Dec	6	Palliative Care - CANCELLED
	13	Heart Failure
	20	Diarrhoea/IBD - CANCELLED
Jan	3	Pulmonary Embolism
	10	Adrenal Disease
	17	Acute Renal Failure
	24	Falls and Deterioration in Mobility
	31	Liver Failure/Portal Hypertension
Feb	7	Coagulation and Anticoagulation
	14	Advances in Therapy in Rheumatology
	21	Arrhythmias (Sr Thelma Carville)
	28	Hypertension
Mar	6	Diabetes: Diagnosis and Complications (cancelled 5/3/8)
	13	Headache
	20	Indications/interpretation of cardiac investigations
	27	The Single Hot Joint - CANCELLED
April	3	Hypercalcaemia
	10	Antibiotic Prescribing
	17	Asthma - CANCELLED
	24	Thyroid Disease
May	1	Jaundice
	8	Respiratory Failure
	15	Acute Confusional State (Dr Patricia Gordon)
	22	Parkinsons Disease
	29	Assessment of Anaemia - CANCELLED

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Compliance measure	Person responsible for conducting the audit / compliance and who they reported to	Methodology used to conduct the audit	Units or areas of the hospital which were subjected to audit	Professional disciplines covered by the audit	Period of time during which the audit was conducted and maintained	Results of the audit
Monitoring through clinical incident reporting:	Led by Dr M Hogan, Lead Clinician in Paediatrics	Ongoing review of paediatric clinical incidents	Paediatric team	Paediatrics, nursing, pharmacy, clinical risk manager and a senior manager.	Ongoing	Awareness implementations plan put in place to avoid re-occurence of incidents Example new gentamycin kardex
Stabilisation and Transfer of Critically Ill Children Telelink Audit 2005/2006	Dr Davis SpR Paediatrics , Dr Bell, Consultant Paediatrician	Monthly telelink at regional level	Paediatric Team/ Emergency Dept team / Anaesthetic team/ radiology team	Paediatrics medical and nursing, emergency dept medical and nursing, Anaesthetics medical and nursing and radiology dept	Ongoing	Sharing points of good practise and continuous improvement for the transfer of critically ill infants example in house simulations between emergency dept and paeds set up, requirement for 2 members of medical staff to always accompany a critically ill child
Transfer Audit	Dr B Bell, Consultant Paediatrician	Completion of form	Children's ward Emergency dept, neonatal unit	Medical,nursing and managers	Ongoing	Information sent to Dr Tubman Director of paediati rc and neonatal transport to inform the needs of the transport team for a 24/7 service
Audit of paediatric resuscitation:	Dr A Chillingworth.	Retrospective review of all paediatric resuscitations between April – July 20	Paediatrics, Craigavon Area Hospital		April – July 2005.	presented at the Area Paediatric Audit meeting on 21 July 2005. Results previously submitted Training need identified and training undertaken

F1 INDUCTION PROGRAMME

Thursday 28th July 2005 – Monday 1st August 2005

Main Lecture Hall
Postgraduate Centre,
Craigavon Area Hospital

THURSDAY 28TH JULY

8:45 am	Welcome and Introduction	
9:00am	Intravenous Fluid Management	Dr Chris Clarke Lead Clinician ICU
10:00am	Drug History Taking	[redacted]
10:25am	New Drug Kardex	
10:50am	Discharge Prescriptions (inc. controlled drugs)	
11:15am	COFFEE BREAK	
11:30am	Warfarin / Enoxaparin Prescription	[redacted]
12noon	Management of the Diabetic Patient	[redacted]
12:30	LUNCH	
1:15pm	Respiratory Medicine	[redacted]
2:00pm – 5:00pm	Injectable Medicines (Workshops + Tutorials)	

[redacted]

GENERIC INDUCTION PROGRAMME
(for junior medical staff)

[redacted]

WEDNESDAY 1ST FEBRUARY 2006

LECTURE THEATRE, MEDICAL EDUCATION CENTRE, CRAIGAVON AREA HOSPITAL

9.00am – 9.10am	Introduction Study Leave	[redacted] Clinical Tutor
9.10am – 10.00am	Drug Prescribing Policy	[redacted] Consultant Physician
10.00am – 10.30am	**COFFEE**	
10.30am – 1.00pm	Cross Infection and Sharp's Policy Antibiotic Policy Use of Pathology Services inc requesting Post Mortems & consent Transfusion Policy Death Certification Hyponatraemia & Hyperkalaemia Management	[redacted] & Colleagues
1.00pm - 1.45pm	**LUNCH**	
1.45pm – 2.00pm	ICU – Criteria for Referral	[redacted] Consultant Anaesthetist
2.00pm - 2.30pm	Lessons from the Past	[redacted] Chairman - M&M
2.30pm-2.45pm	Security Issues	[redacted] Security Officer
2.45pm - 3.15pm	Contractual responsibilities, Rotas, Hours of Work (inc Monitoring)	[redacted] Human Resources
3.15pm	Signing On and Salary Details	Human Resources

GENERIC INDUCTION PROGRAMME
(for junior medical staff)

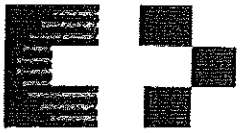
WEDNESDAY 2ND FEBRUARY 2005

LECTURE THEATRE, MEDICAL EDUCATION CENTRE, CRAIGAVON AREA HOSPITAL

9.30 am – 9.40 am	Introduction Study Leave	[redacted]
9.40 am – 9.50 am	Fire Safety	[redacted]
9.50 am – 10.10 am	Drug Prescribing Policy	[redacted]
10.10 am – 10.30 am	**COFFEE**	
10.30 am – 11.~~45~~ am SS	Cross Infection and Sharp's Policy Antibiotic Policy Use of Pathology Services inc requesting Post Mortems & consent Transfusion Policy Death Certification	Dr [redacted] Dr Sharpe & Colleagues
11.45 am – 11.55 am	~~Obtaining Valid Consent~~	[redacted]
11.55 am – 12.15 pm	ICU – Criteria for Referral	[redacted]
12.15 pm - 12.35 pm	Contractual responsibilities, Rotas, Hours of Work (inc Monitoring)	[redacted]
12.35 pm – 12.50 pm	Lessons from the Past	[redacted]
12.50 pm – 2.00 pm	Signing On and Salary Details	[redacted]
2.00 pm	**SPECIALITY INDUCTIONS**	

Thank you
Liz KS

GENERIC INDUCTION PROGRAMME
(for junior medical staff)



WEDNESDAY 4TH FEBRUARY 2004

SEMINAR ROOM, POSTGRADUATE CENTRE, CRAIGAVON AREA HOSPITAL

9.30 am – 9.40 am	Introduction Study Leave	[redacted] Clinical Tutor
9.40 am – 10.00 am	Drug Prescribing Policy	[redacted] Consultant Physician
10.00 am – 10.15 am	**COFFEE**	
10.15 am – 11.30 am	Cross Infection and Sharp's Policy Antibiotic Policy Use of Pathology Services inc requesting Post Mortems & consent Transfusion Policy Death Certification	[redacted] Dr Sharpe & Colleagues
11.30 am – 11.40 am	Fire Safety	[redacted]
11.40 am – 11.50 am	Obtaining Valid Consent	[redacted]
11.50 am – 12.05 pm	ICU – Criteria for Referral	[redacted]
12.05 pm – 12.25 pm	Contractual responsibilities, Rotas, Hours of Work (inc Monitoring)	[redacted]
12.25 pm – 1.30 pm	Signing On and Salary Details	[redacted]
2.00 pm	**SPECIALITY INDUCTIONS**	

GENERIC INDUCTION PROGRAMME
(for junior medical staff)

WEDNESDAY 2ND FEBRUARY 2005

LECTURE THEATRE, MEDICAL EDUCATION CENTRE, CRAIGAVON AREA HOSPITAL

9.30 am – 9.40 am	Introduction Study Leave	[redacted]
9.40 am – 9.50 am	Fire Safety	[redacted]
9.50 am – 10.10 am	Drug Prescribing Policy	[redacted]
10.10 am – 10.30 am	**COFFEE**	
10.30 am – 11.~~45~~ 55 am	Cross Infection and Sharp's Policy Antibiotic Policy Use of Pathology Services inc requesting Post Mortems & consent Transfusion Policy Death Certification	Dr [redacted] Dr Sharpe & Colleagues
11.45 am – 11.55 am	~~Obtaining Valid Consent~~	[redacted]
11.55 am – 12.15 pm	ICU – Criteria for Referral	[redacted]
12.15 pm - 12.35 pm	Contractual responsibilities, Rotas, Hours of Work (inc Monitoring)	[redacted]
12.35 pm – 12.50 pm	Lessons from the Past	[redacted]
12.50 pm – 2.00 pm	Signing On and Salary Details	[redacted]
2.00 pm	**SPECIALITY INDUCTIONS**	

Thank You
Liz KS

T12

MINUTES OF MEETING OF CLINICAL SERVICES MANAGER/SISTERS - MEDICAL DIRECTORATE HELD ON MONDAY 29 MARCH 2004 AT 3 PM IN SEMINAR ROOM POST-GRADUATE CENTRE

PRESENT:	Mrs E O'Rourke	
	Sister L Adair	Sister C Stretton
	Sister M Thompson	Sister E Martin
	Sister L Irwin	Sister P Watt
	Sister M Mackle	NCS D Crooks
	Sister L McParland	Sister R Dickson
APOLOGIES:	Mr S Cartmill	Sister L Cullen
	Sister U Toland	Sister S Burns

Minutes of previous meeting agreed as a true record with one change. Sister Mackle was present.

1. [redacted] joined the meeting to speak to the Sisters re. any issues they were experiencing with the new bed contract.

2. Clinical and Social Care Governance

   Mrs O'Rourke informed the Sisters that Sister Moonan has taken up her new role as Clinical Risk Manager for the Trust, working 2 days within the Medical Directorate.

3. Quality

   [redacted] will now work in the area of quality across the Trust.

4. Complaints

   Mr David Cardwell has now taken up his post of Complaints Manager and Administrative Manager within the Directorate of Nursing and Quality. He is planning to attend one of the meetings to introduce himself to the Sisters.

5. Nurse Bank

   A new computer system for Nurse Bank recording and reports is being introduced and will be available at ward level in the near future.

13. Professional Development Programme

20 places available for this course. Sisters encouraged to bring this to the attention of staff within the wards.

14. QUALPACS

Sisters to inform Mrs O'Rourke of the outcome and forward a copy of the QUALPACS assessment.

15. Questionnaires

Revised Nursing Work Index Questionnaires have been distributed. Mrs O'Rourke asked Sisters to encourage staff to respond.

16. Chaplaincy

Sisters asked to remind staff of the importance of recording the patient's religion on admission, thus ensuring a clergy visit while in hospital. The problem appears to be more obvious in 3 North. Sister Mackle asked to remind her staff when filling in details on PAS to also input the religious denomination of the child.

17. Accidents/Incidents

Reports sent to Sisters on accidents/incidents where the patient sustained a fracture, asking for action taken regarding these incidents, in particular in relation to minimising reoccurrence. Mrs O'Rourke asked that this information be forwarded to her as soon as possible.

18. Commissioned Courses

Courses to be commissioned for 2004/2005 to be forwarded and Sisters asked to identify staff who are to take up these courses and ensure forms are filled in.

19. Management of Hyponatraemia

Mrs O'Rourke checked with Sisters that posters are on each ward re. the management of hyponatraemia and available for all members of staff, both medical/nursing to refer to.

20. Fair Day – Queens

Sister McParland interested to attend on behalf of the Medical Directorate.

T13

Ulster Med J 2005; **74 (2)** *93-97*

Papers

A study of current fluid prescribing practice and measures to prevent hyponatraemia in Northern Ireland's paediatric departments

Jarlath McAloon, Raj Kottyal

Accepted 30 August 2005

SUMMARY

Guidance on the prevention of hyponatraemia in children was issued by DHSSPSNI in March 2002. Two years later Dr Henrietta Campbell, the Chief Medical Officer, wrote to the Chief Executives of acute and combined trusts to seek assurances that the guideline had been incorporated into clinical practice and its implementation monitored. This paper reports the findings of the first prospective study undertaken to examine practice following introduction of the guidance. The evidence suggests that implementation has so far been incomplete and highlights problem areas. The paper reflects on potential explanations for the findings and makes practical suggestions for improvement.

INTRODUCTION

In November 2004, following the broadcast of the UTV Insight programme 'When Hospitals Kill' alleging that three children had died unnecessarily, the Minister with responsibility for Health, Social Services and Public Safety, Angela Smith announced that she had appointed Mr John O'Hara QC, to lead an inquiry into their hyponatraemia-related deaths. Examination of the care and treatment in relation to the management of fluid balance and the choice and administration of intravenous fluids will be a key component of the Inquiry in all three cases. Earlier in the same year Dr Henrietta Campbell, the Chief Medical Officer (CMO), had written to the Chief Executives of acute and combined trusts to seek assurances that the guidance issued by DHSSPSNI in 2002 on the prevention of hyponatraemia in children receiving prescribed fluids[1] had been both implemented and incorporated into clinical practice. In 2003, to promote further awareness and also to elaborate on the rationale underpinning the guideline, Jenkins and colleagues[2] in an Editorial in this journal highlighted the clinical situations where children are at greatest risk for developing elevated vasopressin levels, described associated risk factors and discussed how the choice of prescribed fluids can contribute to dilutional hyponatraemia. Specifically the guideline recommends 0.9% saline as an appropriate crystalloid for resuscitation; directs that the anticipated Na^+, K^+ and glucose requirements, for which age is an essential factor, should determine the type of maintenance fluid and proposes that for most replacement scenarios fluid with minimum sodium content 130mmol/l should be used. Also incorporated is advice on patient assessment that includes checking the weight of the child; advice on how to calculate fluid requirements and details of the clinical and biochemical monitoring required while in receipt of IV fluids.

In response to the CMO's request for assurance that the guidance had been implemented the prospective

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study described in this paper, the first to examine guideline adherence in local paediatric units, was undertaken to examine practice and to identify any component(s) presenting implementation difficulty and if present to in turn reflect on possible practical solutions.

METHODS

All eight acute paediatric inpatient units in Northern Ireland were invited by one of the authors (JMA), through a lead clinician, to participate in a simultaneous snapshot of paediatric practice around the Province and readily accepted. It was proposed that the management of all patients in receipt of intravenous (IV) fluids between 12.00 and 14.00hrs on the same day in May 2003, and who had also been in receipt of IV fluids in the previous twenty-four hours, would be assessed for compliance with the guidance. This time window was chosen in the expectation that a morning ward round would normally by then have been conducted, thus providing a pragmatic method of targeting a high risk group requiring ongoing therapy post baseline assessment and for whom there would have been adequate opportunity for management plans, monitoring and associated decision making to have been put in place. Neonates and intensive care patients, whose management is different, were excluded. The lead clinicians were asked to inform the relevant Clinical Director(s) that the study was being planned; asked to identify a medical assistant for local data collection and to ensure that the date was kept confidential in order to avoid a positive influence on clinician behaviour. To facilitate maximum participation coordinators were reminded of the study date in the preceding week. The same single page data collection form, previously piloted and refined by a paediatric SHO (RK) during two one week trial periods at Antrim Hospital, was used in each contributing unit. Details of diagnosis, presence of dehydration, weight recording, fluid prescription and clinical and biochemical monitoring were transcribed from the case notes, fluid prescription and fluid balance sheets.

Details of the specific elements involved in monitoring, such as records of urinary output and vomiting were, for practical reasons, not included. Instead it was assumed that a documented record of any reassessment of requirements indicated that assessment of all the key components had occurred.

Consistency of data interpretation for the purpose of comparing actual management with expected guideline management was facilitated by having the same experienced clinician (JMA) analyse the returned data forms and cross reference the diagnosis and assessment of fluid balance status against the record of prescription for each individual patient. Also, when the adequacy of data return permitted all calculations of fluid volumes prescribed were recalculated by JMA. To facilitate collation of information a prescription for maintenance fluids was judged to be inconsistent with the guideline if the volume prescribed was greater than +/- 5% and inappropriate if greater than +/- 10% of the guideline calculation. The rationale for this percentage limit is that in terms of degrees of dehydration a larger variation could correspond to incorrect management e.g. treating a moderately dehydrated patient for mild dehydration or vice versa.

As the recruitable numbers able to satisfy the strict inclusion criteria were small an identical exercise was repeated on two further days, one in June 2003 and one in January 2004.

RESULTS

There were thirty-eight eligible children for whom forms with complete/near complete data were returned. All units contributed at least one patient. Twenty-six children had a medical diagnosis and twelve had a surgical problem, eight of whom were in the post operative period. Four children had conditions for which not all elements of the guidance were relevant (see sections b, e). The grades of staff prescribing the fluids were PRHO (4); first term SHO (19); second term SHO (5); SpR (5); SAS (1); consultant (3) with one unknown. The results for adherence to each key component of the guideline are described below with the main findings summarised in table 1.

a. Was the child's weight recorded?

   Data were returned for thirty-five children. Weight was measured in 33 cases and estimated in 2.

b. Was the calculation for maintenance IV fluid volume consistent with the guidance?

   Of the thirty-seven children with this data returned there were two children receiving fluid treatment in association with chemotherapy and one with a diagnosis of benign intracranial hypertension in whom an alternative protocol was being followed and for whom the guideline maintenance calculation was not applicable. Eighty-two percent of relevant calculations

TABLE I

Guideline adherence question	*Total*	*yes*	*no*
b. was maintenance calculation consistent with guidance?	34	28	6
c. was IV fluid composition appropriate?	35	35	0
d. were maintenance & replacement prescribed separately	7	2	5
e. was fluid balance assessed at least 12 hourly?	33	15	18
f. was U&E checked at least once per 24 hours?	34	30	4
g. was oral intake considered in IV prescription?	23	12	11

Adherence to DHSSPSNI guidance[1] on prescribed fluids and hyponatraemia

were consistent with the guidance. There were three calculations judged guideline inconsistent and three others judged inappropriate.

c. Was the composition of IV fluids used appropriate?

Data were returned for thirty children who had received either maintenance fluids alone or both resuscitation and maintenance fluids plus five other children who also had a prescription for replacement and/or ongoing losses. The electrolyte and glucose content of the fluid utilised was suitable in all thirty-five cases.

d. Were maintenance and replacement fluids prescribed separately?

The return for this question provided information on a further two children i.e. a total of seven, who had both maintenance and replacement losses prescribed. Two of the seven had replacement prescribed separately but five did not.

e. Was fluid balance assessed at least every twelve hours?

Of thirty-seven data returns the guidance was considered applicable only to thirty-three as three were following an alternative fluid regimen and one was terminally ill. Forty-five percent had documented evidence of reassessment of requirements in the first twelve hours of treatment. Sixty-six percent had reassessment within the first twenty-four hours. Thirty-three percent had no record of reassessment.

f. Was U&E checked at least once per twenty-fours?

There were thirty-four data returns for whom the guidance was applicable. Twelve percent had not had a U&E checked any time in the preceding 24 hours. There were no children with severe hyponatraemia (Na+ <130mmol/l) though nine children had a Na+ <135mmol/l at some point.

g. Was the oral fluid intake considered in the most recent IV fluid prescription?

Allowance for oral intake occurred in only fifty-two percent of the twenty-three children for whom the guidance was relevant.

h. What oral fluids were used during this period?

Information was provided for seventeen of the twenty-three treated with both oral and IV fluids and is summarised in table 2.

Table II

Fluid type	*n*
Water	2
water and juice	4
water and soup	1
Juice	2
juice and milk	1
Milk	5
rehydration solution	2

Types of oral fluid administered concurrently with IV fluids

DISCUSSION

While the number of children in the study was inevitably small the information obtained should be a valid reflection of clinical practice following issue of the guidance and it is consequently important. As the study period included three induction periods for new/ changing medical staff it is reasonable to conclude that there was sufficient opportunity for the guideline to be both fully disseminated and introduced. Also the patients reported were those with the highest risk of fluid therapy associated complications for whom greatest awareness and attention to the application of the management guidelines would be expected.

The standard for weight, namely that it should always be measured or estimated in a bed bound child, was met. However this may not necessarily reflect guideline conscious behaviour as recording of weight has become part of normal paediatric practice regardless of diagnosis.

The standard achievement rate (82%) for maintenance fluid calculation was also high but with some evidence of the co-existence of potentially significant variation from advised practice. Jenkins and colleagues[2] acknowledge that guidance on maintenance fluid requirements is general guidance and emphasise that assessment should be individualised. We allowed for this in our evaluation by accepting a total calculated volume within +/- 5% of the guideline value as meeting the standard. Of the six children whose calculation was outside the guideline there were three whose prescriptions were classified as inappropriate, two being underestimates and the third an overestimate. The two underestimates were in a fifteen year old (-17%) on day 1 post appendicectomy with a first term SHO as prescriber and in a thirteen year old (-19%) with urinary infection and prescriber not indicated. The overestimated child was a six year old (+27%) admitted with vomiting and constipation but no dehydration and for whom the prescriber was a first term SHO. The management of his child is of concern though close monitoring did take place with the U&E checked on four occasions and the lowest Na+ recorded was 134mmol/l.

While there was full compliance in implementing the standard for appropriate fluid choice problems were encountered at the next step, namely recording the prescription. A separate prescription for maintenance and replacement fluids is recommended to reduce the potential risk of excess fluid administration resulting from a combined prescription inadvertently over running the deficit correction period. Separation of the prescriptions did not occur in seventy percent of relevant situations. While this may reflect lack of clinical awareness, another factor may be lack of user friendliness of available prescription sheets.

Monitoring of hydration status and fluid balance is essential. The guideline specifies that reassessment should occur at least twelve hourly but this was only recorded in the minority of cases. It is unlikely that this finding is attributable more to poor record keeping than lack of reassessment as there were four children identified who had no U&E checked during twenty-four hours of IV therapy, three of whom had actually been on full maintenance. These three included two post-operative, hence relatively high risk, patients aged 6 weeks and 11 years and a 8 year old with septic arthritis. The rigour of some assessments is also of concern as, contrary to advice, no consideration had been allowed for the oral intake in fifty percent of relevant prescriptions.

The guidance mentions hyponatraemic risk in association with use of inappropriate oral fluids but there were only two children whose oral fluid was a commercial rehydration solution (*Table 1*). The prevalent use of hypotonic solutions in this high risk group suggests that common practice needs to be reviewed.

In summary the evidence is that implementation of the Regional guidance has so far been incomplete. This could indicate that there is inadequate guideline awareness due to failure of training programmes and/ or failure of units to provide direction to junior staff. An alternative explanation is that there may be intrinsic operational hindrances to implementing the guideline. If not done already, units should organise a review by nursing, pharmacy and medical staff, both junior and senior, to identify the difficulties and possible solutions. Relevant issues for discussion and action could include: the redesign of prescription sheets to facilitate separation of prescriptions when only one IV infusion/line is present; the facility to indicate required infusion finish times; the provision of action boxes on fluid balance sheets to trigger clinical and biochemical reassessments; appending for reference a simplified maintenance fluid calculation formula on the back of prescription sheets; outlining clinical descriptions for assessment of hydration status on the back of fluid balance forms; provision of oral fluid management information and advice for carers and the introduction of a method for effective nursing and medical handover of management plans for all children receiving IV fluids. Redrafted or new documentation could be

standardised in all trusts and a consensus should be developed on the appropriate use of hypotonic oral fluids with the original guideline Working Group providing a strategic overview.

To conclude, it is probable that the current guidelines will be modified in conjunction with the developing evidence base on appropriate fluid therapy in situations where physiology is not normal, such as illness or postoperatively. Internationally best practice is still controversial[3,4] and preparation of definitive protocols is not yet possible, unlike hyperkalaemia where a consensus is now being reached.[5] Until then it is essential that all clinicians in Northern Ireland caring for children in receipt of fluid therapy know of the associated risks and are aware of our Regional best practice guidance and that paediatric departments initiate a process of regular monitoring of guidance adherence as part of their multidisciplinary audit and clinical governance programme.

The Authors have no conflict of interest.

ACKNOWLEDGEMENTS

The willing collaboration of Mr A Bailie, Drs A Bell, C Corkey, N Corrigan, J O'Donohoe, M Rollins, M Smith in arranging the data collection is acknowledged. Thanks to Dr J Jenkins for reviewing the paper and his helpful suggestions for improvement.

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Water, Water Everywhere- And Not A Drop Was Drunk

Water Intoxication (Removing The Handle From The Pump)

Craigavon Area Hospital

- 2 wks unwell
  - Urinary discomfort
  - G.P. penicillin- rash (?allergic/ fungal)
  - Progressively unsettled
- Brought to A+E

Seen By Paeds

- Apyrexic, distressed
- ?PV mass noted
- ? Enlarged bladder
- Booked for EUA by gynaecologists (? Vaginal tumour)
- Distressed- no BP
- Given paracetamol and IBUPROFEN

Pre Op. Investigations

- Na 133
  K 5.2
  U 15
  Cr 192
- CRP 28.6
- Hb 10.4, WCC 10.2, Plts 521

Arrives Theatre

- Asleep
- Visible bladder
- Rapid sequence
  - SUX !!
  - Caudal
  - Spontaneous resp, sevo/ nitrous
- Stable intraop

On Examination

- ? Urethral prolapse
- Catheterised 80-90 ml pus/ urine
- PV normal
- Failed cystoscopy
- Urology assessment suggested

- 20ml.kg^{-1} Hartmann's (300ml)
- Agreed fluids paeds responsibility post op
- Transfer recovery
- ABG taken

pH 7.08	Lact 0.6
pO_2 33.3	Gluc 4.7
pCO_2 7.59	Na 135
BIC 14.2	K 4.4
BE –12.1	Cl 109

- AG (139-123)= 16

Urine Output

- Polyuric in recovery
- Anticipate 0.5 ml kg (8-10 ml hr)
- Passing 50- 100 ml hr
  (Post obstructive uropathy)
- Fluids not been prescribed
  Hartmann's at hourly rate + 20 ml hr

In The Morning

- Venous sample
  - pH 7.33, pO_2 6.75, pCO_2 3.88, BE –9.3,
  - SvO_2 84
  - Na 135
  - K 4.8
  - U 14.3
  - Cr 174
- Put onto 0.45 % saline , similar rate

Subsequent Days

- Na 138, 142, 144
- (Water deficit 15kg child
  TBW 70% = 11 litres
  ECF 1/3 = 3 litres
  140 X 3 = 144 X ECF
  ECF = 2.92 litres
  Deficit 0.8 litres)
- Third day Na 143, K 3.2, U 4.1, Cr 65, BIC 24.0

The Use Of Hypotonic Fluids

- Nectar of the Gods:
  - 0.9 % saline
  - Hartmann's
  - (3% saline)
- Satan's urine:
  - 5% dextrose
  - 0.18% saline
  - 0.45% saline
- Are they hypotonic? Yes they are.

Why Use Them?

- Current regimes based on healthy maintenance data gathered > 40 years ago
- Widely practised
- In standard texts

Are These The Reasons?

- Children need a source of sugar
- Children cannot excrete a sodium load
- The quantities required met conveniently by hypotonic solutions
- Traditional and familiar
- Are there any other reasons?

Children Need Sugar

- Simply not true, certainly >6M
- Abundant evidence for this
- Stress response
- Endogenous glycogen
- Gluconeogenesis
- Lipid oxidation/ ketoacids
- After all, what happens when a 3M old vs a 3 year old go to sleep?
- (Why not use Hartmann's ?)

Children Cannot Excrete Sodium

- 15 kg GFR =25% adult (conservative)
  = 30ml min
  =1.8l hr/ 48 l 24 hrs
- Plasma Na 140
  GFR = 252 mmol Na hr
  = 6048 mmol Na 24 hrs
- Therefore kidney working like blazes to KEEP Na
- Would have urinated herself in 7 hours !

Sodium Conserving

- If 1.8 l hr GFR is reduced to 8-10 ml hr
- Reabsorb 99-99.5 % of filtrate
- (Why is 0.5 ml kg hr so sacred??)
- Excreting sodium is NO problem
  Conserving sodium is essential
  (maintaining ECF and TB Na)

These Fluids Meet Requirements

- Possibly in health
  (well, why are healthy kids on ivi?)
- TBW: 2/3 ICF
  1/3 ECF
- ECF: 1/3 Circulating volume
  2/3 Interstitial fluid
- Na EXTRACELLULAR
  Osmotic potential determines ECF
  In hypovolaemia TB Na reduced
  (regardless of plasma level)

Therefore

- Hypovolaemia
  (n+v, diarrhoea, haemorrhage etc.)
  IS EQIVALENT TO LOSS OF ECF
  AND REDUCED TBNa
- Most periop/ sick kids relatively hypovolaemic or underperfusing
- Therefore to maintain perfusion and DO_2 need to

  EXPAND the ECF, INCREASE the TBNa

In Restoring ECF Need

- Volume loading- to get volume
- Sodium loading to keep it ECF
- Therefore periop requirements for fluid and Na markedly different from healthy kids
- Replacement regimes based around "maintenance" do not "maintain" ECF or TBNa

TB Na- How Do I Measure It?

- Look upon it as ECF
- Clinical shock/ hypovolaemia
- Cap refill
- Veins/ CVP
- Postural hypotension
- Oliguria etc.
- (It is a million miles from PLASMA Na)

Need Na To Get Oedema

- Consider patient with SIADH
- Consider patient with CCF, liver disease, or renal disease
- WHO IS PUFFY??
- (Not entirely true in kids- but nothing is)

So If Suger, Na load, Requirements Are Not Met…

- Must be tradition
  - Long tradition
  - Teaching in medical school/ experts
  - In practise
- Problems neglected in UK/ Europe- not same in US

Every "sick" kid given hypotonic fluid runs the gauntlet of hypoNa, encephalopathy, and death

So, What Is The Problem?

- Huge
- In U.S. 15,000 deaths pa POST OP hypoNa
- Figure for UK/ Europe probably 10- 15,000
- Highest risks in
  - children
  - menstruant women
  - (and anyone else)

Conventional View Of "Stress Response"

- Patient gets sick
- Neuroendocrine response (renin, AT 2, aldosterone, glucagon, CA's, GH) and inflammation
- State of Na (and water) retention
- Therfore periop avoid Na and give hypotonic fluids to meet water rquirements

Wrong, Wrong and Wrong

- Yes, stress response
- Yes (attempt) to conserve TBNa, ECF
- BUT there is a wild card in the deck
- ARGININE VASOPRESSIN (not ADH)
- Effect is to abolish the ability to excrete free water

Causes of AVP Secretion

- Hyperosmolality (starter for 10)
- Reduced ECF and shock
- N+v, pain, anxiety, X nerve afferent
- Drugs
- CNS disease/injury
- Hypothyroid, adrenal, porphyria
- Is this not just about EVERY sick/ peiop patient???

The Other Thing They Didn't Tell You In Medical School

- AVP is a cardiovascular hormone
  (with a little bit of osmotic release-
  ADH by night)
- The increase is appropriate in most settings
- Is "inappropriate" ADH release really all that "inappropriate"?

SIADH (Or Maybe Not)

- Almost universal diagnosis is low Na
- Initially recognised lung Ca
- Low NA, hypoosmolar
- Urine osm > plasma
- Urine Na > 20
- Noramal renal, hepatic, cardiac, adrenal, pituatry, thyroid function
- Absence of hypotension, hypovolaemia, oedema or responsible drugs
- Corrects with water restriction
- Does this sound like a post op patient?

In Sick Paediatric Patients

- Have (universally) raised AVP
- Failure to excrete a water load
- Get given…free water
- And children especially prone to complications of hypoNa

(A recipe for disaster)

Worrying, But Is It A Genuine Problem?

- Post Op Hyponatraemic Encephalopathy Following Elective Surgery In Children
  (Arieff, Paediatric Anaesthesia, 1998)
- 15,000 deaths US post op hypo Na
- Children and women at highest risk, but can occur in any patient
- Demonstrated raised AVP in 6 studies on kids
- Any fluid with Na < 140 will lead to hypoNa

Hyponatraemic Encephalopathy

- The combination of:
  - Raised AVP
  - Hypotonic fluids
  - Hypoxaemia
- Normal compensation
  - Hypoosmolamity/ hypoNa
  - Entry of water to ICF
  - Reduction CBF/ CSF formation
  - Cation extrusion (hours)
  - Osmole extrusion (hours to days)
- Leaves the cell relatively hypotonic, reduced osmotic potential

Children Are Different

- Inability to extrude cations
- Higher IC water (I.e. larger sized brains) (could this mechanism put women at risk as well?)
- Higher IC Na (Na/K ATPase)
- Higher baseline AVP
- ? Sex steroids, neuropeptides

A Collection Of 9 Series, Over 4 Years

- 847 patients hospitalised, developed hypoNa
- 158 (19%) encephalopathic
- 117 (14%) permanent disability
  96% hypoxic vs 4% correction
- Symptomatic hypoNa- mortality at least 15%
- Symptoms are headache, n + v, fits/ status
- Respiratory arrest/ hypoxaemia common

"There is no rationale for the administration of hypotonic fluids to post op patients (children), unless there is documented hypoNa. The syndrome can be prevented by administering isotonic fluids to post op patients"

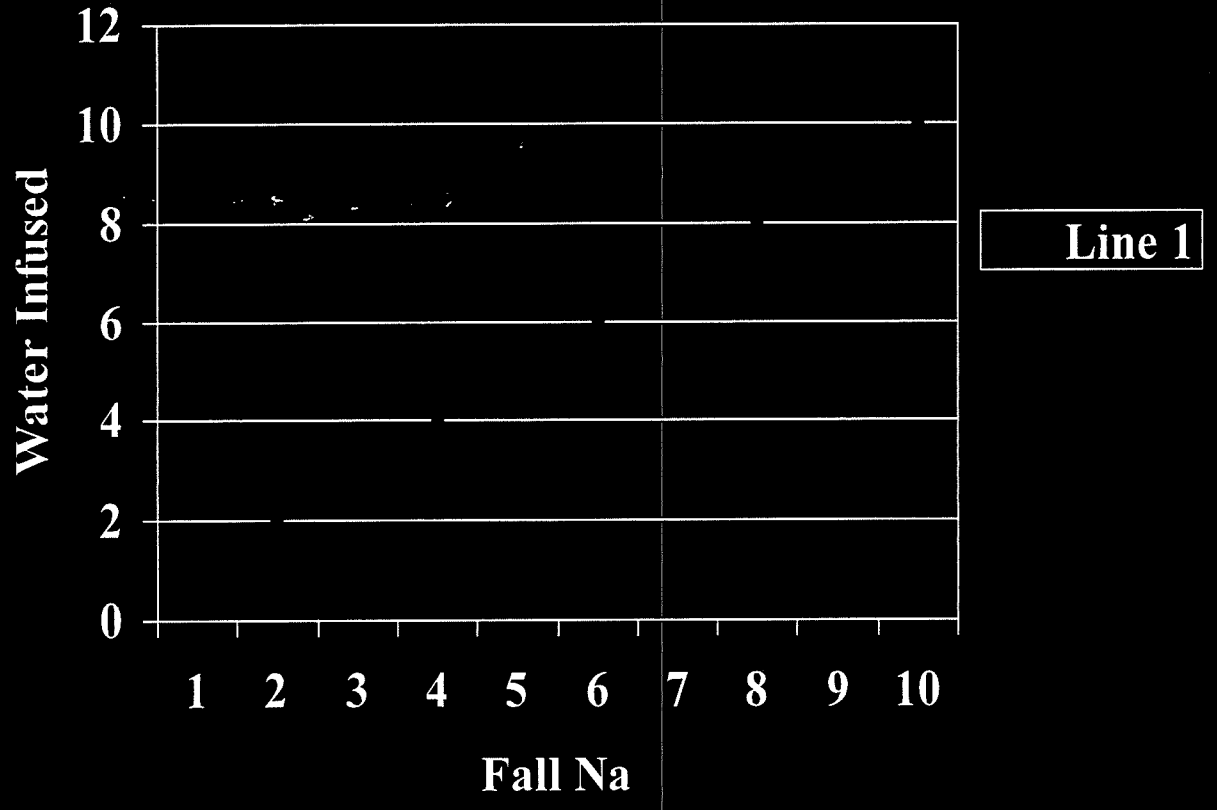
Arieff, 1998

Acute Hyponatraemia In Children Admitted To Hospital- A Retrospective Analysis

- Bohn et al, BMJ 2001
- 306 Children with hypoNa
- Included if <=130 at 48 hrs, ivi given, no underllying renal dis. Affecting Na/water
- 30 cases; 23 complete
  - Median age 5 (1M – 21 yrs)
  - 13 post op
  - 15 needed ICU
  - 18 seizures and vomitting
  - Therapy withdrawn 5 (coning) 1 severely impaired

- All received hypotonic fluids with Na < 140
- 16 records of urine
  - 6 hypertonic – non osmolar AVP
  - 10 not (at that time)
- 12 patients had a fall in Na too large for the water given
  - Either unrecorded water OR excretion of large volume HYPERTONIC urine
- "Desalination" of infused saline

Relationship Between Water Given And Sodium Drop



Discussion

- Incidence may be much higher- much hypoNa seen during hypotonic urine (protective)- spontaneous (or induced) hypotonic diuresis may save lives
- Likely occult M + M
- Currently used guidelines for maintenance fluids in children admitted to hospital must be changed as they do not take into account the unpredictability of AVP.

We recommend that plasma NA be measured when starting an ivi. If Na < 140 isotonic fluid should be given. The use of hypotonic solutions should be rederved for patients with sodium > 140. If a patient has received > 5% of TBW in fluids then plasma Na and electrolytes should be checked.

Got away with it in the past? Don't rely on it in the future.

Acta Paediatrica, 1996

- Good evidence of raised AVP
- 103 acutely ill infants/ children vs 31 controls
- Elevated AVP and PRA with reduced plasma osmolality and raised urine (NON OSMOTIC AVP RELEASE)
- Initial fluid management should be with solutions of 0.45% or 0.9% saline in acutely ill children

American Journal Of Emergency Medicine, 1999

- 2 patients
- Acute gastroenteritis
- 5% dextrose resuscitation
- Fatal outcomes both

  "Recommendations … are for the elimination of hypotonic solutions as stock items in both pre-hospital and emergency department settings"
- Why stop there ?

Jornal Of Paediatric Child Health, 1997

- Retrospective Na <115 or > 165 (severe)
- 21 hypoNa (27 hyperNa)
  - 38% hypoNa water overloaded
  - 58% had neurological signs
  - 19 % died
- Felt outcome predicted by underlying disease process

Annales Francaises Anaesthesiologie Reanime, 2000

- 7 cases children 3-6 years
- Routine surgery
- All hypotonic fluids high rate
- All seizures
  - 5 vomitted
  - 1 respiratory arrest
- 6 good outcome; 1 death

" The use of hyponatraemic solutions prioperatively can lead to hyponatraemic encephalopathy. It must be prevented by the use of appropriate solutions- isotonic fluids in regards of the low free water excretion capacities in the paediatric surgical patient"

HypoNa Seizures And Excessive Hypotonic Fluids,BMJ, 1999

- 12M and 20M girls, 9M and 34M boys
- High intake hypotonic fluids produced seizures
- Note importance dietary history/ measure Na
- In US hypoNa due to dilute feeds/ beverages is the commonest cause of non febrile seizures in < 2 yrs.

Sodium, Lancet, 1998

- Underlying all hypoNa states is a limitation in urinary dilution
- This is most commonly due to (non osmotic) AVP release

Troubling, Thank God I Don't See Kids

- Unfortunately we all see sick patients
- These risks (while reduced) are still present
- You cannot account for AVP…

HypoNa After Orthopaedic Surgery, BMJ, 1999

- 10-15,000 cases US/ Western Europe
- 20% mortality/ serious neurological injury
- 4 problems
  - Clinicians fail to identify those at risk
  - Disregard dangers hypotonic solutions
  - Confuse hypoNa with periop sequelae
  - Attribute encephalopathy to other conditions eg CVA

- Children and menstruating women at risk as high as 128
- Post menopausal rare until 120
- Complicated by thiazides in elderly (compare to post obstructive uropathy)
- "The rationale for using hypotonic fluids in the post op period is hard to discern and has no place in modern practise. Volumes as low as 3-4 litres over 2 days can cause encephalopathy (with convulsions, resp. arrest, brain damage and death) in women healthy before admission. Most cases go unrecognised and are ascribed to conditions such as stroke, AVM, SAH – even when the blood sodium is known"

"Iatrogenic hyponatraemia is inexcusable. It is time doctors woke up to the risks"

Obstetrics

- Patients dipstick urine shows ketones
- Prescribe 5% glucose
- Often with oxytocin

  Stress (AVP) + Hypotonic fluid + oxtocin = Catastrophe
- Why not use Hartmann's- and please use isotonic fluids with oxytocin (or reduce volumes)

General Medicine

- Only 3 main processes with major Na retention problems
  (clue- who is puffy on the ward?)
- Cardiac
- Renal
- Liver
- TBNa and serum are often not saying the same- TBNa = ECF, plasma Na doesn't

In Summary

Surgery/ Illness
+ Hypotonic fluids
+ Kids/ pre-menstrual women
= A massive problem

Don't Believe Me?

- 15 kg child
  - 50 ml hr 0.18% saline
  - = 40 ml hr water
- Assume (generously excrete half this)
  - Over 24 hrs accumulates 480 ml water
  - If ECF is 3 litres
  - Serum Na falls to 120
- "Children … are at risk with Na as high as 128"
  - Who wants to explain it to the parents?

The Way Forward

- Huge revision of training and education
- Tragically will probably need a media frenzy death/ catastrophe
- Recognise the real risks and complications- audit will help
- Use protocol driven fluids
- The only hypotonic fluid available- 5% dextrose to correct DOCUMENTED hypoNa, to a precalculated water deficit, in conjunction with isotonic maintenance and repeat electrolyte measurements

Hartmann's- Myths And Legends

- At FrCA
  - 34% knew correct ions
  - 63% knew fate of lactate- only 21% specifically
- Na 131, K 5, Ca 2, Cl 111, lact 29
  - Guess what- osmolality 280
- Lactate (racemic) used to reduce chloride load

- Adult metabolises 1300 mmol day lactate
- 15 kg child approx 300 mmol
- 50 ml hr gives 35 mmol lactate (=10% endogenous turnover)
- Lactate- 70% gluconeogenesis (2 protons), 30% oxidation (1 proton)
- Therefore 1 litre of Hartmann's =
  10mmol l glucose
  49 mmol protons consumed

- Less chloride load- "expansion acidosis"
  111 vs 154
- Na 131- good ECF and TBNa expander
- (Almost) isotonic
- You could do worse than reach for a bag of Hartmann's in periop patients – you could reach for 0.18% saline