

**A Review of the Teaching of Fluid Balance and
Sodium Management in Northern Ireland and
the Republic of Ireland 1975 to 2009.**

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Produced for the Inquiry into Hyponatraemia-related Deaths.

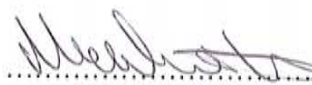
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Personal information: I qualified in Medicine from the Royal College of Surgeons in Ireland and the National University of Ireland in June 1985. I completed training in General Paediatrics following rotations through hospitals in Limerick and Dublin in 1992. I spent the year 1992 as Clinical Tutor in Paediatric attached to University College Dublin. I then spent two years as a Board of Governors' Fellow in Halifax, Nova Scotia, Canada from 1993 to 1995 attached to the Izaak Walton Killam Hospital and Dalhousie University. I spent a further two years as a post doctoral fellow at Yale University School of Medicine, New Haven, Connecticut from 1995 to 1997. I was appointed consultant paediatrician at Coleraine Hospital in 1997 and have worked there and subsequently at Causeway Hospital to the present. I was appointed Medical Director of Causeway Trust in 2003 and remained in that post until 2007 following the review of public administration. I have been Clinical Director of Paediatric in the Northern Trust since September 2007. A complete copy of my Curriculum Vitae is attached to this document as Appendix 4.

Statement:

This document is written with a non-medical reader in mind. I have assumed that the most basic medical terms require a brief definition and that the reader has no familiarity with the outline of medical teaching and training. The information obtained from the sources below was, to the best of my knowledge, true at the time of writing.

Dr Michael Ledwith FRCPCH



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Sources for this document:

- Personal experience
 1. As a medical student at the Royal College of Surgeons in Ireland 1979 – 1985.
 2. Studying for the membership examination of the Royal College of Physicians up to 1992.
 3. As Tutor for University College Dublin medical students studying paediatrics in 1992.
 4. As a Consultant Paediatrician in Coleraine from 1997 to the present.
- Textbooks available at the stated dates.
- Scientific publications published in the more commonly read medical and paediatric journals.
- Discussions with colleagues.
- Online searches

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Undergraduate Teaching

In reading this document a number of significant changes in medical education must be taken into account. Undergraduate medical education in Northern Ireland, as in the rest of the United Kingdom, was largely didactic until 1996. At this point the new curricula based around the General Medical Council's document "Tomorrow's Doctors" (1) (1993) were formulated and introduced. The situation prior to this is best summed up in paragraph 23 of this document: "Present day undergraduate courses have their boundaries but they are not explicit. They vary from school to school and they are defined in terms of general objectives and largely uncoded agreements of examiners as to what a student should be expected to know at the time of the final examinations." Educators would have broad awareness of topics likely to feature in examinations but the curriculum was not codified. Up to this point formal lectures in the Medical School would have been supplemented by small group tutorials situated in hospitals. While a curriculum may have existed there was no clear mechanism for ensuring the teaching of this curriculum or that every student would receive a standardised education. I have made strenuous efforts to obtain copies of curricula from before the mid nineties but have been unable to do so for any medical school on the island of Ireland. Furthermore, any curriculum would have been broad in nature and not detail such specifics as intravenous fluid prescription in children. The content of each lecture would be largely dictated by the lecturer. There was no mechanism to ensure uniformity. Some lecturers would have made efforts to remain abreast of advances in their subject area. Others would have made little change to a lecture they may have given for many years. Most students would supplement these lectures by careful reading of textbooks. A thorough knowledge of any field was ensured only by the random nature of topics which may have arisen in final examinations. Students

would have had to have a clear knowledge of all areas to stand a good chance of passing their final exams. These exams generally took the form of a combination of some or all of the following: essay questions, multiple choice questions and oral examinations.

Until 1996 medical education in Northern Ireland, as in the rest of the United Kingdom and The Republic of Ireland, consisted of two phases. Many, though not all students would spend a year in “pre-med” where the basic sciences of chemistry, physics and biology were taught. This and the next two years (first and second medical years) were the “pre-clinical” years. During these years basic clinical science was taught in lectures and practical sessions. The core topics taught in these years were: anatomy (the physical form and relationships of human organs), biochemistry (the interactions between the chemicals responsible for maintaining life), physiology (the normal functions of individual organs and organ systems). In some medical schools this was supported with lectures or other teaching methods linking the subject matter being studied with clinically relevant examples. In others these sciences were taught largely in isolation from relevant clinical applications. Laboratory experiments supporting the topics covered in the lectures were also performed in practical sessions.

It was during these years that medical students would learn about the physiological relevance of sodium, its absorption during digestion, its distribution within bodily fluids and its elimination in the urine. The vital role played by Antidiuretic Hormone (ADH) and other hormones, their secretion from the hypothalamus and their effects upon the reabsorption of sodium from the renal tubules would also have been

addressed. Physiological experiments aimed at understanding these processes may also have been conducted. Physiological concepts involved in the development of cerebral oedema would also have been explained. This would have been correlated with the brain anatomy and the lethal effects of uncontrolled rises in intracranial pressure. In some situations clinical examples would be used to enhance understanding of the topic.

The subsequent years (3 – 6) were known as the “clinical” years. The third medical year was spent studying topics concerned with the underlying processes of human disease. The three core subject of this year were: pathology (the natural evolution of disease processes within the body as well as it’s gross and microscopic appearance), microbiology (the effects and detection of organisms responsible for human disease) and pharmacology (the effects and metabolism of drugs and other therapeutic agents). Basic medical skills were often also taught during third years when the first regular and formal involvement in hospitals would have taken place. It would be during this year that the basic physiology and pathophysiology of the syndrome of inappropriate antidiuretic hormone (SIADH) would be taught. The situations in which this might occur, the consequences of inappropriate retention of salt by the kidneys and the clinical signs caused by this phenomenon would be covered in detail. Some understanding of the use of intravenous fluids in clinical settings may have been learned in this year.

The fourth medical year was largely spent in hospitals learning the minor medical specialties including paediatrics. Lectures in these areas would be delivered by identified formal or informal tutors as well as by consultants and junior doctors. There

would be no formal syllabus for this teaching and much of it would be opportunistic based on the illnesses of patients who happened to be present on the ward at the time. Some formalised didactic teaching would take place either in the hospitals or back on the university campus. It would be highly unlikely that teaching directed specifically at the prescription of intravenous fluids would be delivered. This was not seen as relevant to medical students and would not have been likely to appear in final examinations. Some understanding of the differences between adult and paediatric medicine would be taught at this stage. The concept that “children are not little adults” is core to all paediatric teaching. This is extremely important when reviewing the prescription of intravenous fluids as children require more careful management and are significantly more susceptible to SIADH than adults.

The final medical year was devoted to adult medicine and surgery. Clinical examination techniques and a more detailed approach to the management of illness would be taught but in a largely adult setting. I have retained my lecture notes from my own days as a medical student. These notes represent a comprehensive overview of topics covered in formal lectures during six years of undergraduate medical teaching. It is worth noting that the only formal lecture on intravenous fluid management was given by a surgeon. The regimen outlined in this lecture was not suitable for paediatric patients and would, in fact, predispose such patients to SIADH. It may, however, have been the only lecture on intravenous fluid prescription given. There is no reason to suppose that other medical schools provided more comprehensive teaching on intravenous fluid management in children. Many regimens advised in contemporary textbooks would also have had limited effect in preventing SIADH in children.

There was no “course work” approach to examinations and success or failure depended on the outcome of written, oral and clinical examinations, which took place over a number of weeks in May. In order to be prepared for these examinations it was understood that the student had to have an in depth knowledge of the majority of topics covered during the year.

Since 1996 in Northern Ireland and elsewhere in the United Kingdom the teaching of medical students has become progressively more formalised with medical schools following more clearly delineated curricula. The GMC's Council has a statutory duty (Medical Act 1983) to set and maintain the standards for undergraduate medical education. These curricula must now meet the outcomes outlined in “Tomorrow’s Doctors”. The GMC ensures that medical schools meet these criteria and outcomes through a process of regular visits to each medical school as part of the Quality Assurance of Basic Medical Education process (2). The GMC criteria do not specifically refer to the management of intravenous fluids in children however it does require in broad terms that the skills required to manage intravenous fluids are taught.

The new curriculum in Queen’s University is based upon the knowledge base required to deliver a basic level of clinical care but also on the ability of medical students to assimilate that knowledge. This course meets the GMC standards as demonstrated in two reports of GMC visits to Queens (3 & 4).

An outline of the Queen’s curriculum is found at (5) and (6). Under this new Curriculum, the first two years are divided into phases with the first phase consisting

of the first semester of year one while the second phase consists of the second semester of year one and both semesters of year two. The first phase examines the basics of medical science, studying genes, the molecules of life and the processes that maintain life. The second phase teaches the process of disease and the means of detecting and treating it. Both phases are integrated with each other and link directly to the skills required of a medical practitioner. It is again, during this time that the basic physiology of hyponatraemia as well as cerebral oedema is taught. Where teaching in the past was based on textbooks and journals (as well as a considerable amount of oral tradition) the new curriculum involves input from bodies such as the Guidelines and Audit Implementation Network (GAIN), National Institute for Clinical Excellence (NICE), National Patient Safety Alerts and the Clinical Resource Efficiency Support Team (CREST). As new guidelines are produced they are introduced into the curriculum. Medical students at Queens University are taught the prevention of hyponatraemia in adults based upon the CREST guidelines. This is expanded upon using the Department of Health and other guidelines as they undertake the (compulsory) Healthcare of Children module in their third year. I have appended a copy of the slides used for the lectures in Fluid and Electrolyte Management in Children at Queen's University Belfast. These cover all aspects of the management of intravenous fluids in children and makes reference to the hyponatraemia related deaths and the Inquiry into Hyponatraemia-related Deaths. There is an outline of the physiological issues underlying fluid prescription and a number of scenarios for discussion. Students also receive a copy of the Hyponatraemia Guidelines (2007). The understanding of these principals as well as their practical application is assessed both in an Objective Structured Clinical Examination (OSCE) and clinical scenario based

examination. The schedule of lectures including lectures in fluid balance is presented at (7).

The third, fourth and fifth year are more hospital and practice based and students are attached to various hospital wards, clinics and general practices throughout Northern Ireland. Medical students undertaking the Healthcare of Children module in their fourth year spend six weeks attached to one of the children's wards throughout Northern Ireland. During this attachment they will be exposed to all aspects of paediatric practice. Intravenous fluids will be prescribed for at least one child (generally many more) on each ward every day and the students will have ample opportunity to observe and question the practical use of the guidelines. The prescription will be reviewed by senior paediatricians and consultants and discussed daily on ward-rounds where further opportunities for questioning and discussion will arise. Clearly, the opportunity to confirm this learning will arise in both clinical and written examination settings. Other universities in the United Kingdom follow a roughly similar course. I have compared the curricula from a number of universities including the University of Dundee Medical School with that of Queen's University Belfast and both are largely similar.

Elsewhere on the island of Ireland the approach to teaching intravenous fluid management has changed less radically over the past few years. The course structures and contents are available on-line and are more integrated and patient focussed than previously but they do not have the same rigid link to structured protocols and clinically relevant updates as exists in the NHS based system. There is nevertheless a far clearer link between current medical practice and what is taught in medical

schools. Individual medical schools have far more tightly regulated curricula. Having canvassed medical educators in the Republic of Ireland I received a number of replies, all similar to that below from the University College Galway Medical School:

“Regarding the teaching of intravenous fluid (IV) management in children in the undergraduate paediatric programme at National University of Ireland, Galway students learn through class based teaching and clinical exposure. The topic is explored in student led case presentations on gastro-enteritis under the following headings:

- Management of mild, moderate and severe dehydration,
- Oral Rehydration Therapy (ORT) versus IV fluids
- Calculating IV fluid requirements based on clinical and biochemical parameters,
- Red flag scenarios..hyponatraemia and hypernatraemia.

Recommend textbooks include Illustrated Textbook of Paediatrics by Lissauer and Clayden.

Students also have access to following reference books:

1. Nelson Textbook of Paediatrics (18th edition)

Behrman, Published by Saunders

2. Oski’s Paediatrics, Principles and Practice, M^cMillan, DeAngelis, Feigin, Warshaw, Published by Lippincott Williams

3. Textbook of Paediatrics, Campbell M^cIntosh, Published by Churchill Livingstone

4. Practical paediatrics (6th edition)

Robinson & Robertson, Published by Churchill Livingstone.

Website recommendation: www.dhspssni.gov.uk (1 month – 16 years)

Other references listed below:

1. Bender *et al* (2007) Pediatric Emergency Care

2. Armon *et al* (2001) Arch Dis Child.
3. Fonseca *et al* (2004), Arch Pediatr Adolesc Med.
4. Nager *et al* (2002) Pediatrics
5. Hartling *et al* (2007) Evid.-Based Child Health: A Cochrane Review Journal.

Students experience paediatric fluid management opportunistically during clinical attachment.”

Postgraduate Training

A complete understanding of many aspects of medicine is not possible without some degree of clinical experience. Most medical students will complete their paediatric training with a clear knowledge of the physiological principals behind the prescription of intravenous fluids and an awareness of the guidelines and algorithms but they will not have had the understanding that comes from a “hands on” application of this knowledge and daily use of the algorithms. At a post-graduate level the assurance of practice in hospital afforded by adherence to protocols and guidelines and supported by audit is a relatively new phenomenon in the NHS.

Until the introduction in 2007 of “Modernising Medical Careers” which radically altered the pathway of doctors into and through specialty training a typical career pathway of a paediatrician would be as follows (8): following qualification the doctor would spend a year of “pre-registration” hospital based work. This was also variously known as the internship or junior houseman year. During this period the doctor was not permitted to practice independently and the year was divided into six month of general adult medicine and six months of general adult surgery. There was no formal paediatric exposure during this year. But while doctors at this stage of their careers

would not be formally attached to children's wards they could be responsible for managing paediatric patients on adult wards. Some peripheral hospitals may also have had small children's wards where children with minor medical or surgical illnesses would be managed. Junior House Officers would be supervised by Senior House Officers but every aspect of their work would not necessarily be reviewed. It would be entirely possible for a Junior House Officer to prescribe Intravenous Fluids for a patient under 16 years old without that prescription being checked by a more senior doctor.

Following the pre-registration year the doctor would apply to jobs as advertised in the medical press. These posts were either individual six month attachments at a specified hospital or a series of six month attachments at one or more hospitals usually part of a specialty training rotation. Those with a clear career goal (eg surgery, medicine, paediatrics) would pursue appropriate posts. Those interested in General Practice would pursue a number of posts in different specialities. Many however would spend time in a number of varying posts until they picked a career that suited them. Such doctors could spend six months on a general paediatric ward without a clear intention of pursuing paediatrics. Most doctors at this point in their careers would study for the Diploma in Child Health. This was seen as a "gateway" to beginning a career in paediatrics and recognition of having acquired sufficient paediatric knowledge for general practice. A knowledge of basic fluid prescription would be expected for this examination but would not be routinely tested.

For many doctors the initial guidance as to which fluids to prescribe would come from experienced nurses on the ward. The importance of this aspect of the training of junior doctors should not be underestimated. Some wards may have had specific guidelines

as to which fluids to use and when but in most cases the doctor would be free to prescribe fluids as he or she saw fit. Further confusion could sometimes be introduced by the fact that different consultants might have had different personal stipulations concerning fluids. Fluid management would change according to which consultant was on call on a particular night. Until around 2007 many if not most textbooks and guidelines continued to recommend the use of hypotonic solutions (eg “solution 18” or “half normal saline”) for maintenance fluid requirements in children. From around 2003 onwards progressively clearer guidelines were being given regarding the monitoring of serum electrolytes in children receiving intravenous fluids. Junior doctors would be made aware of these guidelines when they started on new wards as part of induction, as part of ongoing ward based teaching and as part of their own personal reading. (Appendix 1)

A doctor pursuing a career in paediatrics would pass through a number of Senior House Officer (SHO) posts gaining experience and studying for the examination to gain membership of a Royal College of Physicians (MRCP)(MRCPI in Ireland) which is a requirement for all consultant posts in the NHS or Republic of Ireland. In later years the Royal College of Paediatrics and Child Health (RCPCH) developed their own examination, the MRCPCH. While studying for the membership examination the doctor would be working on a children’s ward on a daily basis. They would be prescribing fluids and monitoring the child’s response to these.

Depending on their undergraduate career and references the doctor would eventually be appointed to a registrar post with a greater level of responsibility. Many registrars would spend some time in research positions with limited clinical involvement. Time

might also be spent doing locum consultant work at weekends and evenings. It is certainly possible that a doctor would pass from graduation to appointment as a consultant without having his or her knowledge of the fundamentals of fluid prescription formally tested. However, the clinical application of this knowledge would be part of all doctors' daily work in the majority of the posts in which they worked. An inability to prescribe appropriate fluids would, in the vast majority of cases, be rapidly detected and corrected.

While the majority of patients being managed in children's wards would be cared for by a member of the paediatric team some would be supervised by surgical trainees. These doctors would have a less clearly supervised knowledge of and training in intravenous fluid management in children. Some may have sought advice from paediatric colleagues. Advice from nursing staff, local protocols or more experienced senior colleagues could also be sought. It would, however be entirely possible for these doctors to prescribe a fluid regimen more appropriate for use in an adult patient. An experienced nurse could challenge this but this might not always occur. Children being managed on adult wards would also be likely to receive a fluid regime designed for use in adult patients.

“Modernising Medical Careers” (MMC) was introduced throughout the NHS in 2007. This system is designed to streamline medical training and improve the education of junior doctors. Under MMC (9) doctors following qualification spend 2 years as “Foundation Trainees” During these years they spend four-month blocks in various specialties now including paediatrics in the second year. There are very clear requirements for the education of these doctors and their training is now closely

supervised throughout. Each trainee doctor has an educational supervisor responsible for ensuring that that trainee has fulfilled the training requirements to progress to the next level. Use is also made of a “Training Tracker” or online program allowing the training achievements of each trainee to be recorded and checked. This training includes the completion of the British Medical Journal’s (BMJ) module covering the prescription of IV fluids in children (10). The BMJ has produced this on-line educational module covering all aspects of the management of intravenous fluids in children. The module also deals in detail with the recognition and management of acute hyponatraemic encephalopathy. This includes a testing section at the end. Anyone doing the module must complete and pass this testing section in order to receive a certificate confirming completion of the module. It is now a requirement in Northern Ireland that all Foundation Year 1 doctors complete this module during their training. In many units other medical as well as nursing staff have completed this module. Nursing staff continue to advise and monitor the prescription of IV fluids on the ward by junior doctors. Considerable work has been done in educating nurses in this area which is, I believe, covered in a separate report to the Inquiry.

Following the two foundation years the junior doctor immediately begins a clearly defined training course in his or her chosen specialty. In paediatrics, specialty trainees start in junior, closely supervised posts and work their way up to more responsible senior posts. Throughout this training they are assessed by their trainers as well as completing a renewed, more complex membership examination. The content of the training in these posts has been clearly laid down by the GMC (11), (12) and the RCPCH (13).

The Postgraduate Medical Education and Training Board (PMETB) was established in 2003 to oversee the training of junior doctors in all specialty areas of medicine including Paediatrics. It was separate from but shared responsibility with the GMC for overseeing and regulating specialty training. In April 2010 PMETB was subsumed into the GMC which now has responsibility for overseeing all aspects of specialty training.

In the Republic of Ireland training has also become more structured and supervised (14). The training pathway has not undergone the same fundamental re-organisation seen in the NHS and remains similar to the scheme described above pre-MMC. The Faculty of Paediatrics of the Royal College of Physicians of Ireland design and oversee the training of SHO grade doctors as well as Specialist Registrars. There are regular assessments of trainees and consultant appointment is dependent upon passing the MRCPI or MRCPCH examinations. There is a clear curriculum which requires a knowledge of fluid and electrolyte balance but intravenous fluids or hyponatraemia are not referred to specifically. Assessments therefore may include intravenous fluid management but there is no mechanism for ensuring that this occurs in every case.

A non paediatric trainee in the new NHS training system will also have a far greater awareness of the dangers of inappropriate fluid prescription in children. Undergraduate training, the requirement to complete the BMJ intravenous fluid module during foundation training, induction training in the hospital and the presence of posters on all wards all combine to reinforce this message. Awareness of the issue amongst nursing staff as well as senior colleagues provide further protection to paediatric patients. The improvement in awareness of this issue has been

acknowledged in a recent RQIA report on the response of Trusts in Northern Ireland to the Alerts on Hyponatraemia (15).

All newly appointed junior doctors undergo a period of induction following appointment. During this induction they will receive written information either in the form of a paper document or a CD Rom presentation concerning the management of IV fluids in children. They will also receive a lecture on the subject from a senior member of staff. Within the paediatric department IV fluid prescription is now the subject of regular audits. These audits can cover practice within the children's ward but can also deal with prescriptions for children managed on adult wards. All Trusts in Northern Ireland use a "Trigger List" to alert auditors of deviation from recommended fluid prescription. These triggers can also be used as a reference for other members of staff such as nurses and pharmacists to use when fluids are being prescribed. An example of the Northern Trust's version of this trigger list is attached at (16).

Post consultant appointment (Continuing Medical Education)

Until very recently maintaining awareness of advances and changes in clinical practice was seen as the personal responsibility of each consultant. There was no formalised mechanism for ensuring that any individual consultant was practising up-to-date medicine. Consultants might become aware of areas of deficiency in their knowledge and personally undertake to address that deficiency by personal reading or attending a relevant course. There was no external body assuring this process or that consultants would keep themselves up to date with changes or advances in clinical

practice. In the early nineties the various Royal Colleges began to introduce mechanisms for ensuring that consultants maintained their medical knowledge. At first these consisted of paper returns whereby consultants would keep a record of their reading, lectures, courses etc which they undertook. In latter years online records are kept. Each activity is awarded a number of points with a point usually equivalent to an hours worth of study or attendance at a lecture. Consultants would be expected to return a specified number of points annually. This was a requirement of the Royal Colleges but initially there was no linkage between this and their status as a consultant within the NHS.

Changes in how consultants work within the NHS including the new consultant contract introduced in 2004, the new appraisal system as well as the activities of the Royal Colleges have combined to dramatically increase the pressure on consultant to keep up to date with changes in practice. Currently consultants must have an adequate number of CME points from their Royal College to be successfully appraised. A successful appraisal is a requirement for pay progression under the new contract. More recently the introduction of licensing for medical practitioners will require that CME be kept up to date in order for a consultant to continue practising. There remains, however, no mechanism for Trusts to select the specific areas of advances with which consultants must keep up to date. Recent moves however will allow Trusts to require that consultants keep their medical education up to date in specific areas as well as in areas chosen by the consultant. This advance is still under negotiation but it will for example allow a Trust to require that all consultants managing children have successfully completed the BMJ's module on hyponatremia mentioned above. In reality the emphasis given to this area as part of undergraduate and postgraduate training as well as emphasis on the subject in the medical and general press has

influenced the majority of consultants to make themselves aware of this important issue.

In daily clinical practice consultants would and do also access various manuals and prescribing guides including the British National Formulary (BNF) and the RCPCH publication “Medicines for Children”. These give detailed advice on the prescription of intravenous fluids as well as warnings on the use of hypotonic fluids.

The majority of consultant paediatricians working in acute general paediatrics will also be certified in Advanced Paediatric Life Support by the Advanced Life Support Group or a similar certification known as the European Paediatric Life Support. Both of these certificates involve intense study over a 2 to 3 day period and require re-certification every 3 years. While these certificates deal in general with acute problems and resuscitation both courses address the prescription of fluid and mention the importance of isotonic fluids particularly the use of Normal Saline in the treatment of shock.

Locums

Many hospitals, in Northern Ireland rely on locum doctors to provide cover, both paediatric and adult, particularly out-of-hours. This is necessary because of a shortage of locally trained doctors but is acknowledged as presenting an increased risk in all areas of practice. While stringent procedures are in place to check locum doctors’ training and references it is impossible to ensure that their standard of training and practice meets those expected in the NHS. Many locums are of the highest standard but not all. All locums receive a copy of the Trust’s induction package on arrival however sometimes these doctors arrive in the Trust an hour or less before they begin working and don’t have time to fully absorb the contents. Most of these doctors will

have spent time elsewhere in the NHS and will be aware of policy on fluid prescribing. At ward level the presence of posters in treatment rooms, the unavailability of “dangerous” fluids such as solution 18 and the training of nurses on the ward all protect patients from inappropriate prescription.

RQIA

RQIA (The Regulation and Quality Improvement Authority) reviewed the safety arrangements for the administration of IV fluids in Trusts in Northern Ireland in September 2008. This review highlighted a number of areas which required further attention with regard to Trusts’ policies dealing with intravenous fluid administration. This was particularly around the area of training within Trusts “Staff Training: The provision of intravenous prescription and administration training for non-paediatric staff caring for older children on adult wards was poor across all organisations visited by the review team.” The review, however was generally positive with regard to Trusts’ arrangements for the administration of intravenous fluids to patients less than 16 years old. It must also be remembered that the majority of junior doctors now working on wards will have had detailed education in the management of fluids in children. A more recent review focussing on the Northern Health and Social Care Trust indicated advances in this area between September 2008 and the second review in November 2009.

PMETB

The Postgraduate Medical Education and Training Board (PMETB) was established in 2005 to oversee the training of junior doctors in all specialities including General

Practice. PMETB replaced the functions of the Specialist Training Authority of the Medical Royal Colleges (STA) and the Joint Committee on Postgraduate Training for General Practice (JCPTGP). These bodies had regulated the training and provided a supervisory role ensuring that hospitals and training schemes met the standards laid down by the various Royal Colleges. PMETB oversaw the introduction of new curricula in all specialties including paediatrics. It supervised and assessed the delivery of training and education. The Royal Colleges, including the RCPCH continued to be responsible for the content of the curricula and the assessment of individual doctors at the end of their training by the administration of the Membership examinations. The functions of PMETB have been taken over by the General Medical Council from April 2009.

NIMDTA

The Northern Ireland Medical and Dental Training Agency oversees the appointment of junior doctors into specific posts within Northern Ireland. They hold the budget for this training and deal directly with the junior doctors during their training. NIMDTA has a more coordinating role than PMETB who largely supervise the delivery of the curricula as created by the Royal Colleges. NIMDTA is responsible for interviewing and appointing trainees as well as setting criteria for appointment and overseeing the management of doctors in difficulty. NIMDTA's area of operation (Northern Ireland) is often referred to as the "Deanery".

The Age of Patients admitted to Paediatric Wards

I have been asked to comment on the issue of the age of patients managed in various areas of general hospitals. There is no universally agreed definition of the term “Paediatric”. Most units choose an upper age-limit based on birth-date to define their patient population. This is generally between the twelfth and sixteenth birthday. The majority of paediatric units in Northern Ireland accept children up until their fifteenth or sixteenth birthday. Children with long standing problems who are well known to a particular unit will be accepted on that unit for some years thereafter but transfer to the care of adult services will take place eventually. Children between the ages of fourteen and sixteen years will not infrequently be admitted to adult wards where they will be cared for by doctors and nurses trained in adult medicine. The decision to manage them there will generally depend on their physical maturity, personal preferences and clinical condition. The guidelines require that such children be managed according to the same intravenous fluid protocol. The recent RQIA (2008) review of intravenous fluid use found that Trusts were committed to the safe use of intravenous fluids and that the arrangements for preventing incorrect fluid use were robust. The Paediatric Intensive Care Unit in the Royal Belfast Hospital for Sick Children only admits children up to 12 years old. This means that children older than that are usually managed in adult intensive care units. It is the nature of intensive care that these children will have particular attention paid to their fluid balance and electrolytes making hyponatraemia highly unlikely.

Summary

Until very recently it has not been the practise to detail the undergraduate or postgraduate curriculum to a level that would include the specifics of intravenous fluid management in children. All such teaching was at the discretion of individual lecturers, tutors and bedside teachers. This teaching was based on currently available knowledge and not always kept completely up-to-date. Such sources as provided instruction in this area were often confusing and contradictory. “Solution 18”, “D5%W” and “1/2 normal saline” were commonly recommended fluids in children regardless of the clinical situation. The phenomenon of SIADH was understood but regarded as uncommon. There was little or no specific teaching concerning hyponatraemic encephalopathy. There was no agreed protocol for the management of children on intravenous fluids until early in the 21st century. There were no recommendations regarding the regular sampling of blood for electrolyte measurement in children on intravenous fluids. A justifiable fear of hypoglycaemia led doctors to favour any fluid that contained glucose regardless of it’s salt content. Junior doctors being asked to manage children post-operatively would rely on knowledge gained on adult surgical wards during their pre-registration year and on advice from experienced nurses.

As part of a general move towards a more accountable teaching system this aspect of medical education has become far clearer in both jurisdictions. Very clear curricula now have specific requirements for the teaching of the management of intravenous fluids in children. These include specific references to the NIPSA Alerts and the Inquiry into Hyponatraemia-related Deaths. There are strong mechanisms for ensuring education, maintenance of knowledge and application of the guidelines in clinical practice particularly in Northern Ireland.

At ward level there are clear guidelines with robust mechanisms for ensuring adherence to IV fluid recommendations. Frequent audits as well as internal mechanisms for review ensure that children do not receive inappropriate fluids on children's wards. It would not be unreasonable to state that the chances of a child developing hyponatraemic encephalopathy on a children's ward in Northern Ireland are extremely low. There are further assurances to be put in place such as the requirement that consultants undergo training in this area as part of the appraisal process.

Children being managed on an adult ward are also very much less likely to develop hyponatraemic encephalopathy than before. The risk here is, however a little higher than on children's wards as nursing staff may be less familiar with the guidelines and posters and other material may not be as readily accessible. The overall risk, however, remains low.

Glossary of terms and concepts

Antidiuretic Hormone(ADH)	A hormone secreted by the brain in response to the levels of sodium in the blood. It acts on the kidneys to increase the concentration of the urine this excreting more sodium leading to lower levels of sodium in the blood.
Audit	A process whereby the activity on a ward or unit is measured and compared with best practice (the gold standard).
Cerebral Oedema	Swelling of the brain which, because the brain is tightly enclosed within the skull, can lead to the brain being forced through the opening in the base of the skull leading to death.
Cl	Scientific shorthand for chloride
Clinical	Relating directly to the care or management of a patient.
Dextrose	Sugar (Identical to glucose).
Didactic	Teaching by means of a formal lecture, the lecturer delivering information to a large group of students using slides etc. There is little interaction between teacher and taught.
Electrolytes	All of the salts in the blood.
Hypertonic	Containing a higher number of molecules of salt (usually as compared with human blood).
Hyponatraemia	A serum sodium level below normal ie less than 136 mmol/l. Usually well tolerated until the level falls below120mmol/l.
Hypothalamus	Part of the brain responsible for the secretion of many hormones controlling the normal functions of the body.
Hypotonic	Containing a lower number of molecules of salt (usually as compared with human blood).

Isotonic	Containing the same number of molecules of salt (usually as compared with human blood).
Intracranial pressure	The pressure within the skull. This can be raised due to cerebral oedema and other causes.
K	Scientific shorthand for potassium.
Maintenance	Intravenous fluids required to maintain normal fluid balance.
Mmol	millimole a measure of the concentration of a substance in intravenous fluids or blood.
Na	Scientific shorthand for sodium.
Normal Saline	A solution of salt which is approximately isotonic compared with blood.
Postgraduate	After receiving a medical degree (ie a doctor).
Renal tubules	The part of the kidneys involved in reabsorbing water, salt and other electrolytes.
Replacement	Intravenous fluids required to replace abnormal fluid loss (eg via vomiting, diarrhoea etc).
Saline	A solution of salt.
Serum sodium	The concentration of sodium in the blood. This has a slight variation from day to day, individual to individual and from laboratory to laboratory (depending on the method used to measure it) normally the range is around 136 – 148 mmol/l.
Syndrome of inappropriate secretion (SIADH)	ADH A condition where, under certain circumstances, ADH is secreted even though the serum sodium is low or normal.
Tutor	A doctor whose main or only job is the teaching of medical students.

Undergraduate

Before receiving a medical degree (ie a medical student)

Addendum List

1. Tomorrow's Doctors, GMC document.
2. School Guidance; Preparing for the QABME process GMC document..
3. Belfast 1998 QABME Report.
4. Belfast 2005 QABME Report.
5. Medicine, A Guide for Yrs 1 – 2, from Queen's University.
6. Medicine, A Guide for Yrs 3 – 5, from Queen's University.
7. A Schedule of Lectures in Fluid Balance, from Queen's University.
8. Medical Training Pathway, Pre-MMC
9. Medical Training Pathway, Post-MMC from RCPCH.
10. BMJ Module on Fluid Management in Children from BMJ on-line module.
11. The "Gold" Guide to Specialty Training in the UK, NHS document.
12. Generic Standards for Training, GMC document.
13. A Framework of Competencies for Level 1 Training in Paediatrics, RCPCH document.
14. General Paediatrics (Royal College of Physicians in Ireland).
15. RQIA Report.
16. Trigger List, Northern Trust.

Western Health and Social Care Trust Board Meeting – 3 April 2008

Feedback – RQIA Review re: Hyponatraemia (NPSA Alert 22)

Dr Kilgallen advised that this week a team convened by RQIA visited all Trusts across Northern Ireland to review fluid management practice and policy. She said that the Team consisted of five members which included a lay person, a NPSA expert, NI experts and RQIA team members. Dr Kilgallen took members through the detail of each of the 5 recommendations as follows:

➤ ***1st Recommendation: Remove sodium chloride 0.18% with glucose 4% intravenous infusions from stock and general use in areas that treat children.***

Dr Kilgallen stated that the visiting team had noted that Altnagelvin has been compliant for more than 3 years prior to the guidance being issued and commended the work of the staff in this respect. She said that for Erne, it was noted that the Paediatric Ward is fully compliant but that the solution is still held in stock in ICU.

➤ ***2nd Recommendation Produce and disseminate clinical guidelines for the fluid management of paediatric patients.***

Dr Kilgallen advised that the Team acknowledged that the Trust has approved a policy which provides clear guidance. She informed members that the Team also noted that the poster presentation of the guidelines issued from the Department has been amended and it was their view that the material cannot be amended. Dr Kilgallen stated that Trust Staff advised the visiting team that it was the Trust's understanding that the guidelines could be amended to include the name of the corporately approved solution.

➤ ***3rd Recommendation: Provide training and supervision for all staff.***

For Altnagelvin, the visiting team commended the site on the levels and range of training that have been undertaken and the enthusiasm for multi-disciplinary training stating there were a range of tools available, in particular the e-learning module provided by the NPSA. For the Erne, the team noted that a lot of training has been provided in particular for Paediatric staff on the Erne site.

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

The Review team commended the work of the Trust in endeavouring to develop a fluid chart that can be used on both sites which has been piloted but not yet being widely used for practical reasons. The review team further stated that staff acknowledged that they would like to see a chart working across both sites. Dr Kilgallen advised that the team particularly liked the pink chart for surgical patients on the Altnagelvin Site designed by Dr Stewart and noted that this would help eliminate risk for staff who may not routinely treat children.

➤ ***5th Recommendation: Promote the reporting of hospital-acquired hyponatraemia via local risk management systems and implement an audit programme to ensure NPSA recommendations.***

At Altnagelvin, the team commended staff for the huge amount of audit work that has been undertaken and noted that the evidence being collected by Dr Stewart has been

extremely beneficial. At the Erne, the team noted that audits have taken place in the past two years and this was to be commended. Dr Kilgallen reported that in general the visiting team noted that at a glance the Trust incident profile would benchmark favourably with a similar Trust in England. She advised that at Altnagelvin, the team reported that they had found evidence that staff were keen to report incidents and noted that in reviewing the incident book on the Paediatric ward there was a record of a fluid incident which had been reported recently and were please to note the action taken recorded. Dr Kilgallen informed members that for the Erne, the review team found there was no evidence of a culture of incident reporting and learning and that the team reported that the staff had highlighted concerns regarding investigating and learning from incidents in particular incidents which are cross specialty. She stated that the team suggested that the Trust considers how to encourage incident reporting and particularly welcomed the single incident form which is currently being printed. Mrs Kelly sought clarity on the concerns regarding incidents that were cross specialty. Dr Kilgallen gave an example of where children are cared for in a surgical setting, it was believed that greater uptake of training could be taken by surgical teams. The Chairman thanked both Mr Finn and Dr Kilgallen for their updates.

**TRUST CURRENT POSITION WITH RESPECT TO THE RQIA INDEPENDENT REVIEW ON:
Reducing the risk of hyponatraemia when administering intravenous infusions to children
September 2009**

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
1. Number 18 solution has been removed completely from the hospital sites / Trust.	ACHIEVED Pharmacies no longer stock this solution. It cannot be ordered by any Trust Staff.		
2.a. Clinical guidelines for the fluid management of Paediatric patients to be reviewed and endorsed by the trust and available in paediatric wards, theatres, paediatric areas and A&E and available in intensive care for children 14 – 16 years.	ACHIEVED Audit available, completed September 2009.		
2.b. Continue with the programme for rolling out Paediatric clinical guidelines for the fluid management of paediatric patients in adult wards.	Existing Paediatric Medical Staff - ACHIEVED It is a requirement for appointment that existing medical staff have undertaken the BMJ e-module.		

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
2.b. Continue with the programme for rolling out Paediatric clinical guidelines for the fluid management of paediatric patients in adult wards.	<p><u>New Paediatric Medical Staff ACHIEVED</u> 100% of new intake of 100% have also F2 in August 2009 completed awareness training session. 100% have also completed the BMJ e-module training. Both these elements are now formally part of paediatric specific induction programme.</p>		
2.b. Continue with the programme for rolling out Paediatric clinical guidelines for the fluid management of paediatric patients in adult wards	<p><u>Existing Paediatric Nursing Staff</u> Existing staff are attending a hyponatraemia awareness session commissioned from the Beeches Training Centre and now provided in house. Existing nursing staff are also completing BMJ e-module on hyponatraemia. <u>New Paediatric Nursing Staff</u> New staff will complete the above programme within 1 month of appointment</p>	All existing staff to complete both awareness session and e-module.	16 th October 2009. Ongoing as part of new staff paediatric induction

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
<p>2.b. Continue with the programme for rolling out Paediatric clinical guidelines for the fluid management of paediatric patients in adult wards</p>	<p>Existing Adult Nursing Staff The Trust has commissioned 1 hour taught modules from the Beeches Management Centre and will also provide access to the BMJ hyponatraemia e-module.</p>	<p>The trust will cohort the majority of 14-16 year olds in 5 adult wards across the Trust. This will reduce the training requirements and also enhance competency levels of trained staff as they will more frequently use and practice these skills.</p> <p>The staff training package is to be delivered on site (CAH & DHH) over the next 6 weeks as rolling sessions. Staff will be released to participate; attendance will be mandatory and will be recorded. Bank staff will not participate in the management of paediatric fluid balance prescription.</p>	<p>End of October 2009</p> <p>End of October 2009</p>

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
2.b. Continue with the programme for rolling out Paediatric clinical guidelines for the fluid management of paediatric patients in adult wards	<u>New Adult Nursing Staff</u>	The commissioned 2 hour training package will form part of the nursing induction programme from September 2009. Attendance at induction is mandatory.	Ongoing as part of staff induction
2.b. Continue with the programme for rolling out Paediatric clinical guidelines for the fluid management of paediatric patients in adult wards	Existing adult medical staff F2 level doctors have been validated by NIMTA as having completed this training	The Trust Plans to deliver this training to existing Core trainees and Trust Doctors.	December 2009

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
<p>2.b. Continue with the programme for rolling out Paediatric clinical guidelines for the fluid management of paediatric patients in adult wards</p>	<p>New adult medical staff F1 grade: awareness session in induction programme for August 2009 intake and completion of the e-module is required within the first month of work.</p>	<p>The Trust is currently monitoring levels of F1 completion of the e – module.</p> <p>New medical staff at core trainee / Trust grade / Registrar level will not be permitted to undertake prescription of fluids for children 16 years and under until they have completed awareness training and the e-module. This will also apply to locum appointments.</p>	<p>November 2009 for this cohort, and then ongoing</p> <p>To be included in the Trust Hyponatraemia policy, October 2009</p>
<p>2.c. Develop mechanisms to ensure absolute clarity for clinical responsibility for the clinical management of 14-16 year olds from the perspective of prescribing,</p>	<p>The Trust has had on going discussions on this recommendation and has agreed the following:</p> <ul style="list-style-type: none"> - The care of 14-16 year olds with respect to prescribing fluids will be shared between 	<p>The agreement will be included in the Trust Hyponatraemia policy which will be formally signed off by the trust.</p>	<p>8th October 2009.</p>

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
<p>monitoring and reviewing on a daily basis.</p>	<ul style="list-style-type: none"> - the appropriate medical or surgical team and the paediatric team. Only those medical staff trained in hyponatraemia will be able to prescribe. Advice will be sought in respect of each individual case and this advice will be documented. - With respect to monitoring and reviewing on a daily basis responsibility for this will rest with the appropriate medical or surgical team 		
<p>3.a. Make wider use of training sources available such as BMJ e-learning module on hyponatraemia to address different learning styles.</p>	<p>Achieved See above. Both e-learning module and taught awareness sessions are available to all new and existing staff.</p>		<p>September 2009 and ongoing</p>

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
3.b. Develop a multidisciplinary structured approach to assessment of competencies in relation to hyponatraemia	<p>Paediatric Wards An audit of documentation and competency in completion of fluid balance charts has been undertaken and analysed.</p>	<p>Paediatric Wards This service will use the results of their regular audits of fluid balance charts to monitor 100% compliance and full competency. Any issues arising from the audit will be addressed with medical and nursing staff through individual training plans.</p> <p>Adult Wards Due to the significantly smaller number of 14-16 year olds in these areas and the need to ensure that competency is maintained adult areas will audit monthly all patients in this category and will link issues arising to individual training plans for staff.</p>	<p>Begin a rolling programme by December 2009.</p> <p>December 2009.</p>

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
4. Continue to progress the introduction of paediatric prescription sheets for 14-16 year olds in adult wards.	<p>Achieved The Trust has rolled out the paediatric prescription sheet to all adult wards. An audit has been completed in September 2009 to evidence this.</p>	Audit again October 2009 to ensure / achieve full compliance.	October 2009
5.a. Undertake a planned audit of the system for paediatric fluid management with respect to incident recording and audit.	<p>Paediatric Wards Achieved Audit on documentation and completion of fluid balance charts has been completed. The paediatric wards also completed a look back exercise to gain learning from previous incidences of hospital acquired hyponatraemia. The paediatric service has also participated in the GAIN audit.</p>	<p>Adult Areas The Trust plans to audit the documentation and completion of fluid balance charts in these areas post training.</p>	December 2009.

ORIGINAL RQIA RECOMMENDATION APRIL 2008	PROGRESS TO DATE	ACTION PLAN	TO BE COMPLETED BY DATE
5.b. Devise and implement an integrated approach to risk management and audit within the acute paediatric service.	<p><u>Achieved</u> Monthly / Bimonthly Multidisciplinary governance meetings are now held at regular intervals. These include risk management and audit.</p>		

Issues for Action arising from Trust Self Assessment August 2009.	ACTION PLAN	TO BE COMPLETED BY DATE
1. Paediatric IV Infusion Policy to include labelling and storage of IV Fluids in clinical areas that accommodate Children.	This policy will be drafted and submitted to the Trust policy committee	8 th October 2009
The development of "trigger lists" that have been adopted by Antrim Area Hospital to aid understanding of the types of incidents to be reported should be shared and taken up more widely.	The Trust is in receipt of this trigger list and is modifying it to our local setting. This will then be displayed beside the wall chart in all areas where 1 month -16 year olds will be cared for.	October 2009