



MODEL OF CARE FOR PAEDIATRIC ANAESTHESIA



NATIONAL CLINICAL PROGRAMME FOR ANAESTHESIA

Endorsed by:
Irish Paediatric Anaesthesia Network



PAEDIATRICS



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1. FORWARD

FORWARD TO PAEDIATRIC ANAESTHESIA MODEL OF CARE

When the National Clinical Programme in Anaesthesia, NCPA, was set-up just over three years ago, we decided to focus on projects that delivered on our top three goals:

- Better patient safety
- Better patient care
- Better collegiate support

When the Irish Paediatric Anaesthesia Network (IPAN) joined forces with the National Clinical Programme for Anaesthesia (NCPA) to collaborate on the development of a model of care for the delivery of Paediatric Anaesthesia throughout the country, the result was a model that embraced these key priorities.

It was gratifying to lead and be part of a group of professionals who all gave of their time for free and contributed so much effort to this project. All concerned were highly motivated, dedicated professionals who brought decades of experience to the project. Whilst much discussion and debate took place during the development of the model, consensus was ultimately achieved and all parties have taken ownership and signed off on the final product. The high standard of this model is a fitting testament to their professionalism and enthusiasm.

This Model of Care is intended to be a guide to the standards and services required in order to deliver acceptable levels of care in paediatric anaesthesia throughout Ireland, irrespective of whether the child is being cared for in a large, paediatric-only hospital catering for the very sick high-risk patient or in a smaller Model 2 Hospital looking after the needs of healthy low-risk paediatric patients.

No single service can work in isolation within the healthcare system. Particular focus has been given to clinical governance for paediatric anaesthesia at a local hospital level, across hospital groups and nationally within the context of the clinical governance structures for the New Children's Hospital Group. In order to maximise peri-operative service delivery and patient experience, the paediatric anaesthesia team need to work in collaboration with their multi-disciplinary colleagues within clinical governance structures to effectively achieve better patient safety, better patient care and better collegiate support.

Our thanks to all our colleagues who contributed to this project. We were proud to work alongside such dedicated team players and are happy our work will make such a positive contribution to the Irish Health Services.



Dr Bairbre Golden

Director

National Clinical Programme for Anaesthesia
HSE



Dr. William Casey

Chair

Irish Paediatric Anaesthesia Network

2. EXECUTIVE SUMMARY

2.1. INTRODUCTION

The aim of the Model of Care for Paediatric Anaesthesia is to describe what is required in order to establish a network to safely deliver anaesthesia Irish children.

The Model of Care for Paediatric Anaesthesia proposes the redesign of paediatric anaesthesia services, in order to provide better, safer and more sustainable care to children in Ireland who need anaesthesia. It complements the National Model of Care for Paediatrics, which will guide the reorganisation of hospitals that deliver paediatric services; such services include paediatric surgery, anaesthesia and peri-operative nursing care. The National Model of Care for Paediatrics is likely to propose a hub-and-spoke model of care, with the new Children's Hospital linked into three/four regional centres, all of which will provide 24-hour paediatric surgical, anaesthesia and peri-operative care. These three/four regional centres will in turn be linked to other hospitals in their Hospital Group areas; they will provide paediatric surgery, anaesthesia, routine operations and peri-operative care to healthy children of an age group that would be appropriate for treatment in those hospitals.

2.2. PAEDIATRIC ANAESTHESIA LITERATURE REVIEW

The paediatric anaesthesia literature review section of the document contains an extensive review of guidelines and papers which were prepared with both a national and international setting in mind. Many papers relating to the provision of paediatric anaesthesia services have been published; we have selected the most important and the most relevant materials, and, where practical, we have applied them to an Irish setting. We have examined guidelines and protocols devised in the United Kingdom, Australia and New Zealand – countries with similar health infrastructure to Ireland.

2.3. PAEDIATRIC ANAESTHESIA AND PATIENT DEMOGRAPHIC DATA FOR IRELAND

It is difficult to access timely, relevant and appropriately

analysed data regarding paediatric anaesthesia in Ireland; nevertheless, the paediatric anaesthesia and patient demographic data for Ireland section of this document describes and discusses the sources that are available – specifically, national surveys and databases. We review activity data, manpower numbers, surgical speciality breakdown, cut-off age limits for paediatric anaesthesia and waiting lists for day case and in-patient procedures. We conclude with a discussion on the relevance of the data.

2.4. PROFESSIONAL AND CLINICAL STANDARDS FOR SAFE PAEDIATRIC ANAESTHESIA

The Professional and Clinical Standards for Safe Paediatric Anaesthesia section opens with an overview of the professional status of paediatric anaesthesia. This leads to a discussion on the current state of manpower, and recommends what will be required for future service delivery. There is a considerable gap between current staffing levels, what is required in order to deliver current service requirements, and what will be required to deliver future service needs.

The section of the document also includes sub-sections covering facilities, equipment and medication in paediatric anaesthesia, as well as standards for peri-anaesthesia care and monitoring. It concludes with a description of the leadership role of the anaesthetist in pre-admission units and a paediatric pain management service.

2.5. PERFORMANCE MEASURES AND QUALITY IMPROVEMENT METHODS FOR PAEDIATRIC ANAESTHESIA AND INTENSIVE CARE MEDICINE IN IRELAND

The aim of Model of Care for Paediatric Anaesthesia is to provide the HSE with national guidelines, and establish quality improvement networks in line with the acute hospitals reform agenda and implementation of the Hospital Groups, in order to improve the outcome and quality of services provided to children in Ireland who are undergoing anaesthesia. Currently, there are no national guidelines on performance measurement or quality improvement initiatives for

paediatric anaesthesia and intensive care medicine in Ireland.

We have developed a suite of performance measures specific to paediatric anaesthesia. They can be broken down into three areas. As follows:

- To evaluate the implementation of the Model of Care for Paediatric Anaesthesia
- Activity measures appropriate for an established, stable paediatric anaesthesia service
- Outcome measures to demonstrate the quality of paediatric anaesthesia.

2.6. STRUCTURE AND GOVERNANCE OF PAEDIATRIC ANAESTHESIA SERVICES: LOCAL, REGIONAL/HOSPITAL GROUP AND NATIONAL

Strong management of an individual hospital's paediatric anaesthesia service is vital at both clinical and managerial level. Effective governance arrangements recognise the inter-dependencies between corporate, financial and clinical governance across the service.

We propose a model for the management of paediatric anaesthesia services at a local hospital level. We outline what is required at every institution where it is proposed to deliver paediatric anaesthesia, surgery, and peri-operative nursing care.

The management of a paediatric anaesthesia service is outlined, with suggestions on how this should be integrated into a regional/Hospital Group paediatric peri-operative clinical governance structure, when it is in place.

This section provides a broad overview of current and future requirements for paediatric intensive care services, including a dedicated section on the transport of critically ill children.

Government policy adopted in June 2014 states that the New Children's Hospital will be the central player in an integrated clinical network for paediatrics on the island of Ireland. It is expected that the New Children's Hospital will take on this leadership position, coordinating the input and contributions from the relevant paediatric clinical programmes and facilitating the implementation of their models of care, including the Model of Care for Paediatric Anaesthesia.

2.7. CONCLUSION

There is a strong consensus among the leaders of a wide range of stakeholders involved in the safe delivery of paediatric anaesthesia in Ireland of the need for a national steering group with oversight of all paediatric services throughout Ireland. This national steering group would comprise leaders from anaesthesia, critical care, paediatric surgery, paediatrics, neonatology, transport medicine, as well as nursing representatives and management representatives.

A considerable amount of work needs to be done in order to clearly identify which units will provide paediatric care, and what type of facilities and appropriate staffing will be required. This work must also align with the National Model of Care for Paediatrics.

The work must be carried out on a partnership basis; it must be evidence based, use best reliable activity data, and take into account of international best practice in the delivery of paediatric care.

The findings should feed into the National Model of Care for Paediatrics. It should outline the delivery of care for children, and it should be signed off by the Department of Health (DoH), Health Service Executive (HSE), and all key stakeholders.

The policy position adopted by the Government in June 2014 (when it approved the Project Brief for the New Children's Hospital) is that the new hospital should act as the central player in an integrated clinical network for paediatrics on the island of Ireland. The Hospital Groups service delivery model will implement the service design modelled in the National Model of Care for Paediatrics. This Model of Care for Paediatric Anaesthesia will form part of the National Model of Care for Paediatrics.

The Children's Hospital Group, in collaboration with the other six geographically based Hospital Groups, will plan and design a network for paediatric service delivery. This will form the structure through which the National Model of Care for Paediatrics and other national clinical programmes, including paediatric anaesthesia, paediatric critical care, paediatric surgery and medicine, will be implemented.

3. INTRODUCTION

1.25 million (23%) of Ireland's 4.6 million population are children aged under 16 years. Ireland, which has the highest birth rate in the European Union (16.3 per 1,000), currently registers approximately 70,000 births each year. In 2013, according to Hospital In-Patient Enquiry (HIPE) scheme data, 43,207 children had general anaesthesia administered for surgical or medical procedures carried out in public hospitals in the Republic of Ireland. A total of 21,127 anaesthetics were administered in the three children's hospitals in Dublin, and a further 22,080 anaesthetics were administered to children in adult hospitals across the country.

3.1. AIM OF THIS MODEL OF CARE FOR PAEDIATRIC ANAESTHESIA

The aim of this Model of Care for Paediatric Anaesthesia is to highlight what is required in order to set up a network to safely deliver anaesthesia to Irish children.

3.2. WHY WE NEED A MODEL OF CARE FOR PAEDIATRIC ANAESTHESIA

Modernisation of our health services demands changes in practice. The fundamental issue to be addressed in the care of children in Ireland (be they sick or healthy) is where these children should be treated. Given anaesthesia's essential role in investigative procedures, surgery, pain management, intensive care medicine, as well as transport and retrieval, it is intrinsic to the successful delivery and implementation of any model of care addressing the needs of this patient population.

Healthy children undergoing routine operations should be treated as close to home as possible, while simultaneously recognising that the institution needs to provide a safe and child-friendly environment, as well as meet the anaesthesia and nursing standards recommended by professional bodies.

3.3. OUR PROPOSAL FOR THE FUTURE

The Model of Care for Paediatric Anaesthesia proposes the reorganisation of all hospitals that are currently delivering paediatric services, and to instead introduce a networked approach. Our aim

is to design services that will improve outcomes in paediatric anaesthesia. The Hospital Groups' role, on the other hand, is to reconfigure services in their network and implement this Model of Care; such services will include paediatric surgery, anaesthesia and peri-operative nursing care. A hub-and-spoke model of care is proposed, with the New Children's Hospital linked into three/four regional centres, all of which will provide 24-hour paediatric surgery, anaesthesia and peri-operative care. These three regional centres will in turn be linked to other hospitals in their Hospital Group, or in the Children's Hospital Group, which will provide paediatric anaesthesia, surgery, routine operations and peri-operative care for healthy children of an age and ASA classification group that would be appropriate for such hospitals.

Paediatric anaesthesia and peri-operative nursing services in Ireland should be delivered by competent, trained staff in a safe working environment, with adequate and appropriate facilities, medication and equipment in place to safely anaesthetise and manage elective and acute paediatric surgery that is appropriate for each institution.

3.4. BREADTH OF PAEDIATRIC ANAESTHESIA SERVICES

Anaesthetists who are trained and experienced in paediatric peri-operative care are involved in not only delivery of anaesthesia but also other aspects of children's care such as:

- Pre-operative assessments and preparation of children for anaesthesia and surgery
- Diagnostic procedures that will require general anaesthesia, not normally required in adults, e.g., MRI, CT scan, cardiac catheterisation, bronchoscopies and endoscopies
- Insertion of long-term intravenous access for long-term antibiotic/chemotherapy administration
- Active member of resuscitation team
- Provision of acute and chronic pain management services
- Involvement in delivery of paediatric intensive care service in children's hospitals – although there is now an evolving separation between paediatric anaesthesia and paediatric intensive care unit (PICU) care
- Involvement in paediatric transport service.

This Model of Care provides detailed information on the care of infants and children undergoing anaesthesia or receiving critical care in a paediatric critical care unit (PCCU); it does not, however, provide information relating to infants cared for in neonatal units within maternity hospitals. Those infants are cared for by specially trained neonatologists.

4. PAEDIATRIC ANAESTHESIA LITERATURE REVIEW

In designing a Model of Care for Paediatric Anaesthesia for Ireland, we felt it was important to carry out an extensive literature review of guidelines and papers that were prepared with both a national and international context in mind, and to then apply those guidelines/papers to an Irish setting. Fortunately, many papers relating to the provision of paediatric anaesthesia services have been published over the years; what we have done is select the most important and relevant materials, and, where practical, apply them to an Irish setting. We have examined guidelines and protocols devised in the **United Kingdom, Australia and New Zealand** – countries whose health infrastructure is similar to the Irish health infrastructure.

4.1. HISTORICAL PERSPECTIVE

Much of the literature relating to the anaesthesia model of care for children dates back to 1989 – to the **Report of the National Confidential Enquiry into Perioperative Deaths** (NCEPOD) (Campling, Devlin & Lunn, 1989). This extensive report examined peri-operative deaths in children under 10 years of age. It is important to note that the vast majority of these deaths were children with severe medical comorbidities. NCEPOD advised against occasional paediatric anaesthesia practice, and recommended that consultant anaesthetists should maintain competencies in the management of children.

Following on from the NCEPOD report, **Lunn** (1992) recommended the nomination of a lead paediatric anaesthetist in each institution that is involved in carrying out anaesthetic procedures on children; he also recommended a minimum case load on a weekly, monthly and annual basis. Specifically, from a paediatric general surgery perspective, **Arul & Spicer** (1998), perhaps controversially, advocated that both specialist and non-specialist paediatric general surgery should be centralised, and that such surgery should not be carried out in district general hospitals. The implications of this latter recommendation would have been the transfer of all children's surgical specialities to centralised facilities, thus causing specialist centres to become overwhelmed, as well as leading to loss of confidence and deskilling of

local anaesthetists, who would still be expected to get involved in the resuscitation of critically ill and critically injured children. During this time, a pattern began to emerge whereby non-specialist paediatric anaesthetists were reluctant to become involved in the resuscitation of critically ill children. In 2002, the Royal College of Anaesthetists of Ireland felt it necessary to circulate correspondence notifying departments of anaesthesia in all hospitals that on-call anaesthesia/critical care teams may be asked to get involved in the resuscitation and stabilisation of critically ill children. In this correspondence the College went on to point out that such assistance should always be provided.

From a paediatric general surgery point of view, in 2006, a joint statement was issued on behalf of the **Association of Paediatric Anaesthetists, the Association of Surgeons of Great Britain and Ireland, the Royal College of Paediatrics and Child Health** and the Senate of Surgery for Great Britain and Ireland. They recommended that a lead paediatric anaesthetist should be nominated in each hospital that is performing paediatric anaesthesia. That the lead paediatric anaesthetist should process one paediatric list or equivalent each week; that they would be responsible for coordinating and overseeing anaesthesia services for children, and would also be responsible for establishing regional networks. The joint statement went on to recommend which elective and emergency surgical procedures should be performed in district general hospitals, and which should not.

In **2008, the Australian and New Zealand College of Anaesthetists** updated its statement on anaesthesia care of children in healthcare facilities without dedicated paediatric facilities. These recommendations will be referred to later in this document.

In **2013, the Children's Surgical Forum** – involving contributions from all the stakeholders involved in providing anaesthesia, surgery and nursing care to children – released a document in which they highlighted the success that clinical networks have achieved in the National Health Service (NHS) in

the UK. This document also contained a number of recommendations on information and standards for children's surgical service provision. The overarching principle of the document is that children are treated safely, and as close to home as possible, in an environment that is suitable for their needs; that the children's parents are involved in decisions, and that optimal quality of care is delivered. In addition, all those involved in children's surgical services should be suitably trained and supported.

Finally, in **2014, the Royal College of Anaesthetists** issued comprehensive guidelines on the provision of paediatric anaesthesia services. These guidelines are referred to extensively in the rest of this section.

4.2. SUMMARY OF LITERATURE REVIEW

Wherever and whenever children and young people undergo anaesthesia and surgery, their particular needs must be recognised. In addition, these children/young people must be managed in appropriate facilities, and must be looked after by staff with relevant experience and ongoing training. (Getting the right start. National service framework for children: standard for hospital services. DH, London 2003)

http://webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/en/Consultations/Closedconsultations/DH_4085150

Delivering a healthy future. An action framework for children and young people's health in Scotland. Scottish Executive, 2007 (www.scotland.gov.uk/Resource/Doc/165782/0045104.pdf).

National service framework for children, young people and maternity services. Welsh Assembly Government, 2004 (www.wales.nhs.uk/sites3/Documents/441/EnglishNSF_amended_final.pdf)

Surgery for children: delivering a first class service. R Col Surg Eng, London 2007 (www.rcseng.ac.uk/publications/docs/CSF.html)

Much of the surgery carried out on children is both elective and very straightforward. It is usually carried out on fit infants and children, and it can be carried

out in non-specialist centres (Royal College of Anaesthetists, 2014). Children with significant acute or chronic medical problems; those undergoing complex procedures, as well as neonates and small infants, are usually referred to specialist children's units (NHS (2013); Scottish Executive (2009); NHS, Wales (2008); Department of Health, Social Services and Public Safety Northern Ireland (2010)).

Non-specialist centres should have arrangements in place for managing and treating simple surgical emergencies in children; in addition, they should be able to resuscitate and stabilise seriously ill infants and children of all ages prior to transfer for surgery and/or intensive care (Royal College of Anaesthetists, (2014)).

Anaesthesia for children should be either carried out or supervised by consultants who have undertaken appropriate training. Unless there is no requirement to anaesthetise children, it is expected that confidence and competence to anaesthetise children will be sustained through direct care, continuous professional development and/or refresher courses, and should be considered as part of annual appraisal and revalidation procedures (Royal College of Anaesthetists, 2014).

All centres where children are admitted for surgery should have a nominated consultant who is responsible for policies and procedures related to emergency and elective anaesthesia for children. This consultant should also be involved in the delivery of such service (Royal College of Anaesthetists, 2014). Locally agreed guidelines should be in place; these guidelines should specify which cases could generally be managed on site, and which would require that the child be transferred to a more specialised unit. Emergency, life-threatening situations would dictate when it may be necessary to consider providing initial management locally. These arrangements should be part of defined clinical pathways, organised and commissioned within a surgical and anaesthesia network for children (Royal College of Anaesthetists, 2014).

Non-specialist and specialist centres catering for children should participate in multidisciplinary networks for surgery and anaesthesia. Networks would agree standards of care and formulate care pathways for common elective and emergency

surgery (Royal College of Surgeons of Surgeons of England (2010); National Confidential Enquiry into Patient Outcome and Death (NCEPOD) (2011); Scottish Government (2008); Welsh Government (2009); Department of Health, Social Services and Public Safety, Northern Ireland (2010).

Paediatric resuscitation equipment must be available wherever and whenever children are treated (Resuscitation Council, UK (2013), and anaesthetists must maintain their skills in a team approach for resuscitation and stabilisation of the sick child (Paediatric Intensive Care Society, 2010).

Successful networks ensure that children are safely treated as close to home as possible; that they have access to the appropriate level of care, and that high-quality care is delivered by the correct staff with appropriate skills. Networks underpin the local delivery of safe services; they provide opportunities for training, CPD and refresher training; in addition, they provide support to clinicians if unexpected circumstances require that they act beyond their practised competencies (Royal College of Surgeons of England, 2013).

4.3. STAFFING FACILITIES AND EQUIPMENT SUPPORT LEVELS

When a child undergoes anaesthesia, the anaesthetist should be supported by staff who have undergone paediatric training and experience, and who have maintained these skills. These skills should also extend into the post-operative/recovery phase, when children should be managed by designated staff with up-to-date paediatric competencies, particularly resuscitation (Royal College of Anaesthetists, 2014).

If children undergo surgery and anaesthesia in a facility that does not have in-patient paediatric medical beds, they should have ready access at all times to a named paediatric consultant with acute care responsibilities (Royal College of Surgeons of England, 2013).

A full range of monitoring devices and paediatric anaesthesia equipment should be readily available in theatres and other areas where children are to be anaesthetised and recovered (Association of Anaesthetists of Great Britain and Ireland, 2007). Equipment must be capable of being used for infants

and for children of all sizes and ages.

Efforts should be made to progress the adoption of a clinical information management system in all theatres. This system should include the facility to move towards electronic prescribing. As advocated by safety agencies worldwide, all paediatric infusions should ideally be run as standardised concentrations, facilitated by the use of smart-pumps.

Resuscitation medications and equipment, including an appropriate defibrillator, should be readily available wherever children are anaesthetised (Royal College of Anaesthetists, 2014). Paediatric high dependency and intensive care facilities should be available and delivered within a network of care that supports major/complex surgery and critically ill or injured infants or children (Royal College of Anaesthetists, 2014).

While it is acknowledged that critical care facilities for children are not available in all hospitals that anaesthetise children, facilities for initiating intensive care prior to transfer/retrieval to a designated regional PICU/HDU facility should be available. This may involve the short-term use of adult/general ICU facilities (Paediatric Intensive Care Society, 2010).

Multi-modal analgesia for children should be available in all settings, with paracetamol and NSAIDs providing the mainstay of simple painkillers for both hospital and home use after minor surgery. Opioids may be required for more severe pain and for rescue analgesia, particularly if paracetamol and NSAIDs are contra-indicated; opioids may also be required for more severe pain (Royal College of Anaesthetists, 2014).

All opioids should be used with caution in children with obstructive sleep apnoea (Medicines and Healthcare Products Regulatory Agency, 2013), and for other patients who have problems with central control of respiration (Royal College of Anaesthetists, 2014).

A fully resourced acute pain management service that covers the needs of children should be in place (Royal College of Anaesthetists, 2014).

All facilities should have ready access to current paediatric dosing information. Where a local

paediatric formulary is not available, alternative sources such as the BNFC (British National Formulary for Children) should be made available; guidelines for the management of pain, nausea and vomiting and post-operative fluids should also be readily available in theatres and ward areas (Royal College of Anaesthetists, 2014).

Analgesia guidance that is appropriate for children should be readily available, and pain scoring, using tools that are appropriate to the developmental age of the child, should be carried out routinely with any child who has undergone a surgical procedure (Association of Paediatric Anaesthetists of Great Britain and Ireland, 2012).

Children should be separated from (and not managed directly alongside) adults, whether in an operating department, in-patient ward, day ward or critical care unit – except as a temporary measure, if required, before transfer to a PICU (Royal College of Anaesthetists, 2014). Theatre design and appearance should reflect the emotional and physical needs of children (Royal College of Anaesthetists, 2014). Recovery areas should be separate or screened from those used by adults (Royal College of Anaesthetists, 2014).

4.4. DAY CASE SURGERY AND ANAESTHESIA

Day case surgery is particularly appropriate for children, provided the operation is not complex or prolonged and that the child is well, with either no morbidity, or with only mild, well-controlled co-morbidity. Even children with relatively complex needs – for example, cerebral palsy, cystic fibrosis – can be managed as day cases, provided they are stable and have minimal cardio-respiratory problems, and provided the surgery is minor (British Association of Day Surgery, 2007).

Children should have their day surgery delivered to the same standards as in-patient care, but with additional consideration of measures to promote early discharge (Royal College of Anaesthetists, 2014). The lower age limit for day surgery will depend on the facilities and experience of staff, and the medical condition of the infant. Ex-preterm infants should generally not be considered for day surgery unless they are medically fit and have reached 55 to 60 weeks post-conceptual age. Risks should be

discussed on an individual basis (Royal College of Anaesthetists, 2014).

Parents and children should be provided with good quality pre-operative information, including fasting guidelines and advice on what to do if the child becomes unwell before the operation date. Post-operative analgesia requirements should be anticipated, and should be discussed at the pre-assessment visit (Royal College of Anaesthetists, 2014).

There should be clear discharge criteria for the period following day case surgery. Discharge criteria should be detailed and carefully worded, in order to facilitate ongoing care by parents. A local policy on analgesia for home use should be in place, with either the provision of medications or the provision of advice to parents/carers to purchase suitable simple analgesics before the child is admitted to hospital. In both instances, there should be clear instructions to parents about the regular use of such medications, the correct dose and duration. Parents should be given written instructions on administration of analgesia and know who to contact if problems arise (Royal College of Anaesthetists, 2014).

Processes should be in place to transfer the child within a network, should complications arise (Royal College of Surgeons of England, 2013).

4.5. ANAESTHESIA CARE OF CHILDREN IN HEALTHCARE FACILITIES THAT DO NOT HAVE DEDICATED PAEDIATRIC FACILITIES

A hospital that is not dedicated to paediatric care, but which proposes to manage children for anaesthesia and surgery, should develop a policy which details criteria for management of anaesthesia, surgery and nursing care. This policy should be developed and documented jointly by representatives of anaesthesia, pharmacy, surgical and nursing staff, and it should be reviewed at intervals of not more than five years (ANZCA – Australia and New Zealand College of Anaesthetists, 2008).

It must be recognised that the initial treatment of paediatric emergencies may be necessary in facilities and under circumstances where paediatric care is not normally provided. In this situation, the child should be transferred to a specialist paediatric centre at the earliest opportunity (ANZCA – Australia

and New Zealand College of Anaesthetists, 2008).

At least one member of the team should have current advanced paediatric life support training. All team members should have up-to-date basic skills for paediatric resuscitation (ANZCA – Australia and New Zealand College of Anaesthetists, 2008).

4.6. FACTORS TO BE CONSIDERED WHEN DEVELOPING POLICY

4.6.1. Age

There should be a specified age at which any restrictions on management and referral policies come into effect. Children aged under 12 months are classified as infants; children aged under 28 days corrected gestational age are classified as neonates. Risks associated with anaesthesia are greater in small children, and therefore policies are more likely to apply to infants and neonates (ANZCA – Australia and New Zealand College of Anaesthetists, 2008).

Any policy should formulate inclusion and exclusion criteria, so as to ensure that all children are managed in an appropriate setting. Assessment of any borderline cases for suitability for surgery should occur pre-operatively, following a multidisciplinary pre-operative process involving surgeons, anaesthetists and paediatricians.

4.6.2. Staff training and experience

Paediatric anaesthetists are expected to have training in the care of infants and children. However, individual anaesthetists may have varying recent experience managing anaesthesia for children. They should not be required to provide anaesthesia care without having had regular clinical exposure to an extent necessary in order to maintain and be comfortable with their competence (ANZCA – Australia and New Zealand College of Anaesthetists, 2008).

Anaesthesia assistants and nursing staff providing care in the peri-operative period must be trained in the care of children. Regular experience and tuition is essential if care of the appropriate standard is to be provided. Sufficient numbers of staff must be available whenever children are managed in the facility (ANZCA – Australia and New Zealand College of Anaesthetists, 2008).

A liaison service should be established with a specialist paediatric facility, so that authoritative advice is available at all times (ANZCA – Australia and New Zealand College of Anaesthetists, 2008).

A clear clinical pathway should exist, in order to obtain medical paediatric advice should the need arise. In addition, there should be clear policies in place for the transfer of children to neighbouring paediatric facilities, should the need arise (ANZCA – Australia and New Zealand College of Anaesthetists, 2008).

4.6.3. Equipment and facilities

Anaesthesia equipment must comply with the Recommendations on Minimum Facilities for Safe Anaesthesia Practice in Operating Suites and Other Anaesthetising Locations (ANZCA) Australian and New Zealand College of Anaesthetists. Specific requirements include:

- Appropriate equipment for the needs of infants and children
- Climate control and equipment designed to meet the special needs of small children so that body temperature is maintained throughout the peri-operative period.
- Monitoring equipment which complies with monitoring during anaesthesia protocols and is suitable for use in infants and children
- A separate ward area in the facility, staffed by appropriately trained personnel and able to cater for children and their families; this area will be separate from adult patient areas. There will also be an area where the parents and the child can be seen privately in the peri-operative phase, to discuss any intraoperative, surgical or anaesthesia-related issues

4.7. CRITERIA FOR TRANSFER TO A SPECIALIST CHILDREN'S HOSPITAL OR FACILITY

The distance to the nearest appropriate national or regional centre will be an important factor in determining transfer of a child. The following groups of patients should be considered for transfer to a specialist children's hospital or facility:

- Neonates: infants born at less than 28 days corrected gestational age, and with a post-conceptual age of less than 52 weeks
- Medical or surgical problems classified as ASA 3 or greater.

4.8. CARE AND TRANSFER OF THE CRITICALLY ILL INFANT AND CHILD

Arrangements for the immediate care of critically ill children should be in place in any hospital that manages children. This need can arise suddenly and unpredictably in an emergency department, operating theatre or in-patient ward. In-house arrangements are therefore required for providing emergency treatment, for stabilising critically ill infants and children, and for initiating intensive care prior to the transfer of the critically ill infant/child to a paediatric or neonatal intensive care unit (Royal College of Anaesthetists, 2014).

In all emergency departments receiving infants and children, neonatal and paediatric resuscitation equipment, medications (including anaesthetic drugs), fluids and access to current paediatric dosing information should be available to prepare the infant or child for PICU transfer (Royal College of Paediatrics and Child Health, 2012). Equipment should include a suitable ventilator, infusion devices and full monitoring, including capnography (Royal College of Anaesthetists, 2014).

Infants and children may require admission to critical care facilities as a planned part of their care, for example after surgery, or due to trauma or an acute illness, or due to extreme prematurity or illness at birth. Paediatric and neonatal intensive care is provided in designated units staffed by doctors and nurses with specialised training. Infants and children who are likely to need intensive care after an operation should undergo their surgery in a hospital/unit with a designated PICU or neonatal intensive care unit (NICU) (Department of Health, UK, 2009).

Hospital protocols for the management of critically ill children should be in place. The clinical management of these children in both specialist and non-specialist units will require close cooperation and multidisciplinary teamwork between nurses, paediatricians, surgeons, anaesthetists, intensivists, pharmacists and other relevant clinicians. Clear, local guidelines on the roles and responsibilities of the multidisciplinary team, including anaesthetic services, should be in place (Paediatric Intensive Care Society, 2010). It is important that further stabilisation and management are not the sole remit of the anaesthetist (Department of Health, UK, 2005).

4.9. TRANSFER AND TRANSPORT

Currently, in Ireland, a dedicated 24/7 neonatal transfer team is in place. A paediatric retrieval service has begun operations, and is offering a Monday to Friday daytime service for patients weighing more than 5 kg and/or of six weeks corrected gestational age. Initially, the service will be run on a limited basis, pending a further increase in staffing and resources. The service will be limited to patients who have been admitted to a PICU, and who have been referred through the 1890-213-213/PICU.ie system.

Set out below is a summary of a review of the literature relating to the transfer of the critically ill child, as well as principles relating to retrieval.

Children may require short-term admission to a general critical care facility while awaiting the arrival of the PICU retrieval team. Other situations include where a child requires a very short period of intensive care that does not necessitate transfer to a PICU. This is acceptable, provided there is a suitable treatment facility within the hospital; there are staff with appropriate competencies, and the episode only lasts a few hours. The general critical care units should have a nominated lead consultant and nurse who are responsible for the policies and procedures for infants and children when they are admitted to a critical care unit (Paediatric Intensive Care Society, 2010).

Hospitals admitting children should be part of a fully funded critical care network. Specialist centres with PICU facilities within the network have the responsibility to provide ongoing education. They also have a clear responsibility to provide clinical advice and help in locating a suitable PICU bed once a referral has been made (Royal College of Anaesthetists, 2014).

Transfer of critically ill children to specialist centres is generally undertaken by paediatric emergency retrieval teams. In certain circumstances it may be necessary for the referring hospital to provide emergency transfer of a sick child, who is intubated and ventilated. This may occur in the case of a child who presents at a non-specialist centre with an acute neurosurgical emergency (for example, an expanding intracranial haematoma or a blocked ventriculo peritoneal shunt). In such circumstances,

an appropriate senior anaesthetist will need to accompany the child during the emergency transfer of the patient (Society of British Neurological Surgeons and Royal College of Anaesthetists, 2010).

Patients being transferred should normally be accompanied by a doctor with relevant competencies in the care of a critically ill child and the transfer of intubated patients, including airway management skills. They should be accompanied by a suitably trained nurse (Royal College of Anaesthetists, 2014). Members of the team should be competent in the operation of all key transport equipment (i.e., infusion devices, monitor, ventilator and transport trolley), medical gas supply, ambulance electrical power sources and communications.

Each hospital that is providing paediatric services should have in place a nominated clinician who, in conjunction with other disciplines – including nursing, pharmacists and bioengineering – is responsible for the organisation of paediatric transport.

Responsibilities should include:

- (i) Familiarisation with protocols for the mobilisation of ground and/or air ambulances
- (ii) Protocols for assembling, checking, securing, battery charging and operating transport equipment
- (iii) Checklists and protocols for the provision, carriage and administration of medications, medical gases and consumables required for transport
- (iv) Familiarisation with CEN Standards (CEN 1789: European Union Standards for Ambulances and Medical Transport Vehicles) and National Transport Medicine Programme (NTMP) recommendations for transport equipment, communication and clinical records. It is also recommended that the readiness for transport should be checked and tested on a regular basis.

4.10. TRAINING AND EDUCATION

Anaesthetists who care for children should have received appropriate training, and should ensure that their competency in anaesthesia and resuscitation is adequate for the management of the children they serve (Royal College of Anaesthetists, 2014).

In all centres that admit children, one consultant should be appointed as lead consultant for paediatric anaesthesia. Typically, this consultant would undertake at least one paediatric list every week and would be responsible for coordinating and overseeing anaesthetic services for children, with particular reference to teaching and training, audit, equipment, guidelines, pain management, sedation and resuscitation (Royal College of Anaesthetists, 2014)

All anaesthetists who work with children should maintain appropriate clinical skills. In paediatric anaesthesia, as in all areas of practice, anaesthetists must recognise and work within the limits of their professional competence. Some anaesthetists working in non-specialist centres will not have regular children's lists, but may have daytime and out-of-hours responsibility to provide care for children who require emergency surgery.

Arrangements should be in place for undertaking regular supernumerary attachments to lists or secondments to specialist centres. Paediatric simulator work may also be useful in helping to maintain paediatric knowledge and skills. There should be evidence of appropriate and relevant paediatric CPD in a five-year revalidation cycle (Royal College of Anaesthetists, 2013).

In centres that do not have an on-site PICU, anaesthesia involvement will also be required in the management of critically ill children who frequently require intubation, resuscitation and initiation of intensive care, before the arrival of the retrieval team or direct transfer to a PICU. All anaesthetists should maintain paediatric resuscitation skills, unless they work in a unit that does not have open access for children (Royal College of Anaesthetists, 2014).

The establishment of regional networks for paediatric anaesthesia should facilitate joint CPD and refresher training in paediatric anaesthesia and resuscitation (Royal College of Anaesthetists, 2014).

All staff need to be cognisant of the fact that the first step in delivering a safe, quality service is the recognition and acknowledgement of risk management.

It is the role and responsibility of all staff to:

- be familiar with the HSE Safety Incident Management Policy 2014 (See <http://www.hse.ie/eng/about/Who/qualityandpatientsafety/incidentrisk/Riskmanagement>)
- comply with this policy
- ensure that safety incidents are reported, managed and investigated in a timely manner
- participate in and cooperate with investigations conducted in accordance with this policy
- participate in the introduction of changes identified as a consequence of an investigation.

All staff need to recognise and acknowledge the need and benefits of open disclosure when an adverse event occurs. Disclosure is not about blame – either apportioning blame or accepting blame. It is about integrity and being truly professional. Accepting responsibility and embracing accountability are part of that professionalism. (See HSE Open Disclosure National Guidelines – Communicating with Service Users and their Families Following Adverse Events in Healthcare <http://www.hse.ie/opendisclosure>)

National Clinical Guidelines have been developed to provide guidance and standards for improving the quality, safety and cost effectiveness of healthcare in Ireland. These guidelines are available at <http://health.gov.ie/patient-safety/ncec/national-clinical-guidelines-2>

The Paediatric Early Warning Score (PEWS) Steering Group has developed new national age-specific paediatric observation charts that incorporate the PEWS system, and also comprise an accompanying training package. Since January 2015, these are being piloted in four paediatric units. (See <http://www.hse.ie/eng/about/Who/clinical/natclinprog/paediatricsandneonatologyprogramme/earlywarningscore>)

The prevention of healthcare associated infections (HCAs) must be a priority for all staff. Precautions against the transmission of infection between patient and staff, or between patients, should be a routine part of anaesthesia practice. In particular, anaesthetists must ensure that hand hygiene becomes an indispensable part of their clinical culture and training. All staff must comply with local

theatre infection control policies. (See AAGBI safety guideline – http://www.aagbi.org/sites/default/files/infection_control_08.pdf and also see http://www.hse.ie/eng/about/Who/qualityandpatientsafety/safepatientcare/HCAI_Programme/HCAILinks/hcailinks.html)

4.11. AUDIT, QUALITY IMPROVEMENT AND RESEARCH

Audit plays an important role in the quality assurance process and also in measuring performance. Simple quality indicators such as unplanned in-patient admission following day case surgery, or admission to intensive care following surgery, can easily be measured and the reasons for such admission documented. This information should be collated and analysed and can be compared usefully within regional networks (Royal College of Anaesthetists, 2013).

Regional networks should provide agreed quality standards for surgical care of infants and children, and units should be encouraged to participate in regular collation of data relating to these standards. Participation in national audits should also be encouraged (General Medical Council, 2013).

Multidisciplinary audit and morbidity meetings, relating to paediatric surgery and anaesthesia, should be held regularly. Audit activity should include regular analysis and multidisciplinary review of untoward incidents (Royal College of Surgeons of England, 2013).

Anaesthetic research in children should be facilitated when possible, and should follow strict ethical standards (Royal College of Paediatrics and Child Health, 2000).

Anaesthetists who care for children and young people should be familiar with relevant patient safety issues (Safety in Anaesthesia Royal College of Anaesthetists).

In particular, it is important that a World Health Organization (WHO) checklist is carried out before and during surgical and radiological procedures for children, and that it is appropriate for use. Such a checklist should include issues that are particularly relevant for the paediatric age group, e.g., flushing of IV cannulae prior to discharge to the recovery/post-

anaesthesia care unit (Royal College of Anaesthetists, 2012).

4.12. ORGANISATION AND MANAGEMENT

This literature review reflects commissioning structures from the UK. Regional networks for surgery and anaesthesia should be in place, and should be maintained by commissioning groups. Networks should agree standards of care, and should develop policies and agreed care pathways based on the complexity of the procedure, the child's age and comorbidity, as well as the clinical urgency of the case. Policies should relate to local service provision and geography, and should be developed in consultation with representative groups within the network (Royal College of Anaesthetists, 2014).

Surgical and anaesthetic networks should work with networks that have been established for the care of the critically ill child; moreover, such networks should provide links between the departments of paediatrics, surgery, anaesthesia and critical care in non-specialist centres and the corresponding specialist paediatric centres. This should facilitate provision of advice (when required) and the production of evidence-based protocols and guidelines. Arrangements should be in place with the regional specialist paediatric units for the transfer of sick infants and children (Royal College of Anaesthetists, 2014).

Hospitals should define the extent of elective and emergency surgical provision for children and the thresholds for transfer to other centres. An appropriately constituted committee comprising a paediatrician, anaesthetist, surgeon, senior children's nurse and other relevant health professionals and managers should formulate and review these policies. The committee should be responsible for the overall management and quality improvement of anaesthetic and surgical services for children, and should report directly to the Hospital Group board. A representative of this committee should liaise with the regional network lead for surgery, and should provide input into regional audit, standards and care pathways (Royal College of Anaesthetists, 2014).

Children undergoing surgery should generally be placed on designated children's operating lists, ideally in a separate children's theatre area. Where this is not possible, children should be given priority

by placing them at the beginning of the mixed list of elective or emergency cases, thus minimising fasting times (Royal College of Anaesthetists, 2014).

All patients should be assessed before their operations by the anaesthetist. Parents and carers, as well as the child, should be given the opportunity to ask questions (Royal College of Anaesthetists, 2014).

4.13. PATIENT INFORMATION AND CONSENT

Before the admission of a child for elective surgery, parents should receive full written information, together with a contact telephone number, should they have any further questions (Royal College of Anaesthetists, 2008).

Children should also receive information before admission; this information should be appropriate to their age and level of understanding (Royal College of Anaesthetists, 2010).

Although separate written consent is not mandatory, discussions should take place with the child and/or parents about the method of induction and the provision of post-operative pain relief, including the use of suppositories (Royal College of Anaesthetists, 2014).

Where special techniques such as epidural blockade, invasive monitoring and blood transfusions are anticipated, there should normally be written evidence that this has been discussed with the child (where appropriate) and with the parents/carers (Royal College of Anaesthetists, 2014).

Arrangements must be in place to ensure that appropriate and understandable information is provided to parents, including after they have left the hospital; arrangements must also be in place to ensure that subsequent sources of support are provided (Royal College of Surgeons of England, (2013).

4.14. CONCLUSION

This literature review helps to provide an international perspective for the Model of Care for Paediatric Anaesthesia. It is not meant to be prescriptive but, on the other hand, it gives us indicators of standards we can aspire to when designing an Irish version of the model of care for paediatric anaesthesia.

5. PAEDIATRIC ANAESTHESIA AND PATIENT DEMOGRAPHIC DATA FOR IRELAND

It is difficult to access timely, relevant and appropriately analysed data regarding paediatric anaesthesia in Ireland.

The available sources, i.e., national surveys and databases, are described and discussed below:

5.1. NATIONAL SURVEYS OF ANAESTHESIA PRACTICE

5.1.1. The National Survey of Paediatric Anaesthetic Practice in General Hospitals in the Republic of Ireland, 1995

The National Survey of Paediatric Anaesthetic Practice in General Hospitals in the Republic of Ireland, 1995 sought to characterise the practice of paediatric anaesthesia outside the three main children's hospitals in Dublin, i.e., Our Lady's Children's Hospital, Crumlin; the Children's University Hospital, Temple Street (standalone hospitals providing care only for children and adolescents); The National Children's Hospital, which is part of The Adelaide and Meath Hospital, Tallaght. Data were gathered prospectively. The survey revealed that anaesthesia was administered to children in 37 general public hospitals throughout Ireland. A total of 31,316 anaesthetics were administered during that year (1995). Of these anaesthetics, 4% were administered to children aged under 12 months.

5.1.2. Survey of anaesthetic surgical activity in Ireland, 2012

A detailed survey of anaesthesia activity in Ireland was conducted over a one-week period in 2012 as part of the fifth National Audit Project. Information was collected on all cases in Ireland where anaesthesia care (i.e., general, regional or local anaesthesia, sedation or monitored anaesthesia care) was provided. The survey estimated that 58,600 children in Ireland received anaesthesia care during 2012. This was the first ever survey of anaesthesia carried out in public and independent hospitals in Ireland. Interestingly, 79% of anaesthesia procedures were provided in public hospitals, and 21% of such procedures were provided in 15 of the 21 independent hospitals. It is also worth emphasising that 57% of all public hospital paediatric anaesthesia cases occurred outside the three main paediatric

centres in Dublin; this finding is in line with the 2013 HIPE data (see below). The survey found that anaesthesia was administered to children in 29 general public hospitals throughout Ireland; this figure represents a significant decrease on the number of general public hospitals reported in the 1995 survey, i.e., 37 hospitals. The number of anaesthetic procedures carried out in general hospitals on children aged less than 12 months also decreased. It was 1,235 (3.9%) in 1995 versus an estimated 600 (2.3%) in 2012.

5.1.3. Paediatric Anaesthesia and Intensive Care Survey 2014

A further survey (i.e., the Paediatric Anaesthesia and Intensive Care Survey 2014) was conducted in acute public hospitals in Ireland via the National Clinical Programme in Anaesthesia (NCPA) programme leads (or their representatives). The main focus was to gather additional data, mainly around staffing and current practice in paediatric anaesthesia. Thirty-eight (95%) of the 40 leads contacted completed the survey. Hospitals with no response were contacted directly to confirm that no paediatric anaesthesia care was provided in those hospitals. The survey found that paediatric anaesthesia is provided in the three Dublin paediatric hospitals (as above) and 28 additional public hospitals across Ireland. The main findings were as follows:

5.2. PAEDIATRIC ANAESTHESIA CONSULTANTS

5.2.1. Our Lady's Children's Hospital, Crumlin and the Children's University Hospital, Temple Street

16.2 whole-time equivalent consultant anaesthetists work in Our Lady's Children's Hospital Crumlin (OLCHC) and the Children's University Hospital, Temple Street (CUHTS). All of these paediatric anaesthetists have paediatric anaesthesia and/or intensive care fellowships and a valid APLS/PALS or equivalent certification.

An estimated 20,300 patients in OLCHC and CUHTS received anaesthesia for procedures in 2013; this figure is in line with the HIPE figures detailed later in this section.

5.2.2. National Children's Hospital as part of The Adelaide and Meath Hospital, Tallaght

The National Children's Hospital (which is part of the Adelaide and Meath Hospital, Tallaght) differs from OLCHC and CUHTS in that the 17 consultant anaesthetists have a mix of children and adults in their practice. The majority of these consultants do not have paediatric anaesthesia and/or paediatric intensive care fellowships. No elective procedures are performed on neonates. All children are anaesthetised for emergency procedures, whereas ASA 1– 3* patients are anaesthetised for elective procedures.

Finally, there is no dedicated intensive care facility available on site for paediatric patients.

* ASA Physical Status Classification System

ASA Physical Status 1 –

A normal healthy patient

ASA Physical Status 2 –

A patient with mild systemic disease

ASA Physical Status 3 –

A patient with severe systemic disease

ASA Physical Status 4 –

A patient with severe systemic disease that is a constant threat to life

ASA Physical Status 5 –

A moribund patient who is not expected to survive without the operation

ASA Physical Status 6 –

A declared brain-dead patient whose organs are being removed for donor purposes

5.3. PAEDIATRIC ANAESTHESIA NURSES

Peri-operative nurses undertake additional roles/tasks in these centres, such as vene-puncture, IV cannulation, basic airway manoeuvres, administration of IV analgesia, and removal of LMAs (laryngeal mask airways) and ETTs (endotracheal tubes) in recovery.

5.4. PAEDIATRIC ANAESTHESIA SERVICES IN 28 ADDITIONAL PUBLIC HOSPITALS THROUGHOUT IRELAND

5.4.1. Paediatric anaesthesia consultants

In 2013, there were a total of 256 consultant anaesthetists working in an additional 28 public hospitals throughout Ireland. Of these, 22 consultants

(9%) had paediatric anaesthesia fellowships and six consultants (2%) had paediatric intensive care fellowships. The number of consultant anaesthetists varied between two and 27 per hospital. A valid APLS/PALS or equivalent certification was held by 62 consultants (24%). Only five consultants had completed a work placement as a consultant in a paediatric hospital to "refresh/revalidate" in the previous five years. In the hospitals that provided anaesthesia for elective and emergency procedures on children, one in 10 consultant anaesthetists (22, 9%) did so for emergency procedures only. This reflects the practice whereby some anaesthetists only provide on-call cover for paediatric emergencies and do not anaesthetise children for elective procedures during their regular working day.

The total estimated number of paediatric anaesthesia cases performed in the 21 hospitals that provided figures for 2013 was 16,990, and varied greatly between hospitals, i.e., between 30 and 5,000 paediatric cases per year per hospital and between eight and 360 paediatric cases per year per consultant.

5.4.2. Paediatric anaesthesia nurses

In 2013, the availability of anaesthetic nurses and their role as peri-operative nurses varied widely in the other 28 mixed adult and paediatric hospitals throughout Ireland. In 25 hospitals, the majority of anaesthetic nurses rotated between paediatric and adult anaesthesia theatre lists on a daily basis (eight out of 25, 33%) or monthly basis (one out of 25, 4%). Of necessity, and in order to maintain competencies, nurses were rotated through other peri-operative roles (i.e., recovery, theatre etc.). In adult/paediatric mixed hospitals, this proved more challenging, due to different patient demographics and smaller absolute numbers of paediatric patients. Such role rotations can happen on either a daily (nine out of 25, 36%) or weekly (two out of 25, 8%) basis. In one hospital, arrangements were in place for the nursing staff from a dedicated paediatric centre to assist with paediatric cases.

There was considerable variability in the role of peri-operative nurses in the 28 hospitals, particularly in relation to the following activities: pre-operative; recording of ECG; basic airway manoeuvres, e.g., bag-mask ventilation, removal of laryngeal mask (LMA) in recovery room, extubation of endotracheal

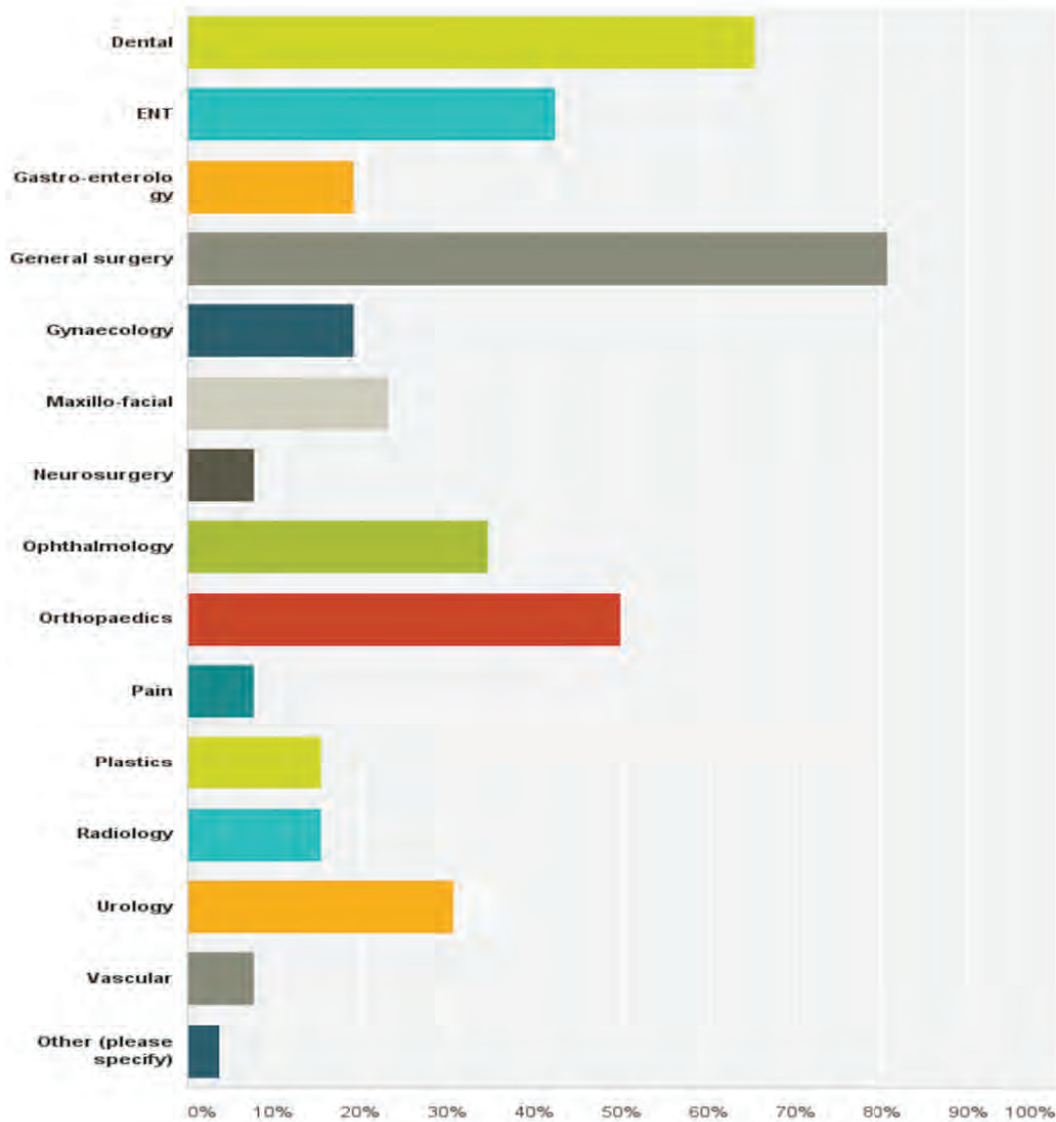
tube in recovery room, and administering IV analgesia in recovery room.

5.5. PAEDIATRIC SURGICAL SPECIALITY BREAKDOWN

Figure 5.1 illustrates the percentage of non-specialist paediatric hospitals providing different surgical specialties on site. The majority of these hospitals

(79%, or 22 of the 28) provided anaesthesia care to children for elective and emergency procedures, while the remaining 21% (i.e., six of the 28), provided paediatric anaesthesia care for elective procedures only. All 28 hospitals provided a combination of both paediatric and adult anaesthesia care in their hospital units.

FIGURE 5.1 - PAEDIATRIC ANAESTHESIA AND INTENSIVE CARE SURVEY RESULTS



5.6. CUT-OFF AGE LIMITS FOR PAEDIATRIC ANAESTHESIA

Table 5.1 shows the number of hospitals with cut-off age limits for the provision of paediatric anaesthesia in elective surgery. All 28 hospitals provided anaesthesia to ASA 1 and ASA 2 patients, but only ten hospitals (36%) will care for ASA 3 patients and only two hospitals (7%) will care for ASA 4 patients.

Not all of the respondents provided annual estimates/figures so averages are calculated for the hospitals in which we had data for both the number of consultants and the number of procedures

NOTE: Not all of the respondents provided annual estimates/figures so averages are calculated for the hospitals in which we had data for both the number of consultants and the number of procedures.

TABLE 5.1: THE CUT-OFF AGE LIMITS FOR ELECTIVE PAEDIATRIC PROCEDURES IN DIFFERENT HOSPITALS

	Number of hospitals (%)
All children aged >5 years	3 (11%)
All children aged >3 years	3 (11%)
All children aged >2 years	10 (36%)
All children aged >1 year	4 (14%)
All children aged >9 months	1 (3.6)
All children aged >1 month	1 (3.6%)
No age limit is set by the department. Individual anaesthetists determine this themselves.	2 (7%)
No age limit is set by department. Children of all ages are anaesthetised.	4 (14%)

5.7. PAEDIATRIC INTENSIVE CARE AND HIGH DEPENDENCY CARE

Fourteen (50%) of the 28 mixed adult and paediatric hospitals provided high dependency or intensive care to children; of these, only three hospitals provided such care for elective admissions. The majority (11, 79%) of the hospitals that can admit children to an ICU accept emergency admissions only. This category comprises unplanned post-operative admissions (5, 36%); and/or emergency admissions of short anticipated stay (9, 64%); and/or prior to transfer to a paediatric centre (10, 71%). In 2013, a total of 113 children were admitted to ICUs in the 22 hospitals that provided figures for this survey (mean 6, range 0–35 per hospital).

5.8. NATIONAL DATABASES

5.8.1. Hospital In-Patient Enquiry (HIPE) system

A further source of information is the HIPE system, which captures activity in public hospitals in Ireland

and is administered by the Economic and Social Research Institute (ESRI). HIPE provides the only alternative source of information on activity – other than engaging in time-consuming, labour-intensive direct activity surveys. A crude estimate of 25,498 procedures that may have required anaesthesia was obtained from the ESRI Activity in Acute Public Hospitals in Ireland, 2010 Annual Report. The 25,948 procedures estimate does not include a category of procedures “not elsewhere classified”, which amounts to an additional 13,564 procedures. The paucity of reliable data relating to anaesthesia workload and practice in this age group is evident.

Table 5.2 presents details on the number of patients that required general anaesthesia nationally in 2013; these figures were obtained from HIPE during the preparation of this document. No HIPE results for paediatric cases were available for Kerry General Hospital, Mayo General Hospital and Merlin Park University Hospital for 2013; such data are therefore excluded from the tables below.

TABLE 5.2: NUMBER OF GENERAL ANAESTHETICS AND SEDATION IN 2013, GIVEN TO CHILDREN AGED UNDER 17 YEARS IN THE REPUBLIC OF IRELAND

Age/ASA grade	1	2	3	4	5	Unspecified	Grand total
0–28 days	49	119	192	38	1	267	666
29 days–1 year	667	568	391	24	2	819	2,471
1–5 years	9,112	3,133	1,282	25	4	420	17,786
6–16 years	11,671	4,361	1,117	26	2	5,107	22,284
Grand total	21,499	8,181	2,982	113	9	10,423	43,207

TABLE 5.3: NUMBER OF GENERAL ANAESTHETICS AND SEDATION IN 2013, GIVEN TO CHILDREN AGED UNDER 17 YEARS, IN THE NEW CHILDREN'S HOSPITAL GROUP, I.E., OUR LADY'S CHILDREN'S HOSPITAL, CRUMLIN; CHILDREN'S UNIVERSITY HOSPITAL, TEMPLE STREET; THE NATIONAL CHILDREN'S HOSPITAL AS PART OF THE ADELAIDE AND MEATH HOSPITAL, TALLAGHT

Age/ASA grade	1	2	3	4	5	Unspecified	Grand total
0–28 days	44	117	192	38	1	131	523
29 days–1 year	556	551	384	24	2	601	2,118
1–5 years	4,218	2,355	1,060	25	4	1,938	9,600
6–16 years	3,942	2,691	940	18	2	1,293	8,886
Grand total	8,760	5,714	2,576	105	9	3,963	21,127

TABLE 5.4: NUMBER OF GENERAL ANAESTHETICS AND SEDATION IN 2013, GIVEN TO CHILDREN AGED UNDER 17 YEARS, IN DUBLIN NORTH EAST GROUP

Age/ASA grade	1	2	3	4	5	Unspecified	Grand total
0–28 days	0	0	0	0	0	4	4
29 days–1 year	2	0	0	0	0	8	10
1–5 years	586	90	7	0	0	248	931
6–16 years	952	227	43	3	0	400	1,625
Grand total	1,540	317	50	3	0	600	2,570

TABLE 5.5: NUMBER OF GENERAL ANAESTHETICS AND SEDATION IN 2013, GIVEN TO CHILDREN AGED UNDER 17 YEARS, IN GENERAL HOSPITALS IN THE DUBLIN MIDLANDS GROUP

Age/ASA grade	1	2	3	4	5	Unspecified	Grand total
0–28 days	5	3	0	0	0	5	13
29 days–1 year	46	21	1	0	0	38	106
1–5 years	1,106	249	8	0	0	466	1,829
6–16 years	1,699	447	16	0	0	841	3,003
Grand total	2,856	720	25	0	0	1,350	4,951

TABLE 5.6: NUMBER OF GENERAL ANAESTHETICS AND SEDATION IN 2013, GIVEN TO CHILDREN AGED UNDER 17 YEARS, IN GENERAL HOSPITALS IN THE DUBLIN EAST GROUP

Age/ASA grade	1	2	3	4	5	Unspecified	Grand total
0–28 days	0	0	0	0	0	11	11
29 days–1 year	1	1	0	0	0	3	5
1–5 years	434	86	1	0	0	142	663
6–16 years	844	210	20	0	0	362	1,436
Grand total	1,279	297	21	0	0	518	2,115

TABLE 5.7: NUMBER OF GENERAL ANAESTHETICS AND SEDATION IN 2013, GIVEN TO CHILDREN UNDER 17 YEARS, IN GENERAL HOSPITALS IN SOUTH/SOUTH WEST (EXCLUDING KERRY GENERAL HOSPITAL FIGURES)

Age/ASA grade	1	2	3	4	5	Unspecified	Grand total
0–28 days	2	1	0	0	0	92	95
29 days–1 year	71	16	4	0	0	80	171
1–5 years	1,819	286	28	0	0	642	2,775
6–16 years	2,848	637	55	4	0	1,107	4,651
Grand total	4,740	940	87	4	0	1,921	7,692

TABLE 5.8: NUMBER OF GENERAL ANAESTHETICS AND SEDATION IN 2013, GIVEN TO CHILDREN AGED UNDER 17 YEARS, IN GENERAL HOSPITALS IN THE SOALTA GROUP (EXCLUDING MERLIN PARK UNIVERSITY HOSPITAL AND MAYO GENERAL HOSPITAL)

Age/ASA grade	1	2	3	4	5	Unspecified	Grand total
0–28 days	0	0	0	0	0	6	6
29 days–1 year	22	1	0	0	0	40	63
1–5 years	879	137	2	0	0	639	1,657
6–16 years	1,328	260	10	1	0	954	2,553
Grand total	2,229	398	12	1	0	1,639	4,279

TABLE 5.9: NUMBER OF GENERAL ANAESTHETICS AND SEDATION IN 2013, GIVEN TO CHILDREN UNDER 17 YEARS, IN GENERAL HOSPITALS IN THE MIDWEST GROUP

Age/ASA grade	1	2	3	4	5	Unspecified	Grand total
0–28 days	3	1	0	0	0	37	37
29 days–1 year	38	1	0	0	0	97	136
1–5 years	1,741	257	5	0	0	1,063	3,066
6–16 years	2,539	475	21	1	0	1,549	4,585
Grand total	4,321	734	26	1	0	2,743	7,825

5.8.2. Waiting list and waiting time databases

The future provision of quality anaesthesia care for children will be influenced by the number of children requiring anaesthesia care. The current waiting list for paediatric anaesthesia and diagnostic investigations indicates a deficit of service provision at this time.

The National Treatment Purchase Fund (NTPF) has been responsible for the collection, collation and publication of in-patient and day case waiting lists since 2005. It does this through the PTR (Patient Treatment Register). Information on the in-patient and day case waiting lists for 42 public hospitals in Ireland is presented in three different report formats, and is based on extract file submissions from each hospital.

Waiting time data over specific timeframes for each hospital (with analysis by in-patient, day case, endoscopy as well as hospital trends for child and adult patients) are available. Although the current minimum dataset that hospitals are required to complete – for submission to the NTPF regarding their in-patient and day case waiting list – does not include a field to indicate whether a general anaesthetic (GA) is required or not, it can be deduced (by the nature of the procedures) that an anaesthetic will be required for the majority of procedures.

The current target for children is that no child should wait more than 20 weeks for their procedure; the comparable target for adults is eight months for an in-patient or day case procedure, and 13 weeks for

a scope. The most recent data available are for 31 October 2014, and are as follows:

5.8.3. Number of children on waiting lists

A total of 5,305 children, who had not been given a

date for their procedure, were on waiting lists. Table 5.10 illustrates the numbers by Hospital Group, with the National Children's Hospital (part of The Adelaide and Meath Hospital, Tallaght) being included in the new Children's Hospital Group.

TABLE 5.10: THE NUMBER OF PAEDIATRIC PATIENTS ON WAITING LISTS FOR IN-PATIENT, DAY CASE AND GASTRO-INTESTINAL ENDOSCOPY PROCEDURES AS OF 31 OCTOBER 2014

	In-patient and day case procedures	Gastro-intestinal endoscopy procedures	Grand total	Proportion of annual activity **
New Children's Hospital Group	2,545	70	2,615	12%
Ireland East	236	6	242	11%
Dublin Midlands	545	6	551	11%
Dublin North-East (RCSI Hospital Group)	543	6	549	21%
University of Limerick Hospital Group	291	7	298	4%
South/South West	538	4	542	7%
Saolta Group	507	1	508	12%
Grand total	5,205	100	5,305	12%

** Number of patients on waiting lists as proportion of number of procedures performed in 2013, as confirmed by HIPE

Tables 5.11 and 5.12 provide a breakdown of the waiting categories for day case and in-patient waiting lists, respectively (excluding endoscopy figures). Almost one-third (1,464, 28%) of paediatric

patients are on a waiting list for more than six months; of these, 719 paediatric patients (49%) are on lists in the new Children's Hospital Group.

TABLE 5.11: NTPF WAITING LIST FOR DAY CASE PROCEDURES AS OF 31 OCTOBER 2014

	Waiting list category					Total
	0-3 months	3-6 months	6-9 months	9-12 months	>12 months	
New Children's Hospital Group	576	312	130	43	28	1,089
Ireland East	78	31	15	6	0	130
Dublin Midlands	49	82	65	22	0	218
Dublin North-East (RCSI Hospital Group)	137	92	28	66	1	324
University of Limerick Hospital Group	99	37	28	0	0	164
South/South West	149	69	32	22	18	290
Saolta Group	140	93	23	10	3	269
Grand total	1,228	716	321	169	50	2,484

TABLE 5.12: NTPF WAITING LIST FOR IN-PATIENT PROCEDURES AS OF 31 OCTOBER 2014

	Waiting list category					Total
	0–3 months	3–6 months	6–9 months	9–12 months	>12 months	
New Children's Hospital Group	548	390	209	153	156	1,456
Ireland East	50	31	15	9	1	106
Dublin Midlands	85	123	75	44	0	327
Dublin North-East (RCSI Hospital Group)	72	72	63	5	7	219
University of Limerick Hospital Group	41	29	32	23	2	127
South/South West	94	84	64	6	0	248
Saolta Group	96	82	42	13	5	238
Grand total	986	811	500	253	171	2,721

Changes in the number of patients on waiting lists are published by NTPF, and Table 5.13 illustrates the trend in figures for October 2013, compared to October 2014, for the two main paediatric referral hospitals.

TABLE 5.13: NTPF WAITING LIST TREND CHANGES BETWEEN OCTOBER 2013 AND OCTOBER 2014, FOR DAY CASE AND IN-PATIENT PAEDIATRIC PROCEDURES

		>3 months	>6 months	>9 months	>12 months	All waiting lists
New Children's Hospital Group	Oct - 13	182	53	14	5	452
	Oct - 14	146	43	14	5	436
	Change	-36 (-20%)	-10 (-19%)	0 (0%)	0 (0%)	-16 (3.5%)
Our Lady's Children's Hospital, Crumlin	Oct - 13	750	347	149	33	1,448
	Oct - 14	1,213	669	366	179	1,958
	Change	+463 (+62%)	322 (+93%)	217 (+145%)	146 (+442%)	510 (+35%)

5.8.5. Type of procedures on NTPF waiting lists

The number of patients awaiting specific surgical procedures is provided by the NTPF. Table 5.14

illustrates the 10 surgical/interventional procedures, with the largest number of patients on the waiting lists nationally.

TABLE 5.14: THE 10 SURGICAL/INTERVENTIONAL PROCEDURES, WITH HIGHEST NUMBER OF PAEDIATRIC PATIENTS ON WAITING LISTS, AS OF 31 OCTOBER 2014

Type of procedure	Total (proportion of waiting list)
Tonsillectomy with adenoidectomy	1144 (22%)
Other	450 (8.5%)
Myringotomy	397 (7.5%)
Non-invasive diagnostic tests, measures or investigations, not elsewhere classified	319 (6%)
Male circumcision	212 (4%)
Strabismus procedure involving one or two muscles, one eye	210 (4%)
Excision of lesion of skin and subcutaneous tissue of other site	198 (4%)
Diagnostic intervention cardiac catheterisation	172 (3%)
Posterior spinal fusion, one or two levels	141 (3%)
Comprehensive oral examination	122 (2%)
Total	3365 (63%)

5.9. WHY IS THIS RELEVANT?

This overview of published and newly obtained data relating to paediatric anaesthesia practice illustrates the paucity of information previously available for service planning. Even with the latest available data, it is clear that there are still deficiencies, especially relating to independent hospital activity.

Practice varies between individual anaesthetic departments and anaesthetic consultants, as illustrated by the variation in age limits for elective procedures, as well as admission criteria for intensive care units.

These limits are determined mainly by local need, capacity and staff expertise – often arbitrarily and with no physiological basis. The age limits for elective procedures are not currently determined by or aligned to classification of hospital as defined by “The Establishment of Hospital Groups as a transition to Independent Hospital Trusts” (DOH, 2013). The majority of anaesthetists who provide care to children in adult Model 2 and Model 3 hospitals do so in conjunction with an adult anaesthesia practice. Almost all consultant anaesthetists would have completed six months’ paediatric anaesthesia training during their Specialist Anaesthesia Training SAT 3-6 programme, and some would have completed a longer period of specialist paediatric anaesthesia training within or outside the Specialist Anaesthesia Training SAT 3-6 programme. Some consultants may have APLS certification and/or paediatric anaesthesia fellowships.

The variation (30–5,000 paediatric cases per year per hospital) in anaesthesia activity between hospitals other than the three paediatric centres in Dublin,

coupled with the very wide range of exposure to paediatric cases (8–360 cases per year per consultant) may result in a decrease in competency for individual consultant anaesthetists if special arrangements, e.g., refresher weeks in paediatric centres are not made available.

Currently, there are 48 consultant anaesthetists with a fellowship in paediatric anaesthesia in Ireland; of these, the majority (26) work in the three Dublin paediatric centres. The majority of anaesthetic nurses working in non-paediatric centres are not registered paediatric nurses, or have no higher training in paediatric peri-operative nursing. Many rotate through other peri-operative roles on a frequent basis.

This results in nursing staff with varied paediatric experience working with anaesthetists. Recruitment and retention of skilled staff with paediatric anaesthesia expertise in general hospitals will have to continue while alignment of service need and availability is resolved at Hospital Group and national level.

The ‘target’ currently is that no child should wait more than 20 weeks for a hospital procedure. The NTPF waiting list figures highlight that many children are still waiting for periods of longer than 20 weeks. Of great concern is the 35% increase in waiting list numbers for OLCHC (Crumlin hospital) from October 2013 to October 2014. The other national referral centres for neurosurgery, ENT and ophthalmologic surgery appear to be facing similar challenges. The impact on quality of life and other outcomes in children when there is a delay in certain surgeries (e.g., scoliosis correction surgery) is well known. Appropriate allocation of resources and alignment of service needs is required.

6. PROFESSIONAL AND CLINICAL STANDARDS FOR SAFE PAEDIATRIC ANAESTHESIA

6.1. PROFESSIONAL STATUS

Anaesthesia services are a vital component of basic healthcare, and they require appropriate resources. Medically trained anaesthesia specialists who are accredited, and therefore should have clinical and administrative autonomy.

6.2 TRAINING, CERTIFICATION AND ACCREDITATION

Adequate time, facilities and financial support should be available for professional training, both initial and continuing, in order to ensure that an adequate standard of knowledge, expertise and practice is attained and maintained.

6.3 PEER REVIEW AND INCIDENT REPORTING

Institutional, regional and/or national mechanisms to provide continuing review of anaesthetic practice should be instituted. Regular, confidential discussion of appropriate topics and cases with multidisciplinary professional colleagues should take place. Protocols should be developed, so as to ensure that deficiencies in individual and collective practice are identified and rectified. Incident reporting systems, with case analysis and resulting suggested remedies, are recommended.

6.4 WORKLOAD

A sufficient number of trained anaesthesia professionals should be available, so that individuals can practise to a high standard without suffering undue fatigue or physical demands.

Time should be allocated for education, professional development, administration, research and teaching.

6.5 ANAESTHESIA PROFESSIONALS

An anaesthesia professional (consultants and doctors in anaesthesia training) should be dedicated to each patient, and should be present throughout each anaesthetic procedure (general, regional or monitored sedation); this anaesthesia professional should be responsible for the transport of the patient

to the recovery room/post-anaesthesia care unit (PACU), and should ensure the handover of that care to appropriately trained personnel. An anaesthesia professional should retain overall responsibility for the patient during the recovery period, and should be readily available for consultation until the patient has made an adequate recovery. If responsibility for care is transferred from one anaesthesia professional to another, a handover protocol should be followed; during this handover, all relevant information about the patient's medical history, medical condition, anaesthesia status and care plan should be communicated.

If or when aspects of direct care are delegated, the anaesthesia professional should ensure that before, during, or after an anaesthetic the person to whom responsibility is delegated is both suitably qualified and conversant with relevant information regarding the anaesthetic and the patient.

The Working Group has had robust discussions around a number of issues relating to the delivery of care for children undergoing anaesthesia.

Should all children only be anaesthetised in hospitals with on-site paediatricians? The APA and Royal College of Anaesthetists (RCoA) in their documents recommend this requirement. However, they have taken their recommendations from the Royal College of Paediatricians document, which referred only to acute medical units. In contrast, Australian and the American documents do not specify this requirement.

In the analysis of the literature review, no evidence was found to support improved outcomes for healthy children undergoing routine surgery due to the availability of paediatricians.

As a result of the reconfiguration of paediatric services (following the construction of the new National Children's Hospital), there should be more centralisation of paediatric services, including paediatric surgery and anaesthesia.

An anaesthetist or other physicians trained and experienced in paediatric peri-operative care

(including the management of post-operative complications and the provision of paediatric cardiopulmonary resuscitation) should be immediately available to evaluate and treat any child in distress. Advanced paediatric life support (APLS) or PALS is recommended.

A paediatrician should generally be available for consultation on the management of children with co-morbidities who are undergoing anaesthesia.

All professionals working with children should have some training in child protection, so that the appropriate mechanisms can be activated, and also so that there is good inter-disciplinary cooperation. All anaesthetists should be aware of the need to refer suspected cases of child abuse. A named paediatrician, trained in paediatric child protection, should be available for advice and consultation.

6.6 PAEDIATRIC ANAESTHESIA WORKFORCE

6.6.1 Current situation

Currently, there are three children's paediatric hospitals providing anaesthesia cover for 12 operating theatres. In addition, there are three MRI scanners; one cardiac interventional theatre; two interventional radiology theatres, and a radiotherapy unit (St Luke's Hospital). The three hospitals employ 19.2 whole-time equivalent (WTE) anaesthetists between them. Of these, 1.5 of OLCHC's WTEs is seconded to PICU cover, giving a total anaesthesia cover of 17.7 WTEs.

In 2014 the College of Anaesthetists of Ireland and the National Clinical Programme in Anaesthesia issued a joint document on Anaesthetic Manpower in Ireland. In addition to providing templates for estimating anaesthesia workforce needs, this document clarified the standards expected for provision of anaesthesia in Ireland. Principal among these was that there should be one consultant anaesthetist per site where anaesthesia is being delivered. The AAGBI document Workload for Consultant Anaesthetists in Ireland allows us to estimate that it takes 1.8 WTEs to provide cover for one anaesthesia site for one year.

This allows for a 75% anaesthesia workload commitment; it also factors in annual leave, study leave, on call etc. On this basis, 36 WTEs should be employed to cover the sites where anaesthesia is being provided currently in the three children's

hospitals. There is, therefore, a current deficit of 20 WTE paediatric anaesthetists.

Currently, there are six paediatric intensivists employed in PICUs. The Joint Faculty of Intensive Care Medicine of Ireland, National Standards for Adult Critical Care Services Report 2011 on paediatric critical care recommended that there should be between 12 and 18 full-time paediatric intensivists in place by 2012. There is, therefore, a PICU deficit of 6–12 paediatric intensivists.

As outlined in Section 5, in non-children's hospitals the situation is less clear. We do not know how many anaesthetists are comfortable with the practice of anaesthetising children across the various age groups. We do know that only 22 anaesthetists have paediatric anaesthesia fellowships, and only six anaesthetists have paediatric intensive care fellowships. We also know that 22 consultants only anaesthetise children in emergency situations, i.e., they have no ongoing paediatric anaesthesia experience. It is heartening to see that 24% of consultants employed in hospitals other than children's hospitals have valid APLS/PALS certification, which indicates their commitment to paediatric care.

6.7 MODEL OF CARE RECOMMENDATION

This Model of Care describes our ideal model for provision of anaesthesia and paediatric intensive care for children in the future. Providing Quality, Safe and Comprehensive Anaesthesia Services in Ireland - A Review of Manpower Challenges document sets out the templates and standards expected for such provision, and allows us to estimate future numbers of paediatric anaesthetists. The situation with respect to paediatric intensive care is clearly delineated by the Det Norske Veritas (DNV) report, i.e. 12–18 intensivists to cover paediatric (not neonatal) intensive care. For anaesthesia, the requirements may be divided into those required for the New Children's Hospital and those required for paediatric anaesthesia in locations other than the New Children's Hospital.

The New Children's Hospital proposes 22 anaesthetic sites, and this will require 39.6 WTE paediatric anaesthetists to provide anaesthesia to the national standards.

In addition to anaesthesia, the New Children's Hospital

will have to provide pre-operative assessment clinics as well as a chronic pain management service. All elective ASA 3 patients should be seen in pre-operative clinics.

OLCHC has seen an increase in ASA 3 patients presenting for anaesthesia; this figure has risen from 16% in 2010 to 21% in 2014. There will be a requirement

in the New Children's Hospital for between two and three whole-time paediatric anaesthetists to staff weekly pre-operative assessment clinics.

In 2014, the National Clinical Programme in Anaesthesia published the Model of Care for Pre-Admission Units in Ireland. The minimum guidelines on staffing levels recommended:

TABLE 6.1: MINIMUM GUIDELINES ON STAFFING LEVELS

	Consultant anaesthetist WTE	Nurse WTE
In-patient surgery	15 hrs/week per 1,000 adult in-patients/year requiring the services of an anaesthetist*	0.9 WTE per 1,000 adult in-patients/year requiring the services of an anaesthetist
Day case surgery	5 hrs/week per 1,000 adult day cases/year requiring the services of an anaesthetist **	0.6 WTE per 1,000 adult in-patients/year requiring the services of an anaesthetist ***

* Includes time for non-clinical duties (service development etc.) as per RCoA recommendations, but does not include backfill for leave.

** Does not include time for non-clinical duties, as day case pre-assessment clinics are usually affiliated with in-patient pre assessment units. However, institutions with only day case pre-assessment clinics should be allowed one hour/week extra for non-clinical duties.

*** Institutions that do not have facilities/clinical services to support in-patient admissions should factor a local attrition rate into their calculations, so as to account for those patients who are initially pre-assessed as day cases, but are deemed unsuitable for day case surgery at that institution.

Particular emphasis was given to the role of secretarial/ clerical support. This was seen as being "crucial to the efficient and cost-effective administration of a Pre-Admission Unit".

Currently, in Dublin, there are five fully functioning and serviced pain management clinics for adults in the public hospital service, and four pain management clinics in private hospitals. There is no properly funded and resourced pain management clinic service in the three children's hospitals. The Pain Faculty of the College of Anaesthetists of Ireland (CAI) recommends one chronic pain consultant per 100,000 population. Given that children probably have less chronic pain conditions than adults, it may be safe to halve that number; nonetheless, that would still indicate a requirement for six chronic pain WTEs to service the national paediatric population.

In the hub-and-spoke Model for Paediatric Anaesthesia Services in Ireland, it is estimated there will be three/four paediatric regional anaesthetic centres, each intending to provide 24/7 cover for paediatric surgical and anaesthetic care. Each centre will require a minimum of six paediatric anaesthetists to fill the 24/7 duties and on-call rosters. There will, therefore, be a requirement for at least 24 paediatric anaesthetists in peripheral hospitals.

In addition, many of the hospitals currently providing paediatric anaesthesia may continue to do so, albeit with a lesser level of complexity than is required for patients who are anaesthetised in peripheral centres. The question that arises is: What level of training will be required for paediatric anaesthetists in the paediatric regional hubs? Given that the anaesthetists will be anaesthetising children of all ages and with varying co-morbidities, 1.5 years of paediatric anaesthesia/ paediatric intensive care training would not seem unreasonable. In addition, as with anaesthetists in the New Children's Hospital, APLS/PALS certification should be recommended.

The level of training required for regional centres should be achievable within the current CAI anaesthesia training scheme.

All trainees spend six months in a paediatric hospital during their training, and it is now possible for trainees to spend the sixth and final year training in their choice of specialty. Currently, both OLCHC and CUHTS offer special interest years in paediatric anaesthesia for trainees in their final year. For those who do not attain the required training within the training scheme, there is also the possibility of post-CCST training in paediatric anaesthesia at OLCHC.

6.8 SUMMARY

Currently, in the three children's hospitals, there are 17.7 WTEs in paediatric anaesthesia and six (+1.5) PICU WTEs.

In contrast, currently, there should be 38 WTEs in anaesthesia and 12–18 WTEs in PICU.

The New Children's Hospital will require 67 WTE paediatric anaesthetists and intensivists, to include 40 general paediatric anaesthetists, three anaesthetists specialising in pre-operative assessment, six anaesthetists specialising in providing a chronic pain service and 18 paediatric intensivists. In addition, the regional centres will require at least 24 paediatric anaesthetists.

The total number of paediatric anaesthetists and intensivists required for 2019 will be 91 WTEs. Currently, there are 25.2 employed. The deficit of 65.8 WTE anaesthetists represents a considerable challenge to overcome if we are to have paediatric services working correctly for children in Ireland. It will require acknowledgement of the problem and a commitment to gradually increase numbers from the commissioning authorities – currently the HSE. In addition, while the training structures are in place, it will require proactive measures on the part of the CAI and the current children's hospitals to direct trainees into paediatric posts. At the moment, the task of encouraging paediatric practice is hampered by what is perceived by trainees as an onerous workload and long hours. This can be overcome if a clear career pathway is developed, thus allowing trainees to step out of their training scheme and into paediatric posts.

6.9 FACILITIES, EQUIPMENT AND MEDICATIONS

Appropriate equipment and facilities, which are adequate both in quality and quantity, should be in place during anaesthesia for children, and also during recovery, in every location, including outside the traditional hospital operating room environment – such as, for example, in procedure or imaging rooms. Appropriate anaesthetic, resuscitative, and adjuvant medications must be age specific and must be available in every institution that intends to carry out paediatric anaesthesia.

6.10 IN-SERVICE TRAINING AND VERIFICATION

In service training and verification of an individual's ability to use a specific piece of equipment correctly and safely is required.

6.11 WORLD HEALTH ORGANIZATION 2009 SAFE SURGERY CHECKLIST

The World Health Organization 2009 Safe Surgical Checklist comprises evidence-based vital checks in three phases: before starting anaesthesia, before starting surgery, and at the end of surgery. The use of the Checklist (locally modified for children if appropriate) in anaesthesia care is national policy in Ireland.

6.12 PERI-ANAESTHESIA CARE AND MONITORING STANDARDS

Monitoring of the anaesthetised child under the care of an anaesthetist for local, regional, monitored or general anaesthesia must be in compliance with the current Recommendations for Monitoring during Anaesthesia and Recovery as defined by the AAGBI. The first and most important component of peri-anaesthetic care, including monitoring of the anaesthesia delivery system and the patient, is the continuous presence of a vigilant anaesthesia professional during anaesthesia. In addition to the use of monitoring technology, careful continuous clinical observations are required, because equipment may not detect clinical deterioration as rapidly as would be detected by the skilled professional.

6.13 PRE-ANAESTHETIC CARE

Children must be evaluated by an anaesthesia professional prior to administration of anaesthesia, and an appropriate anaesthetic plan must be formulated. Prior to initiating anaesthetic care, the anaesthesia professional must ensure that all necessary equipment is present and is functioning correctly. The anaesthesia professional should ensure that assistance is available as needed, and that the assistant is competent. The development of protocols and checklists to facilitate such verification is recommended.

6.14 PRE-ANAESTHESIA CHECKS

An appropriate “pre-list check” should be established in the healthcare institution providing paediatric anaesthesia services.

This should include checks of the anaesthesia system, facilities, equipment and supplies; it should form part of the preparations for each operating list, and it should be adapted to the physical location where the anaesthesia is to be carried out.

The relevant components of the World Health Organization Safe Surgery Checklist should be performed.

6.15 MONITORING DURING ANAESTHESIA

During all anaesthetics, the patient’s oxygenation, ventilation, circulation and temperature must be continually evaluated.

Essential monitoring devices include pulse oximeter, non-invasive blood pressure monitor, electrocardiograph for induction and maintenance of general anaesthesia, in addition to airway gas analysis – oxygen, carbon dioxide and vapour, and airway pressure monitor.

6.16 VENTILATION AND OXYGENATION

Adequacy of ventilation and oxygenation is clinically assessed by continual inspection of the patient, evaluation of chest excursion, observation of the reservoir bag during spontaneous ventilation, and auscultation of breath sounds.

Continuous monitoring of the child’s oxygenation with pulse oximetry is essential, with the addition of continuous capnography during assisted or controlled ventilation. The use of an oxygen analyser with an audible alarm monitoring the inspiratory gas mixture is essential during general anaesthesia. A disconnect alarm must be installed and activated within the breathing circuit.

The National Audit Project (NAP) 4 states that all patients with artificial airways should have continuous monitoring of end tidal carbon dioxide. This applies to patients in the post-anaesthesia care unit (PACU), intensive care unit (ICU) and the emergency department (ED); it also applies to the transport of critically ill patients.

6.17 CIRCULATION

Continuous monitoring and display of heart rate with ECG is essential. Display of cardiac rhythm and peripheral pulse rate with pulse oximetry are highly recommended.

6.18. BLOOD PRESSURE

Arterial blood pressure should be measured continually at appropriate intervals, usually non-invasively every five minutes, and more frequently if indicated by clinical circumstances.

6.19 TISSUE PERFUSION

The adequacy of tissue perfusion should be monitored continuously by clinical examination, e.g., inspection, palpation of a pulse, auscultation of heart sounds. In addition, continuous monitoring of peripheral perfusion with pulse plethysmography or oximetry is highly recommended, as is continuous capnography monitoring during general anaesthesia.

6.20 TEMPERATURE

A suitable means of measuring the child’s temperature should be available, and should be used at frequent intervals when clinically indicated, e.g., prolonged or complex cases for young children.

6.21 NEUROMUSCULAR FUNCTION

When neuromuscular blocking medications are administered, monitoring the degree of neuromuscular blockade with a peripheral nerve stimulator is recommended.

6.22 DEPTH OF ANAESTHESIA

Level of consciousness and depth of anaesthesia should be regularly assessed by clinical observation. During general anaesthesia with vapours, the continuous measurement of inspired and expired concentrations of anaesthetic gases and volatile agents is essential, and may provide an indication of the depth of anaesthesia. While it is controversial, and is not universally recommended, the application of an electronic device to measure brain electrical activity as an adaptation of level of consciousness should be considered during general anaesthesia in scenarios where there is a high risk of awareness.

6.23 AUDIBLE SIGNALS AND ALARMS

Available audible signals (such as the variable pitch pulse tone of the pulse oximeter), and audible alarms with appropriately set limit values, should be activated at all times, and should be loud enough to be heard by the anaesthesia professional and care team in the operating room.

6.24 POST-ANAESTHESIA CARE

All children who have been given an anaesthetic that affects their central nervous system function and/or a loss of protective reflexes should remain in the location where they were anaesthetised until they have recovered, or are ready to be transported safely with care monitoring, as indicated, to a specifically designated recovery location for post-anaesthetic monitoring.

6.25 MONITORING

All children should be observed and monitored in a manner that is appropriate to the state of their nervous system function, vital signs and medical condition, with emphasis on the adequacy of oxygenation, ventilation, circulation, and temperature.

6.26 PAIN RELIEF

All children are entitled to appropriate efforts to prevent and alleviate post-operative pain employing appropriate available medications and modalities; the use of such efforts is therefore highly recommended. Usually, the anaesthesia professional involved in the child's case assumes initial responsibility for this.

6.27 PRE-OPERATIVE ASSESSMENT OF IN-PATIENTS – THE ROLE OF THE ANAESTHETIST

The anaesthetist should assume the central role in the organisation of pre-operative services – a role that encompasses much more than preparing the delivery of anaesthesia.

The anaesthetist has the skills necessary to assess, optimise and estimate risk, and support patients in the process of deciding whether or not to proceed with surgery and anaesthesia.

Pre-operative anaesthetic assessment should minimise risk for all children, as well as identify children at particularly high risk. The pre-operative assessment clinic should cooperate with primary care to achieve these aims.

In the process of preparing patients for anaesthesia, skilled clinical nurse specialists are both safe and cost effective, and they should work closely with anaesthetists with a special interest in pre-operative assessment and preparation.

Most anaesthesia departments should plan for one WTE consultant to run and manage daily high-risk clinics with appropriate secretarial support. The Department of Anaesthesia must establish clear pathways of care for unplanned admissions in conjunction with surgeons, emergency department consultants, intensivists and theatre personnel. Special consideration must be given to children and young people undergoing anaesthesia and surgery. Operating sessions and the individual anaesthetist's work load must be arranged so as to allow time for the anaesthetist responsible for an individual patient's care to visit and review the patient at an appropriate time before surgery.

In all but exceptional circumstances this patient review should take place in a designated reception area, dedicated clinic room or in a ward, in order to ensure privacy and respect the patient's dignity. Pre-operative anaesthesia clinical reviews should only be conducted in the anaesthetic room in exceptional circumstances.

Clinical directors for anaesthesia and theatres should work with appropriate managers to establish comprehensive and integrated pre-operative assessment facilities, and ensure that there is a lead anaesthetist available to carry out pre-operative assessments.

The National Clinical Programme in Anaesthesia published a Pre-Admission Unit (PAU) Model of Care in December 2014. This document contains considerable detail about the establishment, delivery and ongoing improvement of anaesthesia-led, nurse-delivered pre-admission units.

6.28 PAEDIATRIC PAIN SERVICE

Paediatric pain services were first established in large paediatric centres over two decades ago. At the time, children's acute pain was poorly managed, due to misconceptions, safety concerns and variability in practice. While many large paediatric centres now have acute pain services, there remains a need for better pain management to be provided in smaller facilities or geographical locations that have fewer resources.

Major obstacles hindering the implementation of such services include institutional acknowledgement, lack of a desire to change, lack of appropriate staffing, and lack of funding. When establishing a pain service, the principal objectives are better recognition and assessment, as well as safer and more effective treatment of pain.

A holistic approach to pain management is recommended in order to cater for each individual child's needs, taking into account the age of the child, the affective nature of pain, the physical effect

of the pain, the environment, the psychological status of the child and the family support available. In order to evaluate the effectiveness of the multimodal analgesia, the use of a pain assessment tool (appropriate to the age of the child) must be an ongoing process. Following regular pain assessment, analgesia can be titrated according to the response. A pain relief service will involve many members of the multidisciplinary team, including anaesthesia, pain nurse specialists, pharmacists, health and social care professionals, and others.

It is important to determine whether the proposed services intends to treat acute, chronic, procedural and/or cancer and palliative pain, as each requires different skills and resources. An ideal and comprehensive paediatric pain service should be equipped to diagnose and treat pain, persistent (chronic), procedural, and cancer/palliative pain. It is neither feasible nor necessary for every hospital to manage all. Establishing the scope of practice based on case mix and caseload in any given hospital or region will determine which resources are required.

7. PERFORMANCE MEASURES AND QUALITY IMPROVEMENT METHODS FOR PAEDIATRIC ANAESTHESIA AND INTENSIVE CARE MEDICINE IN IRELAND

Performance measurement is the process of collecting, analysing and/or reporting information regarding the performance of an individual, group, organisation, system or component.

Quality improvement is the combined and unceasing efforts of everyone – healthcare professionals, patients and their families, researchers, payers, planners and educators – to make the changes that will lead to better patient outcomes (health), better system performance (care) and better professional development (learning). This definition arises from our conviction that healthcare will not realise its full potential unless change-making becomes an intrinsic part of everyone’s job, every day, in all parts of the system. Defined in this way, improvement involves a substantial shift in our idea of the work of healthcare, a challenging task that can benefit from the use of a wide variety of tools and methods (Royal College of Anaesthetists, 2014).

7.1. WHY MEASURE OUTCOME?

There is an increasing emphasis on improving healthcare quality nationally and internationally. Irish examples include the recent publication by HIQA of the National Healthcare Standards, the issuance of guidance by the HSE Quality and Patient Safety Division which assists hospitals to comply with these and other guidelines.

Currently, there are no national guidelines on performance measurement or quality improvement initiatives for paediatric anaesthesia and intensive care medicine in Ireland. The aim of this Model of Care is to provide national guidelines and establish quality improvement networks, in order to improve the outcome and quality of services provided to children in Ireland who are undergoing anaesthesia.

All clinicians want to provide patients with the best possible standard of care. Many believe that they can do this by focusing on the individual patient. The

only way clinicians can be certain about the quality of care they provide is by measuring what actually happens, and comparing this to established best practice. Only then can clinicians know what action to take in order to improve the care they provide.

Clinicians and non-clinical personnel working in paediatric anaesthesia require easily measureable, consistent and definable clinical and non-clinical outcomes for paediatric anaesthesia that are applicable nationally. By examining and interpreting these outcomes, we can ensure ongoing quality improvement measures.

We improve what we can measure. Data will flag the need for improvement; will confirm that we are improving, and will help us to understand the degree of improvement that would be possible following a given change in practice. Meaningful reporting of outcomes allows the consumers and providers of paediatric anaesthesia and paediatric intensive care services to make informed decisions. Consistent reporting of outcomes informs clinicians and managers in their efforts to drive quality improvement initiatives.

7.2 WHY MEASURE?

- It is a critical part of testing and implementing change.
- It allows us to determine further impact of the change.
- Performance and quality improvement measurements provides evidence of the improvements made and the weaknesses identified.

7.3 HOW DO WE MEASURE, AND HOW DOES THIS LEAD TO QUALITY IMPROVEMENT?

Clinicians need evidence to persuade them that their practice needs to change. Ensuring that clinical audits are high quality and well-designed is

essential for success. Involving clinicians in the design and running of the project via their professional bodies and clinical networks helps to provide further quality assurance of the audit process. Finally, if the measurements are not correct, the wrong areas may be tackled in an effort to seek improvement. Accurate and valid data are necessary in order to guide continual improvements.

The clinical audit cycle is a well-established way for clinicians to progress quality improvement work. Using this model, clinicians measure their own practice against established national standards. Once they have data about their own performance, they can take action to improve it.

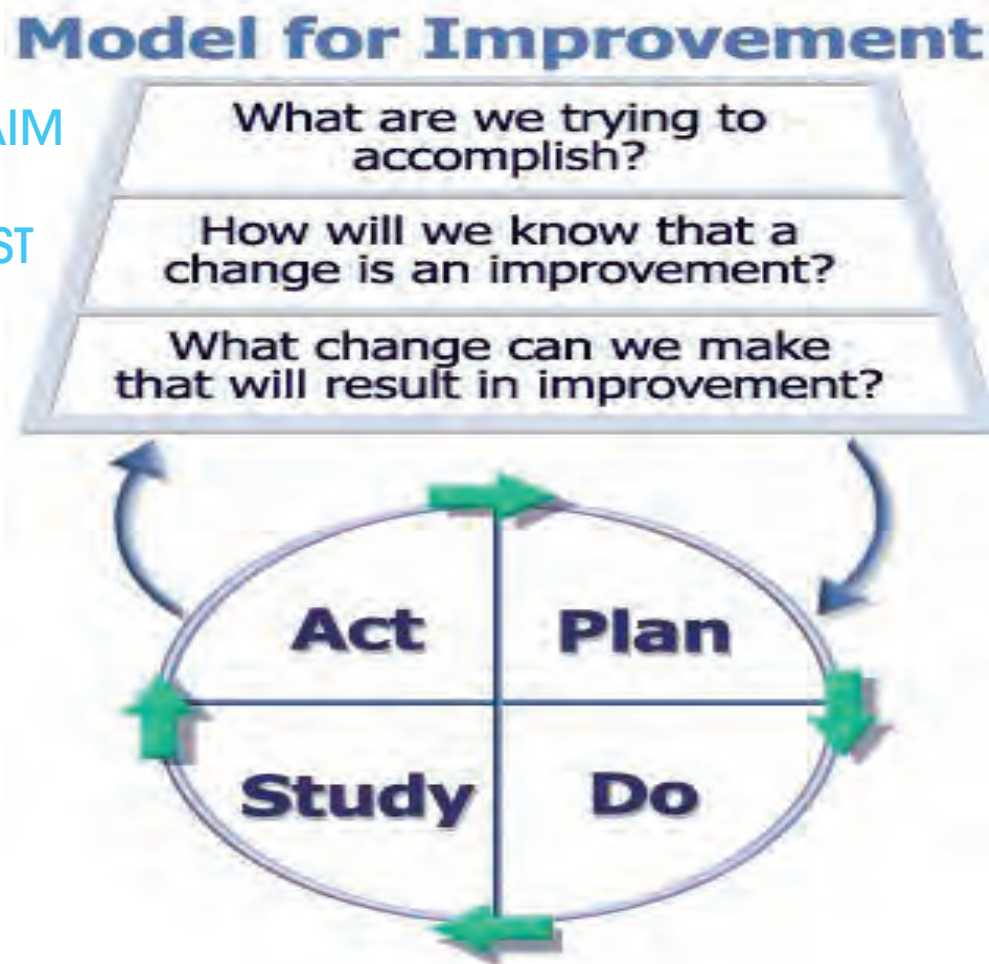
7.4 WHAT IS QUALITY IMPROVEMENT?

Quality improvement is a formal approach to the analysis of performance, followed by systematic efforts to improve it. Improvement comes from the application of knowledge and a thorough understanding of the system you are trying to improve.

The Model for Quality Improvement highlights five key points.

- Knowing why or what you need to improve (audit will have provided this information).
- Having a feedback mechanism to identify if improvement has occurred (closing the audit loop).
- Developing a change that will lead to improvement.
- Testing a change before implementation; this may lead to multiple cycles of further change.
- Knowing when you have an effective change that will lead to an improvement.

The Model for Quality Improvement (Langley GJ et al. *The Improvement Guide* (2nd Edition). Jossey-Bass, San Francisco 2009) requires clinicians to look at data over time, in order to help understand variation – both wanted and unwanted – for the purpose of quality improvement (Model for Improvement reproduced from the *Improvement Guide*) (NHS, 2013; National Steering Group for Specialist Children's Services, Scottish Executive, 2009).



7.5 WHICH OUTCOMES SHOULD WE MEASURE?

Outcome measures are the cornerstone of clinical governance, strengthened by acceptance of the value of systematic critical and objective examination of practice by clinicians and management alike. The quality of delivery of healthcare can be divided into three domains:

Structure: e.g., how many emergency operating theatres are available 24 hours a day?

Process: e.g., is there a local guideline for paediatric sedation?

Outcome: e.g., what is your hospital's rate of unplanned admissions for day case surgery?

There is an infinite list of outcome measures that can be looked at both locally and nationally. It is vital that a national quality improvement programme for paediatric anaesthesia is initiated, in order to make the necessary changes that will lead to better patient outcomes (health), better system performance (care) and better professional development (learning).

7.6 SAMPLE OUTCOME MEASUREMENTS FROM THE UK

Clinical audit is a component of quality improvement. The Royal College of Anaesthetists (RCoA) publication: *Raising the Standard: a compendium of audit recipes*, 3rd Edition 2012 is a most comprehensive book that guides the user through the process of quality improvement using the Model for Improvement system.

The section on paediatric surgery provides a list of sample audit projects that could be utilised in Ireland, both locally and nationally, to evaluate current clinical standards of care in paediatric anaesthesia and to begin the quality improvement process for Irish children in the peri-operative setting.

The following is a list of suggested audit projects outlined in detail in the RCoA's *Raising the Standard: a compendium of audit recipes* – covering the 'why, who, when and where' of how to proceed in setting up and conducting clinical audits in paediatric peri-operative care.

Royal College of Anaesthetists *Raising the Standard:*

a compendium of audit recipes, 3rd Edition 2012: Suggested audit projects

- **Pre-operative parent and child information**

Parents and their children demonstrate a high incidence of anxiety prior to surgery (Royal College of Surgeons of England, 2013).

Adequate pre-operative information and preparation will help allay these concerns and reduce anxiety (ANZCA – Australia and New Zealand College of Anaesthetists, 2008).

- **Pre-operative fasting in elective paediatric surgery**

Adequate pre-operative fasting reduces the risk of regurgitation of stomach contents at the time of induction of anaesthesia. This must be balanced against the risks of prolonged fasting leading to hypoglycaemia, dehydration and distress. However, maintaining such a balance can be logistically difficult.

- **Pre-medication in pre-school age children**

Induction of anaesthesia may be a stressful experience for pre-school-aged children and their parents. If the child resists intervention, unnecessary distress may occur. As well as being undesirable, this may also influence the child's attitude to medical care in the future.

- **Parent satisfaction with arrangements for being present with their child at induction**

A child-centred approach to anaesthesia and surgery should be employed with, as far as possible, provision for parents to accompany children to both the anaesthetic room and the recovery area' (Campling, Devlin & Lunn, 1989; Lunn 1992).

- **Peri-operative temperature control in children**

Thermoregulation is known to be disrupted in the peri-operative period, with the paediatric population particularly at risk. This audit will establish whether warming techniques are being used effectively in children and whether appropriate intra-operative monitoring is being used.

- **Post-operative pain management**

Pain is experienced by paediatric patients of all ages, especially in the post-operative period (Campling, Devlin & Lunn, 1989). Pain relief is a basic humanitarian requirement, which in the hospital environment is

entrusted to healthcare professionals (Lunn, 1992). It is essential that this responsibility is discharged safely and effectively.

- **Peri-operative fluid audit in children**

There have been a number of concerns and case reports of morbidity associated with hyponatraemia due to water intoxication in the peri-operative period (Campling, Devlin & Lunn, 1989; Lunn 1992). The NPSA (National Patient Safety Agency) produced a safety alert to reduce the risk of hyponatraemia in children and the APAGBI (Association of Paediatric Anaesthetists of Great Britain and Ireland) produced a consensus guideline on peri-operative fluid management in children (Arul & Spicer, 1998; RCoA, 2002). The purpose of this audit is to observe the use of intravenous fluids given to children during the peri-operative period, and therefore to check that current guidance is being followed.

- **Paediatric sedation**

When sedation is administered to a child by a person who is not an anaesthetist, this can result in unintended loss of consciousness. In contrast, some sedation techniques may not be effective enough and can lead to patient distress and failure to complete the procedure. Practitioners need to know how to deliver effective sedation and be able to manage the complications of airway obstruction, and cardio-respiratory depression.

- **Children experiencing pain at home after undergoing day surgery**

It is well established that the expansion of day surgery has not been mirrored by a corresponding increase in the provision of analgesia at home following surgery (Campling, Devlin & Lunn, 1989).

With an increasing amount of surgery joining the list of 'suitable for day case' procedures, it is incumbent on anaesthetists charged with the administration of peri-operative pain control to look further than the day surgery discharge lounge when assessing the success of their post-operative analgesia regime.

- **Unplanned hospital admission following paediatric day case surgery**

Unplanned overnight admission to hospital is stressful, and is a major inconvenience for children and their families. High unplanned admission rates may be due to inadequacies in one or more aspects of the care pathway; patient selection, pre-assessment, peri-

operative management, staff experience, as well as the day care facilities, geographical factors and case mix (Campling, Devlin & Lunn, 1989).

- **Care pathways for dental extractions under general anaesthesia in children**

Each year in Ireland many children undergo general anaesthesia for dental extractions. Although the facilities and organisation of paediatric dental services vary widely, these children should receive the same standard of care as children undergoing general anaesthesia for any other procedure.

- **Post-operative nausea/vomiting in children**

Post-operative nausea/vomiting (PONV) is approximately twice as frequent in children as it is in adults, with an incidence of 13–42% in all paediatric patients (Campling, Devlin & Lunn, 1989; Lunn 1992). PONV is one of the major causes of parental dissatisfaction after surgery, and is the major cause of unanticipated hospital admission after day surgery, with resulting increased healthcare costs (Arul & Spicer, 1998; RCOA, 2002).

- **Performance measures specific to paediatric anaesthesia**

In the design of this Model of Care for Paediatric Anaesthesia, a multidisciplinary workshop was held to establish a consensus on performance measures, activity measures and outcome measures applicable to paediatric anaesthesia that could be used to guide the development, delivery and growth of services locally, within Hospital Groups and at a national level.

It was agreed that the Model for Quality Improvement would be adopted to improve outcome and the quality of service provided to children in Ireland who are under the care of anaesthetists. The group included a combination of personnel both from dedicated paediatric-only hospitals and from adult Model 3 and Model 4 hospitals throughout the country. The latter group covered a broad range of paediatric anaesthesia practice sizes.

Table 7.1 lists the top 14 performance and quality improvement measures ranked in order of importance by the group as implementation priorities.

These measures will be useful when setting up a paediatric anaesthesia governance and clinical service, either de novo or as a result of building on existing structures. Not all measures may be

appropriate in all situations, but we have included all metrics generated by our group. The measures are

not listed in order of priority.

TABLE 7.1 PERFORMANCE AND QUALITY IMPROVEMENT MEASURES FOR EVALUATION OF IMPLEMENTATION OF THE MODEL OF CARE FOR PAEDIATRIC ANAESTHESIA

National, regional and local governance
Identification of local age profile
Identification of local volume of cases
Implementation champion
Critically ill child – identify, stabilise, transfer
Continuous audit cycle
Communication
Update of continuous professional development (CPD) week in paediatric hospital
Safe site surgery checklist
National information sharing of PPG
Appropriate paediatric physical infrastructure
Definition of paediatric hospital models
Clinical incident reporting
Ongoing review of policies and guidelines

Table 7.2 lists the top three performance measures, ranked in order of importance, for the establishment and implementation of a paediatric anaesthesia

service according to our model of care. These are critical to the quality of a paediatric anaesthesia service.

TABLE 7.2 – TOP THREE PERFORMANCE MEASURES FOR ESTABLISHMENT OF A PAEDIATRIC ANAESTHESIA SERVICE

1	Definition of paediatric hospital models
2	National, regional and local governance
3	Critically ill child – identify, stabilise, transfer

Table 7.3 lists the top two activity performance measures identified as most important and relevant to paediatric anaesthesia in Ireland today. These are appropriate for an established, stable service in

paediatric anaesthesia that is seeking to evaluate its current practice, with a view to streamlining its processes and improving its clinical services.

TABLE 7.3 – ACTIVITY PERFORMANCE MEASURES – APPROPRIATE FOR AN ESTABLISHED, STABLE SERVICE IN PAEDIATRIC ANAESTHESIA

1	Volume of cases by age by Hospital Group
2	Wait list data – by age, region, procedure

For paediatric anaesthesia services that are regarded as being in an established and stable phase of development and service delivery, a multitude of performance measures are available to assess the quality of anaesthesia service being delivered. Below is a list of measures identified in our workshop as

suitable, appropriate and relevant for this purpose.

- ISBAR (identify - situation - background - assessment - recommendation)
- Safe site surgery
- Unplanned admission

- Theatre take-back
 - Unplanned transfer to another hospital
 - Pre-admission unit
 - Trolley waits
 - Patient information (pre- and post-op)
 - Pre-op fasting
 - PEWS
 - Pre-med
 - Paediatric sedation
 - Emergency transfer to another hospital
 - National information-sharing (policies, guidelines, patient information, questionnaire)
 - Patient and guardian satisfaction
 - Child friendly
 - Temperature control
 - Teenager satisfied
 - Day case rates
 - Consultant anaesthetist satisfaction
 - Pain at home
 - Post-op nausea vomiting
 - Same-day cancellation
 - DOSA
 - Peri-operative paediatric governance
 - Reporting to management team
 - Meetings
 - Communication
 - CPD
 - Review policies and guidelines
 - Percentage day case
 - Percentage DOSA
 - Fasting
 - Emergency/elective
 - Reporting and audit of implementation
 - Peri-operative risk meeting
 - M&M meetings
 - Critical incident reporting
 - Adherence to guidelines
 - Patient and staff surveys
 - Monitoring of staffing levels
 - Equipment maintenance and replacement schedule
 - Day case surgery versus percentage in-patient
 - Unplanned admission
 - Cancellation rate
 - Pre-admission unit ratio
 - Fasting times
 - Pain management service
 - Emergencies
 - Out of hours
 - Resuscitation and transfer of critically ill child
 - Hub-and-spoke reporting
 - Delayed admission transfer
 - Local and national audits
 - Defined targets
 - National governance structure
 - Peri-operative committee
 - M&M resources
 - Overall staff satisfaction with quality of clinical service
 - Model for continuous quality improvement
 - Cost savings
 - Audit of metrics
 - Audit of guidelines
 - Local/Hospital Group/national integration
 - Ongoing investment in service, structure, equipment
 - Manpower planning
 - Staff training
 - M&M feedback
 - Uptake of paediatric anaesthesia refresher week in children's hospital
 - Quality of paediatric emergency transfers
- Below are the top 19 unranked outcomes measures for the evaluation of the quality of clinical paediatric anaesthesia service delivery.
- Percentage day case surgery
 - DOSA (day of surgery admittance)
 - Unplanned admission
 - Cancellation rate
 - Fasting times
 - Percentage admission of patients through pre-admission unit by ASA grade
 - Pain management service
 - Out-of-hours emergency service
 - PONV
 - Post-op pain
 - Peri-op fluids
 - Temperature control
 - Satisfaction surveys
 - Patient information
 - Unplanned theatre take-back
 - PEWS
 - Pre-medication
 - Paediatric sedation
 - Unplanned transfer to another hospital
- Table 7.4 lists the top four outcome measures for the evaluation of the quality of paediatric service Delivery, ranked in order of importance, with unplanned admissions regarded as the most important, and with both the presence of an out-of-hours emergency service and the use of satisfaction surveys ranked as equally important (i.e., in second place).

TABLE 7.4 – TOP FOUR OUTCOME MEASURES FOR QUALITY OF PAEDIATRIC ANAESTHESIA

1	Unplanned admission
2	Out-of-hours emergency service
3	Use of satisfaction surveys
4	Unplanned transfer to another hospital

7.8 NEXT STEPS

- Agreement should be reached on at least one national outcome measure, and this measure should be included in the national data collection mechanisms within the HSE.
- A robust method of collecting data should be in place, in order to collect data relating to structure, process and outcome at a local, Hospital Group and national level. These data are required in order to establish quality improvement networks.
- All data collections should include a plan for analysis and dissemination of relevant and usable information to all stakeholders in a timely fashion.
- Key areas to be identified for quality improvement. This may be at a local, regional or national level.
- Quality improvement initiatives can be designed at both a local and national level using the model for improvement.
- A steering group should be convened to govern the process.
- Key stakeholders would include senior managers, clinical directors, senior clinicians and senior nurses, so as to ensure the appropriate allocation of resources and support for the process.

8. PAEDIATRIC CRITICAL CARE

8.1 DEFINITION

A paediatric critical care unit (PCCU) is a specialised facility within a children's hospital charged with the care of infants and children. It is staffed by a specialist team and is designated to provide an increased level of detailed clinical observation, invasive monitoring, focused interventions and technical support, in order to facilitate the care of critically ill paediatric patients over an indefinite period of time.

A PCCU will care for patients who, typically, are aged 0–16 years; are diagnosed with life-threatening, potentially recoverable conditions; are post-operative patients who may benefit from close nursing or technical support; have chronic complex medical co-morbidities which exceed the capabilities of other clinical care areas within the hospital.

Between the ages of 16 and 18, new patients may be admitted to a paediatric service where there is a clinical indication that they should be treated in a paediatric setting. It is also widely recognised that end-of-life care, including potential organ donation and family bereavement counselling, are skills that are integral to the care of a critically ill child, and are facilitated within the PCCU.

The PCCU team comprises paediatric intensivists, nurses, pharmacists and allied professionals (such as clinical engineers, physiotherapists, dieticians, speech and language therapists, occupational therapists, social workers and psychologists) who are certified in, and/or have received recognised specialised training (particular to their profession) in the care of critically ill infants and children. These individuals should deliver care within a PCCU that conforms to the agreed guidelines and standards of the relevant professional regulatory bodies.

8.2 LEVELS OF CRITICAL CARE

Level 1

High dependency care requiring a nurse to patient ratio of 0.5:1

Close monitoring and observation is required, but acute mechanical ventilation is not. Patients who require basic respiratory/circulatory/neurological or renal support, and whose needs cannot be met on

an acute ward, require the input of the critical care team.

Level 2

Critical care requiring a nurse to patient ratio of 1:1

The child requiring continuous nursing supervision who is receiving advanced respiratory support (complex NIV or invasive ventilation). Level 2 also pertains to the unstable, non-intubated child, e.g., the haemodynamically unstable patient requiring invasive cardiovascular monitoring, frequent fluid challenges and vasoactive drug infusions.

Level 3

Critical care requiring a nurse to patient ratio of 1:1

The critically ill child with two organ failures or greater, requiring intensive supervision, who needs additional complex therapeutic procedures, e.g., respiratory support with multiple organ failure requiring vasoactive and inotropic medications.

Level 3S:

Critical care requiring a nurse to patient ratio of 2:1

The critically ill child requiring the most intensive therapeutic interventions, e.g., ECMO and/or renal replacement therapy.

These criteria may change in line with advances in technology.

8.3 CURRENT STATUS

Ireland currently has two paediatric critical care units. These are located in Our Lady's Children's Hospital Crumlin and the Children's University Hospital, Temple Street. The total number of beds (divided between the two sites) is 32, and the total number of admissions per year is more than 1,600. Both units are capable of delivering Level 3 and Level 3S care. The PCCUs can be contacted on the National Paediatric Critical Care Network telephone number 1890-213-213 and via www.picu.ie. The parent/guardian of any neonate, infant or child who is critically unwell, or who has the potential to become critically unwell, can access the PCCUs via the 1890-213-213 number. The professionals staffing this telephone service locate an appropriate PCCU bed, and provide advice on resuscitation, stabilisation and transfer of the critically ill child to the appropriate facility. Access to this

telephone service and advice is available 24/7.

8.4 MODEL OF CARE RECOMMENDATION FOR PAEDIATRIC CRITICAL CARE

This section covers two time periods:

1. Up to the opening of the New Children's Hospital (NCH)
2. Following the opening of the NCH and beyond

This Model of Care describes the ideal model for provision of a paediatric critical care unit for children, both now and in the future following the opening of the NCH. Currently, there is no PCCU manpower document which clearly sets out the templates and standards expected for the provision of safe PCCU care in the Republic of Ireland. The PCCU Working

Group is in the process of writing a PCCU Model of Care document; this is expected to be published in mid-2015. Templates and standards for the PCCU Model of Care document will be drawn from international publications, e.g., DNV 2008 and PICS Standards 2010, and the National Standards for Irish Paediatric Critical Care Services 2013. It will allow for the estimation of future numbers of paediatric intensivists. In addition, it will take account of planning for staffing at NCHD and consultant level in PCCUs, as well as the establishment of a formal training programme in PCCU.

The situation with regard to paediatric critical care has been delineated by the DNV report 2008 – an interim report that made 13 recommendations. Currently, PCCUs are at 40% of the recommended NCHD and consultant staffing levels.

TABLE 8.1 CURRENT AND RECOMMENDED BED STATUS AND STAFFING LEVELS IN OLCHC/CUHTS PCCU

	OLCHC Jan 2015	CUHTS	OLCHC + CUHTS combined Jan 2015	PICS Standards 2010 and DNV 2008
PCCU beds open	23 capacity 25	9	34	34
WTE PCCU consultants Jan 2015	4	2	6	12 add retrieval >16
WTE Reg/SpR in PCCU EWTC	6.5	2	8.5	25
Approx. number of admissions per year	>1,100	>450	1,500 and >34	

8.5 PRE-NCH

Up to the time when the NCH is expected to open, there will continue to be two PCCUs in Dublin, between them providing a total of 34 beds; of these, 32 beds are currently staffed. Because the two PCCUs are located across two sites (OLCHC and CUHTS), this has implications for the staffing model and the numbers of staff required to run two units across two sites. (See table above)

8.6 NCH PICU STAFFING

Based on our current validated PICAnet data (from 2009), and allowing for population expansion and the treatment of Belfast-based cardiac patients in the Republic of Ireland, we have created a capacity modelling diagram which has allowed us to predict PCCU/CCCU bed numbers for the NCH.

TABLE 8.2 NCH PICU BED NUMBERS AND STAFFING RECOMMENDATIONS PICS STANDARDS 2010/DNV 2008

	NCH PCCU beds 20	NCH CCCU 22	Total = 42
WTE intensivists	8	8	16
WTE NCHDs	16	16	32
24-hour retrieval NCHDs	+8		40
Retrieval intensivists	+4	>	20

8.7 PICU TRAINING PROGRAMME

The PCCU Model of Care document that is currently being prepared by the PCCU cross-city working group will take account of the creation of a paediatric critical care sub-speciality within the Medical Council specialty registration (as per the Adult ICU programme). The vision for PCCU is that it will sit under the umbrella of the Joint Faculty of Intensive Care as a specialty in its own right, with a fellowship exam. A PCCU training programme will subsequently follow. Trainees will be drawn from all specialties, e.g., anaesthesia, paediatrics, neonatology etc.

8.8 INTENSIVISTS

The vision for paediatric critical care is that there will be a core group of full-time paediatric intensivists, with a two-year post fellowship training programme in PCCU/CCCU drawn from many sub-specialties. It will also allow for dual accreditation across anaesthesia and paediatrics, as well as providing a wealth of training and experience and a world-class service.

8.9 RECOMMENDATION

- Arrangements for the immediate care of critically ill children must be in place in any hospital that manages children. This need can arise suddenly and unpredictably – in the emergency department, operating theatre, or in-patient wards. In-house arrangements are therefore required for providing emergency treatment, for stabilising critically ill infants and children, and for initiating intensive care prior to the child's transfer to a paediatric critical care unit (Royal College of Anaesthetists, 2014). It is recommended that during the initial stabilisation period, early communication is established with the Paediatric Critical Care Network. This communication facilitates the early provision of a paediatric critical care bed and the provision of specialist advice from the outset.
- All emergency departments receiving infants and children, neonatal and paediatric resuscitation equipment, medications (including anaesthetic and resuscitation medications) and fluids should be available to prepare the infant or child for PCCU transfer (Royal College of Paediatrics and Child Health, 2012).
- Equipment should include a suitable ventilator, infusion devices and full monitoring, including capnography, (Royal College of Anaesthetists, 2014).
- Infants and children may require admission to critical care facilities as a planned part of their care – for example, after surgery; due to trauma or an acute illness, or due to extreme prematurity or illness at birth. Infants and children who are likely to need critical care after an operation should undergo their surgery in a hospital/unit with a designated PCCU (Department of Health, UK, 2009).
- Each hospital should have a nominated clinician dedicated to the organisation of resuscitation and stabilisation protocols for the critically ill child. Protocols for the management of critically ill children should be in place. Clinical management of critically ill children in both specialist and non-specialist units will require close cooperation and multidisciplinary teamwork between nurses, paediatricians, surgeons, anaesthetists, intensivists and other relevant clinicians. Local guidelines should be clear on the roles and responsibilities of the multidisciplinary team, including anaesthetic services (Paediatric Intensive Care Society, 2010). It is important that further stabilisation and management are not the sole remit of the anaesthetist (Department of Health, UK, 2009).
- Children may require short-term admission to a general critical care facility while awaiting the arrival of the PCCU retrieval team, if available. There may also be occasions when a child requires a very short period of critical care that does not necessitate transfer to a PCCU. This is acceptable, provided that there is a suitable facility within the hospital; provided that there are staff with appropriate competencies in place; and provided that the episode lasts only a few hours. Children who require Level 2, Level 3, and Level 3S critical care support for >12 hours should be transferred to a PCCU. There should be a nominated lead consultant and nurse in the critical care unit who is responsible for overseeing admission policies and procedures for infants and children (Paediatric Intensive Care Society, 2010).
- Hospitals that admit children should be part of a critical care network. Specialist centres with

PCCU facilities within the network have the responsibility to provide ongoing education. They also have a clear responsibility to provide clinical advice and help in locating a suitable PICU bed once a referral has been made (Royal College of Anaesthetists, 2014).

8.10 TRANSPORT OF CRITICALLY ILL CHILDREN

8.10.1 Current status

The Paediatric Critical Care Retrieval Service commenced (on a six/eight-month pilot basis) on 13 October 2014. It became known as the Irish Paediatric Acute Transport Service (IPATS), part of the National Transport Medicine Programme (NTMP). The service is not due to be formally launched until the end of pilot phase, at which time a full review will take place to establish the feasibility, safety and sustainability of the programme. A neonatal transport service is now in place 24/7/365.

The retrieval team initially began operating three or four days a week, with an expectation of having five days a week cover in the coming months. The hours of service are from 10.00am until 8pm. The team must return to base by 8pm. Currently, cover is not provided on national holidays and at weekends.

All requests for service must be made by 4pm (for calls in the Dublin region, e.g., Tallaght). Calls from the south, west and northwest have to be received earlier than 4pm, in order to ensure that the team are back at base by 8pm. The decision to travel is made by the IPATS consultant, and is dictated by the place, time and nature of the referral.

The service will support the transfer of critically ill infants and children from the referring hospital to the PICU in the Children's University Hospital, Temple Street or to Our Lady's Children's Hospital Crumlin. Referrals to the general wards will not be facilitated. The patient must be accepted by a paediatric intensivist in either hospital, in addition to any specialist service (e.g., cardiology).

A request for the referral and retrieval team must be directed to the PICU referral phone line 1890-213-213. Requests channelled through other routes will not be considered.

IPATS retrieves patients aged from four weeks corrected gestational age to patients who are on the eve of their 16th birthday. The neonatal team retrieves all infants aged under four weeks corrected gestational age or weighing < 5 kg. When the neonatal team is unavailable, and if the infant weighs more

than 3 kg, IPATS will consider transporting the patient. The team will be dispatched from the Children's University Hospital Temple Street or from Our Lady's Children's Hospital Crumlin.

8.10.2 Post-pilot phase of IPATS

It is planned to have a full-time, consultant led-service in place towards the end of 2015. This service will have the following aims:

- Provide a single point of telephone contact for referring clinicians.
- Facilitate access to immediate specialist clinical advice.
- Facilitate access to online clinical support tools.
- Work with accepting PICUs to identify a PICU bed, so that the most appropriate care is provided in the most appropriate location for any infant, child or adolescent requiring specialist care in Ireland.
- Triage to an appropriate level of transport provision, and dispatch transport teams within a clinically appropriate time window.
- Work with referring hospital teams to stabilise patients before transferring them to an accepting PICU.
- Provide logistical support for the high-risk transfer of critically ill infants, children and adolescents for continuing medical care that is not available in Ireland.
- Repatriate or facilitate the repatriation of patients from paediatric intensive care units to continue their care in an institution nearer their home, or transfer them to a facility that best suits the patients' ongoing needs (once service is fully resourced).

In order to achieve this, the Paediatric Retrieval Service will:

- Maintain appropriate communication between all parties, so as to ensure efficient and effective continuity of patient care.
- Ensure that every transfer is carried out in a way that maximises patient safety, comfort and dignity, and minimises patient pain, discomfort, or distress, and also minimises the discomfort/distress of parents/guardians.

8.10.3 Scope of service

The Paediatric Retrieval Service serves approximately 1.1 million children in the Republic of Ireland by providing support to hospital sites that provide

acute care to infants, children and adolescents. This includes:

- All infants of over four weeks corrected gestational age and who weigh more than 5 kg; children and adolescents up to their 16th birthday who are, triaged, identified and accepted to be in need of paediatric critical care in an appropriate paediatric facility.
- The repatriation of these children from a critical care unit to an appropriate facility not located in a paediatric hospital, in order to continue their care if it is in the patient's best interest (and once the Paediatric Retrieval Service has been fully resourced and is fully operational).
- In exceptional circumstances, and at the discretion of the receiving institution, children aged over 16 years who, due to their specialist needs, require care in a PICU.
- In certain circumstances, referral of infants or children to the care of a regional hospice, following discussions with the referring PICU.
- Transfer of critically ill child to a facility outside the State for ongoing medical care that is not available in Ireland.
- Facilitate the repatriation of critically ill Irish children from institutions outside the State for continuing medical care in the State.
- The service will only be operational on the day there is a named transport consultant available to support or provide the service.
- It is hoped that the service will expand to a 24/7/365 service when additional funding and appropriate staffing is in place.

8.10.4 Acceptance criteria for transfer into PICU

- To activate a transfer, the referring consultant will be required to make an initial telephone referral to PICU.ie. Telephone: 1890-213-213.
- This will be a consultant-to-consultant referral. Referrals from trainees will not be accepted unless it is confirmed that the referring consultant is not in a position to make the phone call and has delegated this task to a suitably qualified trainee.
- The referring hospital will follow the existing guidelines for such referral requests. Referral processes that do not follow this protocol will not be accepted by the Paediatric Retrieval team.
- The patient must be accepted by the receiving intensivist before the team is activated.
- The Paediatric Retrieval team will be activated

by a call from the accepting intensivist, or will be contacted at the earliest opportunity. Ideally, the retrieval process will be initiated by a consultant-to-consultant conversation.

- Ideally, the receiving PICU will have identified a bed before the team is dispatched. In the event that a PICU bed is not identified, the Paediatric Retrieval team will be dispatched, with the expectation that a PICU bed will be designated within the hours delineated for operation of the Paediatric Critical Care Retrieval Service. However the team will not transport a patient until a PICU bed has been designated – even if the team has arrived on site at the referring hospital.

8.10.5 Types of transfer undertaken

Paediatric transfers to PCCUs of patients over six weeks corrected gestational age, and/or greater than 5 kg, deemed to require paediatric critical care. The following types of patients will be considered:

- Two organ failures including/or respiratory failure
- Receiving invasive mechanical ventilation via a tracheal tube, and currently in the first 24 hours after its withdrawal
- Non-invasive mechanical ventilation for any part of the day
- Life-sustaining extra-corporeal therapies (such as extracorporeal membrane oxygenation (ECMO))
- Infusion of an inotrope, pulmonary vasodilator or prostaglandin
- Infusion of a bronchodilator
- Infusion of a central nervous system (CNS) depressant, or of a drug concentration or dosage likely to cause CNS depression
- Infusion of cardiac anti-arrhythmic medications
- Infusion of anti-hypertensive medications
- Infusion of medications, which may cause wide fluctuations in cardiac output, respiratory minute ventilation and level of consciousness
- Any very unstable child (in the opinion of the nurse in charge) who generally requires 1:1
- Any child expected to have large flux in circulating blood volume, or with the potential to require larger infusion of blood, colloid or crystalloid solutions
- A child recovering from a complex surgery to the airway, or who has an unstable airway
- A child who has suffered a major trauma with

- an injury severity (or similar) score higher than 8
- Transfer of acute patients requiring specialist out-of-region services, e.g., burns, cardiac care, and in some circumstances, in discussion with ECMO centres, transfer of these patients for ECMO/extracorporeal life support (ECLS)
- Neonatal patients will ordinarily be transferred by the neonatal transport team (NNTT). Exceptions to this will be considered in consultation with the consultant neonatologist on duty.

8.10.6 Exclusions

The Paediatric Retrieval team will not be responsible for the transfer of the following patient groups:

- Adult patients (patients who have passed their 16th birthday). In exceptional circumstances, young adults aged over 16 years who have specialist needs; who are in transitional arrangements, and who require care in a tertiary paediatric setting will be transferred.
- Primary pre-hospital transfers
- Patient transport service for patients to meet in-patient or out-patient planned appointments
- Inter-hospital transfers of paediatric patients that do not require critical care
- Out-of-hours, low-dependency transfers: in exceptional circumstances such a transfer may be undertaken at the discretion of the consultant on call for CHICA.
- Patients who have been exposed to hazardous materials, or who have a highly infectious disease which poses a risk to hospital staff, despite the application of normal barrier precautions.
- Certain time-critical requiring emergency surgery or intervention: Patients with 'time-critical lesions' (which are deemed so by the appropriate specialist) should not wait for the transport team; this is because there could be a risk of adverse clinical outcome if there were to be a delay in transferring the patient to the specialist service. Such patients should be transferred to the accepting unit at the earliest and safest opportunity. Examples include patients with rapidly expanding intracranial lesions or transposition of the great vessels with intact interventricular septum.

9. STRUCTURE AND GOVERNANCE OF PAEDIATRIC ANAESTHESIA SERVICES: LOCAL, REGIONAL/HOSPITAL GROUPS AND NATIONAL

9.1 MANAGEMENT OF LOCAL HOSPITAL SERVICES

Strong management of an individual hospital's paediatric anaesthesia service is vital at both clinical and managerial level, in order to ensure successful implementation of operational policy and day-to-day management of the unit. This will require input and support from all relevant stakeholders within the hospital/Hospital Group and community services.

9.2 OVERALL QUALITY AND SAFETY STRUCTURE

Effective governance arrangements recognise the inter-dependencies between corporate, financial and clinical governance across the service.

To support quality and safety of an individual department's paediatric anaesthesia service within a hospital/Hospital Group, governance should be clearly set out in the context of the overall peri-operative group (see below for sample peri-operative governance structure) and its interface with the Hospital Executive. If clinical directorates are in

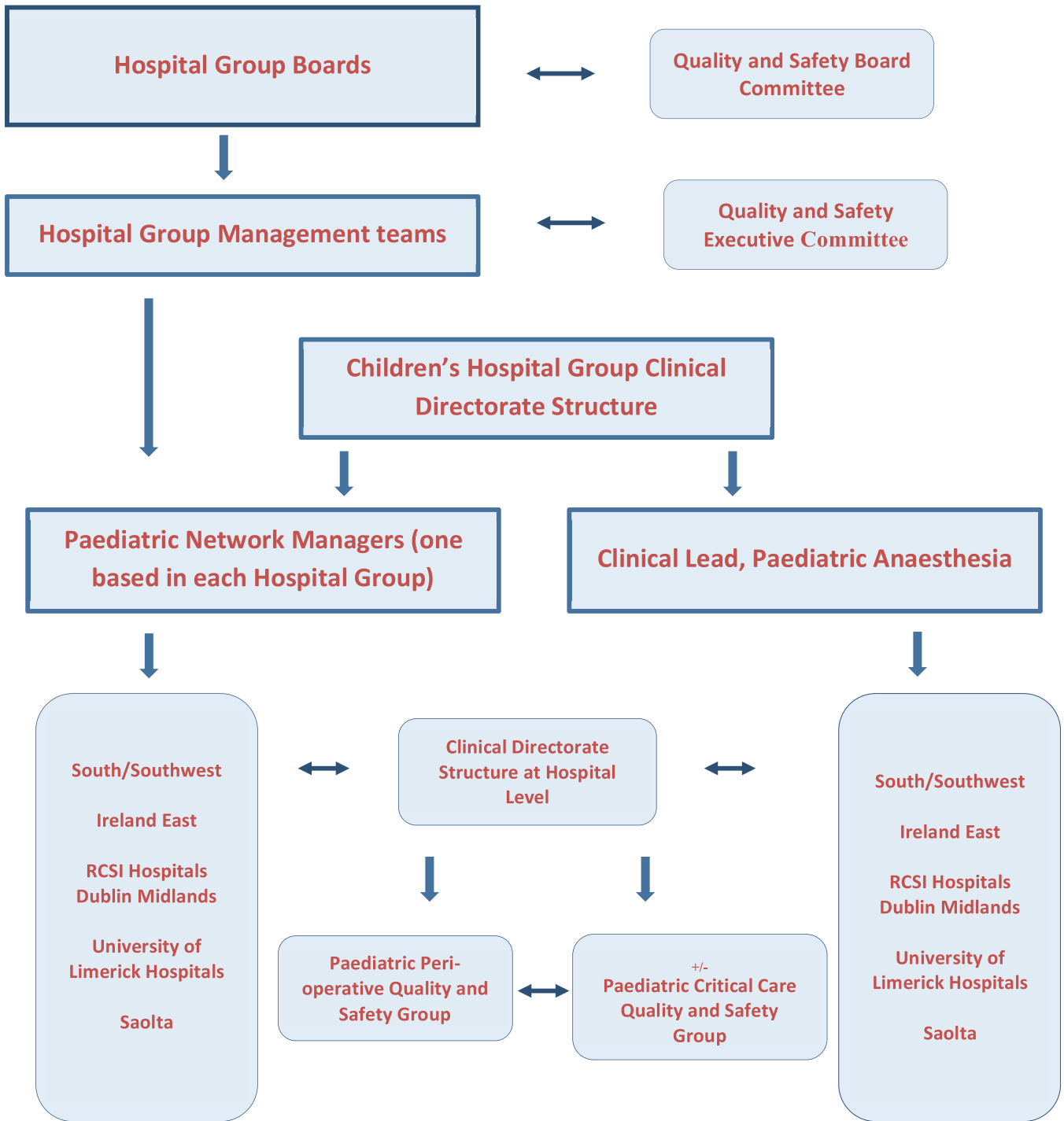
place, appropriate line reports with relevant clinical leads and specialities should be unambiguous.

9.3 STANDALONE PAEDIATRIC HOSPITALS

For standalone paediatric hospitals, peri-operative governance will be similar to peri-operative governance structures in any Adult Model 3 or Adult Model 4 hospital. This could be similar to the first half of the governance structure outlined in the table below, but could be detailed in a way that reflects the complexity and diversity of clinical practice undertaken in these hospitals.

Obviously, with the development of the New Children's Hospital, and planned development of the hub-and-spoke model for paediatric services in Ireland, there is scope for a functioning cross-hospital or inter-hospital peri-operative group which would reflect the governance structures into which individual hospitals and departments will eventually merge.

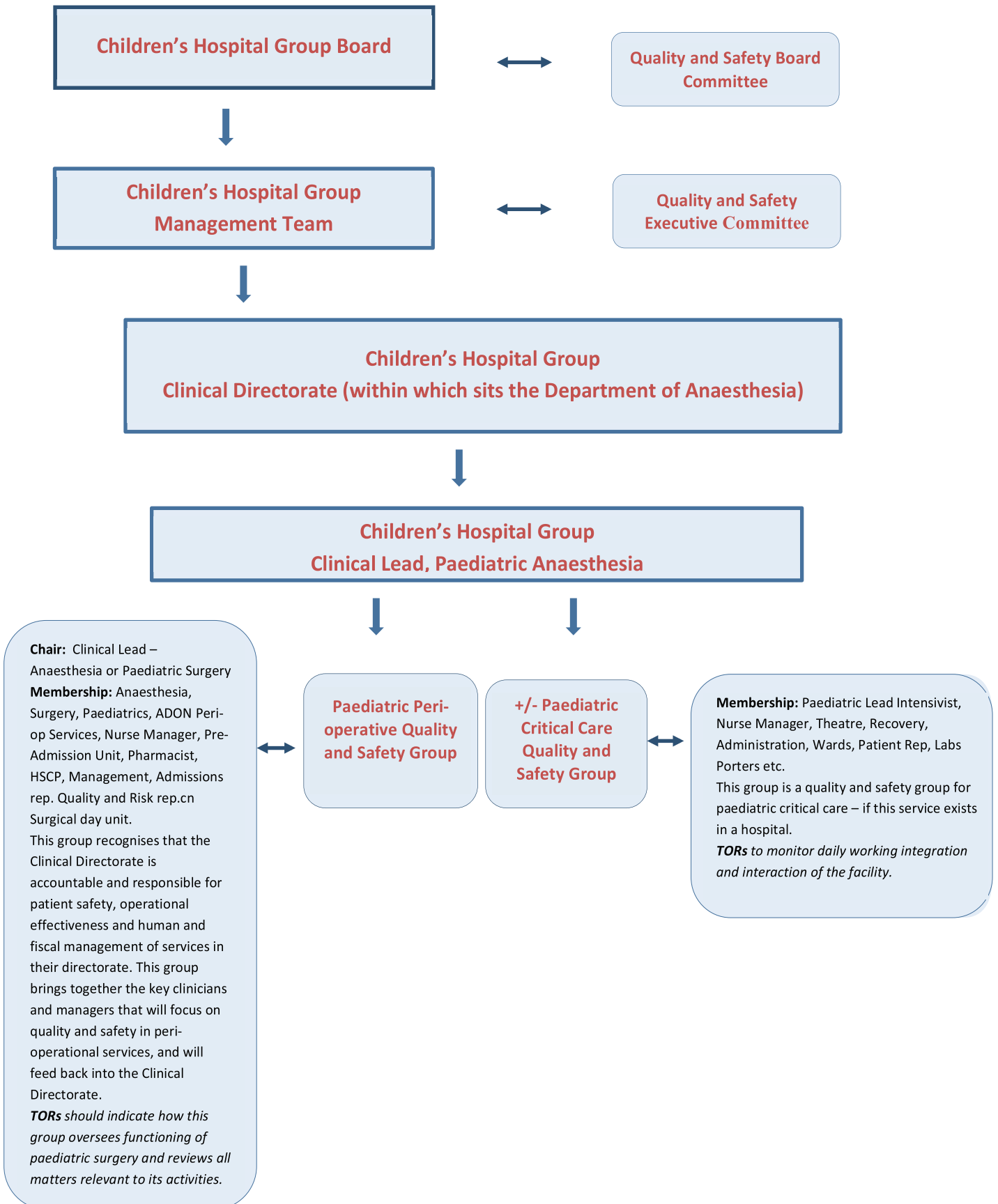
TABLE 9.1 A MODEL FOR GOVERNANCE AS A NETWORK FOR PAEDIATRIC ANAESTHESIA SERVICES IN HOSPITAL GROUPS



Executive accountability for resources, ownership, leadership, peri-operative, management and monitoring of paediatric anaesthesia services should be set out in the terms of reference for the paediatric peri-operative quality and safety group. The paediatric peri-operative quality and safety group itself should be integrated into the clinical and managerial infrastructure with the rest of the hospital (e.g., directorates, where these are in

place). The quality and safety structures, processes, and appropriate referral mechanisms will need to be communicated both internally (within the hospital) and externally to key partners, such as primary care teams or other major referring agents. Each Hospital Group will liaise with the clinical lead in paediatric anaesthesia on the standardisation of core processes, education, training, audit and peer support.

TABLE 9.2 A PROPOSED MODEL FOR GOVERNANCE OF THE CHILDREN'S HOSPITAL GROUP



9.4 QUALITY AND SAFETY OF PAEDIATRIC ANAESTHESIA

Quality improvement and safety incorporates accountability for clinical performance. The aim is to create and support an environment where all staff understand their role within the service, recognise their accountability and are committed to the guiding principles for quality and safety.

Each hospital should have a multidisciplinary paediatric peri-operative group that oversees the organisation and day-to-day running of paediatric surgical services; agrees policies, protocols and guidelines (PPGs) which are aligned with the PPGs of the Children's Hospital Group; timetables and plans the service; manages resources; reviews operational problems, and organises audit strategies. Individual hospitals should formulate a staffing structure that takes local needs into consideration.

As hospitals become networked in groups, it may be more productive and appropriate to develop a single paediatric peri-operative group to meet the needs of the local Hospital Group. This could be a single paediatric peri-operative leadership, quality improvement and management structure, with local on-site groups as required reflecting the needs of individual hospital clinical caseloads.

Paediatric anaesthesia and surgical services and processes need to be adapted to suit individual hospital needs, as reflected by surgical case mix and patient complexity (e.g., Adult Model 2 hospital with paediatric day surgery for ASA Physical Status 1 and ASA Physical Status 2 patients versus Adult Model 3 and Adult Model 4 hospitals covering both paediatric day surgery and day-of-surgery admission for high risk paediatric patients).

ASA Physical Status Classification System

ASA Physical Status 1 –

A normal healthy patient

ASA Physical Status 2 –

A patient with mild systemic disease

ASA Physical Status 3 –

A patient with severe systemic disease

ASA Physical Status 4 –

A patient with severe systemic disease that is a constant threat to life

ASA Physical Status 5 –

A moribund patient who is not expected to survive

without the operation

ASA Physical Status 6 –

A declared brain-dead patient whose organs are being removed for donor purposes

This model of care provides a flexible framework for paediatric peri-operative clinical governance, thus enabling different levels of hospitals to be responsive to individual local needs.

Every paediatric peri-operative group should operate under the leadership of a consultant anaesthetist or surgeon. The lead clinician for the paediatric peri-operative group, within the context of the hospital quality and safety structure, will oversee the quality and safety of the unit. Their remit will include the development of local PPGs and clinical governance.

The lead clinician will encourage innovations and development in the range of issues encompassed within the broad remit of peri-operative paediatric surgery and clinical governance, with particular emphasis on clinical risk management and clinical audit.

The paediatric peri-operative group overseeing all aspects of paediatric surgery should be chaired by a lead consultant in anaesthesia or surgery, and should include representatives from surgery; paediatrics; senior nurse management; health and social care professions (such as physiotherapists, occupational therapists, dieticians and nutritionists); hospital administration; hospital management and finance.

It is important that the paediatric surgery staff have dedicated time allocated to the service, in order to ensure that it functions appropriately. The maximum value from the paediatric peri-operative group will be derived from the team working as a complete unit to cover all aspects of care involved in paediatric surgery – from administration to nursing, medical personnel and beyond.

Additionally, a paediatric anaesthesia user group, comprising representation from all specialties involved in paediatric anaesthesia, should be established, in order to allow discussion of wider issues relating to the operational function of the individual service. Typical membership might include the following: paediatric lead anaesthetist; nurse manager; representatives from theatre, recovery,

administration and nursing; representatives from hospital wards; patient representatives; laboratory representative; healthcare assistants; porters etc.

9.5 LEARNING NETWORKS

On a national basis, paediatric anaesthesia user groups should try to develop learning networks, so as to ensure the transfer of skills, expertise, information and evaluations. Units should share locally developed PPG algorithms; this would not only reduce duplication of effort, but would also encourage peer review of such algorithms.

9.6 SUMMARY OF REQUIREMENTS FOR DELIVERY OF CARE AT EACH INSTITUTION PROPOSED TO DELIVER SURGERY, ANAESTHESIA AND PERI-OPERATIVE NURSING CARE

- Compliance with minimum standards of monitoring (as recommended by AAGBI guidelines)
- Child and parent-friendly facilities, ideally with children managed in a separate environment from adults
- It is recommend that there should be an area near the operating theatres where parents and medical staff can have a private conversation.
- Each hospital undertaking paediatric anaesthesia must have one designated lead anaesthetist who has sub-specialty interest in paediatric anaesthesia. The lead anaesthetist(s) should undertake a sufficient volume of procedures in order to maintain competencies in the peri-operative care of children and adolescents.
- Each hospital undertaking paediatric anaesthesia must have one designated lead nurse.
- The WHO Safe Surgery Saves Lives checklist should be in operation.
- Appropriately trained and competent staff for the age and ASA classification of the patients that the institution proposes to care for should be in place.
- Child-friendly pre-operative assessment clinics should be in place.
- Day ward, in-patient beds, operating theatres, recovery areas that are appropriate for children should be in place.
- Equipment, medications and monitors, defibrillators that are designed for children should be in place.
- An acute pain service that is child appropriate should be available.
- A management policy on the care and appropriate transfer for the critically ill child should be in place.
- A policy on the age and ASA classification of patients who are to be transferred should be in place.
- A policy on what operative procedures are to be carried out should be in place.
- Hospital management will need to ensure that appropriate policies are in place; that regular audits are conducted, and that relevant staff competencies are maintained.
- Analysis of adverse events and regular audits should take place at a local, regional and national level.
- The multidisciplinary team should audit their practice on key outcomes, including but not limited to, the following: complication rate; unexpected readmission rate; unexpected referral to tertiary centres; post-operative nausea and/or vomiting rates; regional anaesthesia success rates. These audits should include anaesthetists and other healthcare professionals in local, regional and tertiary hospitals, in a network framework. Audits should be incorporated in a quality improvement framework at a local, Hospital Group and national level.
- A policy on child protection and safeguarding children in the operating theatre should be in place.
- The hospital should have: capacity/capacity planning; facility requirements for physical infrastructure/specifications of specific units/sites; bed stock (current/required); capacity to manage the demands of surges and major surges.
- The HR team should comprise members of the multidisciplinary team, as appropriate, in order to ensure that the competencies required to deliver the model of care are available - business, administrative and support staff - role, responsibilities and contributions of each member of the MDT
- There should be recognition of the interdependencies with other national clinical programmes, e.g., acute medicine;

emergency medicine; acute and elective surgery; intensive care diagnostics; infection prevention and control; palliative care; transport medicine. Collaboration and cross programme initiatives is necessary.

- All anaesthetists who provide anaesthetic services for elective paediatric surgery must have paediatric anaesthesia training and must maintain their skills in paediatric resuscitation to PALS/APLS level or equivalent

9.7 ROLES AND RESPONSIBILITIES WITHIN PAEDIATRIC ANAESTHESIA USER GROUPS

9.7.1 Lead clinician: consultant anaesthetist

The role of lead clinician for paediatric anaesthesia should be resourced appropriately, including ensuring that designated time is allocated to the respective anaesthetic department.

- The lead clinician for paediatric anaesthesia should be an anaesthetist who acts as the key point of contact with surgical, nursing and anaesthetic departments.
- The lead may act as Chairperson of the Paediatric Peri-Operative Group.
- The lead will act as Chairperson of the Paediatric Anaesthesia User Group.
- The lead oversees the implementation of the operational PPGs for paediatric anaesthesia.
- The lead is responsible for establishing evidence-based PPGs for paediatric anaesthesia, data collection for clinical audit; the establishment of a risk register/reporting system for risk management, which is reported to the Peri-operative Quality Improvement and Safety Group and from there to the overall Quality and Safety Executive Committee for the hospital(s).
- The lead will arrange executive and clinical ratification and circulation of protocols.
- The lead will ensure that risk assessment, KPIs (key performance indicators) and audits of paediatric anaesthesia services and care are conducted as appropriate, and that outputs are monitored and reviewed. The group will adopt the Model for Quality Improvement.
- The lead will ensure that paediatric anaesthesia is a consultant-led service and that hospital management is informed of the requirements for adequate staffing by anaesthetists and

other clinical staff as appropriate.

- The lead will link in with other lead clinicians for paediatric anaesthesia nationally, in order to establish a network of learning through the Irish Paediatric Anaesthetic Network (IPAN).

9.7.2 Consultant surgeon and surgical team

Please refer to the Model of Care for Elective Surgery and the Model of Care for Acute Surgery.

9.7.3 The peri-operative nurse

Peri-operative nursing is the nursing care provided to patients throughout their peri-operative journey. It encompasses the care from the moment the patient has a pre-operative assessment to the point of discharge from the operating department.

The Association of Perioperative Registered Nurses (AORN) recognizes the “peri-operative nurse” as one who provides, manages, teaches, and/or studies the care of patients experiencing the peri-operative journey.

This nursing care must be of a high standard and is governed by policies, procedures and guidelines (PPGs). Such PPGs must be in place, in order to define the role and responsibilities of the peri-operative nurse in caring for a child or young person who is undergoing any form of anaesthesia or surgical procedure.

The anaesthetic nurse works as part of the peri-operative team in collaboration with the anaesthetist in the preparation and safe delivery of general, regional or local anaesthesia. The success of a coordinated team approach is dependent on respect and communication between the anaesthetist, anaesthetic nurse, scrub nurse and surgeon. Paediatric nursing is very much a family-centred approach to care. Pre-operative education of parents/guardians is vital, in order to afford them the knowledge required to prepare and support their child. The nurse provides emotional and psychological support to both the patient and their families.

While the patient is under general anaesthesia, the nurse assumes the role of advocate, as the patient is unable to serve his/her own needs, make decisions regarding his/her wellbeing, protect his/her dignity and maintain respect for his/her confidentiality (BARNA, 2012).

“Trained assistance for the Anaesthetist must be provided wherever anaesthesia is provided. The safe administration of anaesthesia cannot be carried out singlehandedly; competent and exclusive assistance is necessary at all times. Staff assigned to the role of anaesthetic assistant should not have any other duties that would prevent them from providing dedicated assistance to the Anaesthetist during anaesthesia” (The Association of Anaesthetists of Great Britain and Ireland (AAGBI), 2010).

9.8 COMPETENCE AND EDUCATION

9.8.1 Competence

The skills required for peri-operative nursing care of children is highly specialised and complex, and involves caring for patients until they reach their 16th birthday.

Children undergoing anaesthesia must be cared for by nurses who are skilled in both paediatrics and anaesthesia/recovery room nursing. Specific specialist knowledge, skills and training are required in order to deliver holistic quality care in accordance with best practice guidelines. Peri-operative nurses should be trained and experienced in providing both routine care and emergency care.

Structured competencies using a competency framework, with mentorship and support, allows nurses to advance in the area of anaesthesia and recovery.

The competency assessment document should adhere to British Anaesthetic and Recovery Nurses Association (BARNA), Nursing and Midwifery Board of Ireland (NMBI), and AAGBI guidelines. The following is not an exhaustive list of competencies; moreover it must be understood that this list should be completed within a realistic and achievable timeframe.

Competencies which should be included are:

- Pre-operative management, including pre-assessment
- Airway management
- Patient monitoring and the equipment used for same
- Anaesthetic pharmacology
- Pain management and assessment
- Infection control
- Immediate care of the paediatric patient post-

operatively

- Safe removal of an airway adjunct.

9.8.2 Education

9.8.2.1 Roles and responsibilities

- a. The nurse must be responsible for completing all local and national mandatory training relevant to their area of expertise. He/she must demonstrate the application of knowledge, based on scientific and nursing principles, while working within their scope of practice. Scope of practice is defined as the range of roles, functions, responsibilities and activities, which a registered nurse is educated, competent, and has authority to perform (An Bord Altranais, 2000).
- b. It is recommended that all paediatric nurses caring for children should have access to and undertake advanced paediatric life support (APLS), paediatric advanced life support (PALS) or paediatric life support (PLS) training. Depending on local service needs and the age range of children being cared for, nurses may also be required to undertake a neonatal resuscitation programme (NRP).
- c. The clinical nurse facilitator (CNF) in peri-operative nursing/anaesthetics and recovery plays an important role in the development and preservation of an anaesthetic nursing service. The CNF facilitates the anaesthetic and recovery nurses in maintaining their competence, and ensuring that a high standard of care is delivered. This role includes competency assessments, education programmes, auditing practice, quality initiatives, regular simulation sessions, as well as PPG development and maintenance.

All peri-operative nurses must have knowledge of the following policies:

- National Consent Policy, 2010
- WHO guidelines for safe surgery, 2009
- National Policy and Procedures for Safe Surgery 2013

9.9 PROGRAMMES AVAILABLE

Currently, there is one paediatric peri-operative nurse

education programme with a module in paediatric anaesthesia in place in both OLCHC and CUHTS. From September 2015, this programme will become a Post Graduate Diploma/MSc in Peri-operative Children's Nursing, with the opportunity to specialise in anaesthetics/recovery room children's nursing or surgical children's nursing. The programme will be run by OLCHC in conjunction with the Royal College of Surgeons in Ireland (RCSI).

Tallaght Hospital delivers a Post Graduate Diploma in Peri-operative Nursing, with a paediatric component, incorporating anaesthesia, recovery and the surgical scrub side of care.

The national clinical programme in anaesthesia is at an advanced stage in the development of a national standardised foundation programme in anaesthesia/recovery room nursing for nurses and midwives. This programme comprises core theoretical lectures and core competencies, with a component in paediatric anaesthesia.

9.10 NURSE MANAGEMENT

The paediatric nursing staff should be supported by a nursing framework of governance for quality and safety, as delineated by local service decision-makers. The agreed nurse management structure should support the development of a clinical directorate structure through PPGs, strategic planning of the unit, and implementation of the recommendations of the paediatric unit leadership team.

It is likely that the nurse manager will take on a leadership role within the paediatric unit user group.

Role

- 1 Promote and maintain the highest standards and quality care based on individual patient needs.
- 2 Lead, direct and support the nursing team in the delivery of safe quality patient care.
- 3 Encourage and ensure that staff are supported in achieving the required education and competencies.
- 4 Develop PPGs in line with safe quality evidence-based practice.

9.10.1 Clinical nurse specialist (CNS)

A clinical nurse specialist (CNS) may be appointed

to provide clinical leadership and management in paediatric anaesthesia, as determined by local service needs/governance, and may be guided by factors including hospital model, patient complexity, individual hospital size and numbers to treat.

9.10.2 Surgical access coordinator

For a standalone day unit that may consider paediatric lists, the role of surgical access coordinator can prove to be an integral part of the overall service, as coordination of lists, surgeons and support staff is required if staff are visiting from other hospitals within the group.

The skill set and role of a surgical access coordinator is different from the role of waiting list manager, and it is important that their roles and responsibilities are not confused.

9.12 PAEDIATRIC ANAESTHESIA NURSING POLICY RECOMMENDATION

For hospitals providing anaesthesia for children, PPGs that clearly define the roles and responsibilities of the peri-operative nurse in caring for a child undergoing any form of anaesthesia should be in place.

The hospital policies must be evidence based. Such policies may be guided by the Association of Anaesthetists of Great Britain and Ireland (AAGBI) and by the British Anaesthetic and Recovery Nurses Association (BARNA).

9.12 PERI-OPERATIVE NURSING – FUTURE TRENDS

- Cannulation and vene-puncture (in hospitals with a sufficient patient throughput)
- Nurse prescribing (valuable for providing pain relief during recovery period)
- Nurse-led extubation (increases efficiency in the theatre department)
- Pre-operative admission units
- Advanced nurse practitioner in paediatric anaesthesia

Although the above roles/skills are not practised at a national level currently, our aim is that all nurses involved in paediatric anaesthesia would have the opportunity to achieve these standards. As recommended for consultant anaesthetists, opportunities should be afforded to nurses from mixed adult/paediatric hospitals, with limited exposure to a

paediatric anaesthesia caseload, to rotate through a paediatric department in one of the three paediatric hospitals: OLCHC and CUHTS or Tallaght Hospital.

9.13 HEALTH AND SOCIAL CARE PROFESSIONS

There is substantial evidence that health and social care professions (HSCPs) play a significant role within the multidisciplinary team involved in pre-operative assessment of patients prior to surgery. The impact of provision of HSCP services from an early stage can also effect a speedier discharge post-operatively through establishment of, for example, mobility status, equipment needs, dietary/nutritional support and the resolution of social needs that may have been identified.

9.14 HEALTHCARE ASSISTANT/SUPPORT STAFF

The role of healthcare assistants/support staff in the peri-operative setting is well established. The service provided by these staff enables rapid turnover of cases and greater efficiency and effectiveness in service delivery within the theatre environment.

9.15 HOSPITAL ADMINISTRATION/CLERICAL OFFICER/SECRETARIAL STAFF

Dedicated administration staff are key team members, as they ensure:

- Effective and efficient running of pre-admission units
- Effective and efficient running of the theatre complex – the productive operating theatre
- Effective and efficient running of day surgery units
- Ensure that most patients are management by day of surgery admission – DOSA

9.16 MANAGEMENT OF A PAEDIATRIC ANAESTHESIA SERVICE

9.16.1 Meetings

- Weekly meetings to plan service delivery, workload etc.
- Monthly meetings to review quality and efficiency of the paediatric surgery pathway
- Regular, scheduled meetings of the Paediatric Peri-operative Group (PPOGG) allow for ongoing paediatric peri-operative services assessment. This group should refer wider

hospital issues to the peri-operative group, in accordance with the governance structure and reporting relationships. Typical issues to be reviewed by the PPOGG operational group might include: Utilisation of theatre time, waiting list management, bed capacity, case mix, staffing levels and expenditure. Auditing of cancellations, DNA rates, unplanned admissions/re-admissions and quality of service as reviewed by the patient.

9.16.2 Regional/Hospital Group paediatric peri-operative groups

As the Hospital Groups develop into collaborative integrated networks, it is hoped that the paediatric peri-operative groups from individual hospital sites will come together into a single Hospital Group PPOGG, in order to service needs across all hospital sites within the Hospital Group. This would enable delivery of considerable economies of scale and full utilisation of scarce resources, while simultaneously balancing the needs of patients to receive as much of their care locally as is both possible and appropriate.

9.17 NATIONAL LEADERSHIP OF PAEDIATRIC SERVICES

Government policy adopted in June 2014 states that the New Children's Hospital will be the central player in an integrated clinical network for paediatrics services on the island of Ireland. It is to be expected that the New Children's Hospital will take on this leadership position, coordinating input and contributions from the relevant paediatric clinical programmes, and facilitating the implementation of their models of care, including this Model of Care for Paediatric Anaesthesia.

While this document is focused on the narrow area of paediatric anaesthesia, the reality is that any clinical service design and delivery involves considerable overlap, crossover and interdependency within other clinical specialities. Alterations of clinical services in one area generally impacts on service providers elsewhere within the local hospital, or further afield within the Hospital Group and nationally.

Given the specific nature of specialist services in paediatrics, this situation becomes polarised very rapidly. For example, should a local hospital at some distance from Dublin decide to no longer anaesthetise children aged under five years, these

patients would need to find care elsewhere – either within their Hospital Group or further afield.

Another relevant example is the dependency of paediatric surgery on paediatric anaesthesia, paediatric pain services, general paediatric medicine, paediatric transport medicine and paediatric intensive care medicine. Alterations to services within any one of these specialities will have consequences, planned or unintended, on related paediatric specialities. Changes to service delivery need to be managed in a planned and controlled fashion.

A National Paediatric Steering Group could incorporate a National Paediatric Peri-Operative Steering Group. These steering groups could take leadership roles in informing the design and potential impact of new service planning and service reconfiguration. The National Paediatric Steering Group could also take a leadership role in the dissemination of best practice policies, protocols and guidelines. The Group would need to be integrated into the governance of the Acute Hospitals Office, in order to allow for effective leadership in the implementation of PPGs. As an interim measure, the National Paediatric Steering Group could be chaired by the National Lead in Paediatrics, until such time as a more permanent solution is found.

The development of appropriate terms of reference for a National Paediatric Steering Group and a National Paediatric Peri-Operative Steering Group would be a key first step in understanding the potential roles and responsibilities of such bodies. However, it is clear that national leaders from the relevant clinical specialities would welcome such a move; indeed, they are already strongly advocating for the establishment of terms of reference.

In time, it is expected that these clinical governance structures will be superseded by the structures put in place to deliver the roles and responsibilities of the New Children's Hospital.

The policy position adopted by the government in June 2014, in approving the Project Brief for the new children's hospital, is for the New Children's Hospital to act as the central player in an integrated clinical network for paediatrics on the island of Ireland. The Hospital Groups' service delivery model will implement the service design modelled in the

National Model of Care for Paediatrics. This Model of Care for Paediatric Anaesthesia will form part of the National Model of Care for Paediatrics.

The Children's Hospital Group, in collaboration with the other six geographically based Hospital Groups, will plan and design a network for paediatric service delivery.

This network will form the structure through which the National Model of Care for Paediatrics and other national clinical programmes, including Paediatric Anaesthesia, Paediatric Critical Care, Paediatric Surgery and Medicine, will be implemented.

9.18 FUTURE PLANNING OF NATIONAL PAEDIATRIC SERVICES IN IRELAND

The funding model needs to be reviewed. Certain jurisdictions favour a central agency for delivery of paediatric services with an independent budget. Some jurisdictions favour regional funding structures, while others prefer funding to be allocated on a local, unit-by-unit basis. Funding models need to be reviewed and evaluated in order to ensure the best interests of the patients being served.

It is our considered opinion that the paediatric budget, including the peri-operative services budget, should be separate in each Hospital Group.

Considerable work needs to be done in order to clearly identify which units will provide paediatric care, and what types of facilities and appropriate staffing are required. Such work needs to be carried out on a partnership basis, and needs to involve key stakeholders in consultation with service users. This work needs to be evidence based; it needs to use the best and most reliable activity data, and it needs to take into account international best practice in the delivery of paediatric care.

Infants, and particularly neonates, undergoing anaesthesia have a significant increased risk. In 2013, in Ireland in 2013, more than 600 infants were anaesthetised in locations other than the three children's hospitals. All of these children should have been referred to a regional centre where appropriately trained staff, including paediatricians, are readily available.

Details of what services (and in what speciality) will

be provided in each hospital location must be clearly defined; there is also a need to define what age group and ASA classification each hospital will cover. Each specialty needs to define the number of procedures that will need to be carried out on paediatric patients in order to maintain competencies.

The findings should feed into the National Paediatrics Model of Care, outlining delivery of care for children. Such findings should be signed off by the Department of Health, the HSE and all key stakeholders. The Paediatric Anaesthesia Model of Care forms part of a much bigger picture.

10. ABBREVIATIONS

AAGBI	Association of Anaesthetists of Great Britain and Ireland
ANZCA	Australian & New Zealand College of Anaesthetists
AORN	Association of Operating Room Nurses
APAGBI	Association of Paediatric Anaesthetists of Great Britain and Ireland
APLS	Advanced paediatric life support
ASA	American Society of Anaesthesiologists
BARNA	British Anaesthetic and Recovery Nurses Association
CAI	College of Anaesthetists of Ireland
CEO	Chief executive officer
CHICA	Children's Hospital Intensive Care Ambulance
CNM	Clinical nurse manager
CNS	Clinical nurse specialist
CPD	Continuous professional development
CUHTS	Children's University Hospital Temple Street
DNA	Did not attend
DNV	Det Norske Veritas
DoH	Department of Health
DOSA	Day of surgery admission
ECG	Electrocardiograph
ECLS	Extracorporeal life support
ECMO	Extracorporeal membrane oxygenation
ENT	Ear nose throat
ESA	European Society of Anaesthesiology
ESRI	The Economic and Social Research Institute
ETT	Endotracheal tube
GA	General anaesthesia
HDU	High dependency unit
HIPE	Hospital In-Patient Enquiry
HIQA	Health Information and Quality Authority
HSCP	Health and social care professionals
HSE	Health Service Executive
ICU	Intensive care unit
IPAN	Irish Paediatric Anaesthetic Network
IPATS	Irish Paediatric Acute Transport Service
ISBAR	Identify, situation, background, assessment and recommendation
IV	Intravenous
KPI	Key performance indicator
LMA	Laryngeal mask airway

M&M	Morbidity and mortality
MDT	Multidisciplinary team
MRI	Magnetic resonance imaging
NAP	National Audit Project
NCEPOD	National Confidential Enquiry into Patient Outcome and Death
NCH	New Children's Hospital
NCHD	Non-consultant hospital doctor
NCPA	National Clinical Programme in Anaesthesia
NICU	Neonatal intensive care unit
NIV	Non-invasive ventilation
NMBI	Nursing and Midwifery Board of Ireland
NMTP	National Transport Medicine Programme
NNTT	National Neonatal Transport Team
NPSA	National Patient Safety Agency
NRP	Neonatal Resuscitation Programme
NSAIDS	Non-steroidal anti-inflammatory drugs
NTMP	National Transport Medicine Programme
NTPF	National Treatment Purchase Fund
OLCHC	Our Lady's Children's Hospital Crumlin
PACU	Post-anaesthetic care unit
PALS	Paediatric advanced life support
PCC	Paediatric critical care
PCCU	Paediatric critical care unit
PEWS	Paediatric early warning score
PICU	Paediatric intensive care unit
PLS	Paediatric life support
PONV	Post-operative nausea/vomiting
PPGs	Policies, protocols and guidelines
PPOG	Paediatric Peri-operative Group
PTR	Patient Treatment Register
RCoA	Royal College of Anaesthetists
ROI	Republic of Ireland
SAT	Specialist anaesthesia trainee
SOP	Standard operating policy
TORs	Terms of reference
TPOt	The productive operating theatre
WHO	World Health Organization
WTE	Whole-time equivalent

11. NATIONAL CLINICAL PROGRAMME IN ANAESTHESIA (NCPA) MODEL OF CARE FOR PAEDIATRIC ANAESTHESIA STEERING/WORKING GROUP MEMBERSHIP

Model of Care for Paediatric Anaesthesia Steering Group

Dr Bairbre Golden, Clinical Director, National Clinical Programme of Anaesthesia (Chair)
 Dr Billy Casey, Consultant Anaesthetist, Our Lady's Children's Hospital, Crumlin
 Dr Kevin Bailey, Consultant Anaesthetist, AAGBI Representative
 Mr Fergal Quinn, Clinical Lead, Paediatric Surgery Programme
 Ms Helen Byrne, Head of Planning and Performance, Acute Hospitals, HSE
 Dr Jacinta McGinley, Consultant Anaesthetist, Our Lady's Children's Hospital, Crumlin
 Ms Suzanne Dempsey, Group Director of Nursing, Children's University Hospital, Temple Street
 Ms Grainne Bauer, Divisional Nurse Manager, Children's University Hospital, Temple Street
 Dr Cathy McMahon, Consultant Anaesthetist, Paediatric Critical Care, Our Lady's Children's Hospital, Crumlin
 Professor Alf Nicholson, Clinical Lead, Paediatric Clinical Programme
 Dr John Murphy, Clinical Lead, Neonatal Clinical Programme
 Dr Dermot Doherty, Clinical Lead, Paediatric Transport
 Dr Kevin Murray, General Surgeon, Kerry General Hospital
 Dr John Stokes, Ophthalmologist, Waterford General Hospital
 Ms Aileen O'Brien, Anaesthetic Nurse Lead, National Clinical Programme of Anaesthesia
 Ms Una Quill, Programme Manager, National Clinical Programme of Anaesthesia

Model of Care for Paediatric Anaesthesia Working Group

Dr Billy Casey, Consultant Anaesthetist, Our Lady's Children's Hospital, Crumlin (Chair)
 Dr Bairbre Golden, Clinical Director, National Clinical Programme of Anaesthesia
 Dr Anthony Hennessy, Consultant Anaesthetist, South Infirmity Hospital, Cork
 Dr Wouter Joncker, Consultant Anaesthetist, Sligo General Hospital
 Dr Brendan McGarvey, Consultant Anaesthetist, Children's University Hospital, Temple Street
 Dr Dara Diviney, Consultant Anaesthetist, Our Lady of Lourdes Hospital, Drogheda
 Dr Robert Whitty, Consultant Anaesthetist, Tallaght Hospital
 Dr Gerry Coughlan, Consultant Anaesthetist,
 Dr Marcella Lanzinger, Consultant Anaesthetist, South Tipperary General Hospital
 Dr Michael Callaghan, Consultant Anaesthetist, Galway University College Hospital
 Dr Branislav Mislovic, Consultant Anaesthetist, Our Lady's Children's Hospital, Crumlin
 Mr Paul Harding, CNMII, Hospital Design Coordinator, Children's Hospital Group
 Ms Aileen O'Brien, Anaesthetic Nurse Lead, National Clinical Programme of Anaesthesia
 Ms Una Quill, Programme Manager, National Clinical Programme of Anaesthesia
 Dr John Chandler, Consultant Anaesthetist, Cork University Hospital
 Dr Klaus Pollmann-Daamen, Consultant Anaesthetist, Kerry General Hospital
 Dr Liam Claffey, Consultant Anaesthetist, APAGBI
 Dr Jennifer McElwain, Consultant Anaesthetist, Galway University College Hospital

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Appendix A – Sample Quality Improvement Project Record Sheet

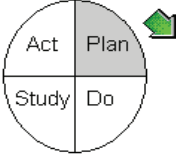
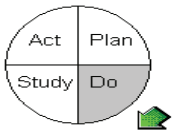
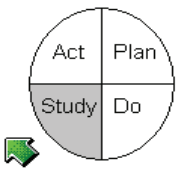

Cycle #1 Meeting # – date	Start date: End date:
Objective of cycle	Collect data to develop a change*** ___ Test a change* ___ Implement a change** Short objective of the cycle:
Plan 	Questions: 1. ? a. Prediction: 2. ? a. Prediction: 3. ? a. Prediction: 4. ? a. Prediction:
	Test/Implementation Plan – Note: Must complete data plan below for a Test or Implementation Cycle What change will be tested or implemented? How will the change be tested or the implementation be conducted (consider small scale early)? Who will run the test or implementation? Where? When will the test or implementation take place?
	Collect Data Plan: Usually required for all PDSA cycles What information is important to collect? Why is it important? Who will collect the data? Who will analyse the data prior to study? Where will the data be collected? When will the collection of data take place? How will the data (measures or observations) be collected?
Do: 	Observations: Record observations that are not part of the plan: Did you need to modify the original plan? If so, how? Begin analysis of the data (graph of the data, picture)
Study 	Questions: (copy and paste Questions and Predictions from the Plan above and add Results. Complete analysis of the data. Insert graphic analysis whenever possible. 1. ? a. Prediction: b. Learning (comparison of questions, predictions, and analysis of data) 2. ? a. Prediction: b. Learning: New issues: Summary:
Act 	Describe next PDSA cycle; New questions to answer/Decisions made/Action to be taken
Ad hoc contributors	Recognise subject matter experts and others who have contributed to the learning

Diagram above - Institute for Healthcare Improvement (IHI) Plan-Do-Study-Act (PDSA) Worksheet ([http://www.ihl.org/IHI/Topics/Improvement/ImprovementMethods/Tools/Plan-Do-Study-Act+\(PDSA\)+Worksheet.htm](http://www.ihl.org/IHI/Topics/Improvement/ImprovementMethods/Tools/Plan-Do-Study-Act+(PDSA)+Worksheet.htm) accessed 29February 2012

References

- Campling, E.A., Devlin, H.B. & Lunn, J.N. (1990) *Report of the National Confidential Enquiry into Perioperative Deaths 1989*. NCEPOD, London.
- Lunn, J.N. (1992) Implications of the National Confidential Enquiry into Perioperative Deaths for Paediatric Anaesthesia. *Paediatric Anaesthesia* 2, 69-72.
- Arul, G.S. & Spicer, R.D. (1998) Where should paediatric surgery be performed? *Archives of Disease in Childhood* 79, 65-72.
- RCoA (2002) *President's letter to colleagues*. Royal College of Anaesthetists, 8 August 2002.
- BAPS (2006) *Joint statement on General Paediatric Surgery provision in District General Hospitals*. Retrieved from www.baps.org.uk/index.html
- ANZCA (2008) *Statement on Anaesthesia Care of Children in Healthcare Facilities without Dedicated Paediatric Facilities*. Australian and New Zealand College of Anaesthetists, Melbourne.
- RCSENG (2013) *Standards for Children's Surgery*. Children's Surgical Forum of the Royal College of Surgeons of England, London.
- Wilkinson, K.A., Brennan, L.J. & Rollin, A.M. (2014) *Guidelines for the provision of paediatric anaesthesia services*. Retrieved from www.rcoa.ac.uk/gpas2014 on
- Getting the right start. National service framework for children: standard for hospital services. *DH*, London 2003) http://webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/en/Consultations/Closedconsultations/DH_4085150
- Delivering a healthy future. An action framework for children and young people's health in Scotland. *Scottish Executive*, 2007 (www.scotland.gov.uk/Resource/Doc/165782/0045104.pdf).
- National service framework for children, young people and maternity services. *Welsh Assembly Government*, 2004 www.wales.nhs.uk/sites3/Documents/441/EnglishNSF_amended_final.pdf
- Surgery for children: delivering a first class service. *R Col Surg Eng*, London 2007 (www.rcseng.ac.uk/publications/docs/CSF.html 2012) Report of the children and Young People's Health Outcomes Forum.
- Scottish Executive (2009) *General Surgery of Childhood*. National Steering Group for Specialist Children's Services. Scottish Executive, Edinburgh.
- NHS Wales (2008) *All Wales Universal Standards for Children and Young People's Specialised Healthcare Services*. National Health Service, Wales.
- DHSSPS (2010) *Improving Services for General Paediatric Surgery – policy and standards of care for general paediatric surgery*. Department of Health, Social Services and Public Safety, Northern Ireland.
- RCoA (2013) *The CPD Matrix*. Royal College of Anaesthetists, London.
- RCSENG (2010) *Ensuring the provision of general paediatric surgery in the District General Hospital: guidance for commissioners and service providers*. Children's Surgical Forum of the Royal College of Surgeons of England, London.
- NCEPOD (2011) *Surgery in children: Are we there yet? A review of organisational and clinical aspects of children's surgery*. NCEPOD, London 2011.

- Welsh Government (2009) *Children and young people's specialised services project (CYPSSP): All Wales anaesthesia and surgery standards for children and young people's specialised healthcare services*. Welsh Government.
- Resuscitation Council (UK) (2013) *Suggested Equipment for the Management of Paediatric Cardiopulmonary Arrest (0-16 years) (excluding resuscitation at birth)*. Resuscitation Council (UK), London.
- PICS (2010) *Standards for the care of critically ill children* (4th edn). Paediatric Intensive Care Society, London.
- AAGBI (2007) *Recommendations for standards of monitoring during anaesthesia and recovery* (4th edn). Association of Anaesthetists of Great Britain and Ireland, London.
- MHRA (2013) Codeine: restricted as an analgesic in children and adolescents after European Safety Review. *Drug Safety Update 11*, (6). Medicines and Healthcare Products Regulatory Agency, London.
- RCoA (2014) *Guidance on the provision of anaesthesia services for acute pain management*. Royal College of Anaesthetists, London.
- Pharmaceutical Press (2013) *British National Formulary for Children 2013-2014*. Pharmaceutical Press, London.
- APAGBI (2012) *Good practice in Postoperative and Procedural Pain* (2nd edn). Association of Paediatric Anaesthetists of Great Britain and Ireland, London.
- BADS (2007) *Issues in paediatric day surgery*. British Association of Day Surgery, London.
- RCPCH (2012) *Standards for Children and Young People in Emergency Care Settings* (3rd edn). Royal College of Paediatrics and Child Health, London.
- Department of Health UK (2009) *Toolkit for High-Quality neonatal services* (Gateway reference 12753). Department of Health, London.
- Department of Health UK (2005) *The acutely or critically sick or injured child in the District General Hospital: A team response*. Department of Health, London.
- RCoA (2010) *Joint statement from the Society of British Neurological Surgeons and the Royal College of Anaesthetists regarding the provision of emergency paediatric neurosurgical services*. Royal College of Anaesthetists, London.
- RCoA (2013) *Continuing Professional Development: Guidance for doctors in anaesthesia, intensive care and pain medicine*. Royal College of Anaesthetists, London.
- RCoA (2013) *Raising the standard: a compendium of audit recipes for continuous quality improvement in anaesthesia* (3rd edn). Royal College of Anaesthetists, London.
- GMC (2013) *Good medical practice*. General Medical Council, London.
- RCPCH (2000) Guidelines for the ethical conduct of medical research involving children. *Archives of Disease in Childhood* 82, 177-182.
- RCoA *Safety in Anaesthesia*. Royal College of Anaesthetists, London.
- RCoA (2012) *Patient Safety Update – January 2012 to March 2012*. Royal College of Anaesthetists: Safe Anaesthesia Liaison Group (SALG). Retrieved from www.rcoa.ac.uk/node/588 on
- AAGBI (1995) *The National Survey of Paediatric Anaesthetic Practice in General Hospitals in the Republic of Ireland*, Association of Anaesthetists of Great Britain and Ireland, London.
- ESRI (2011) *Activity in Acute Public hospitals in Ireland: Annual Report 2010*. Economic and Social Research Institute, Health Research and Information Division, Dublin.
- Jonker, W.R., Hanumanthiah, D., Ryan, T., Cook, T.M., Pandit, J.J., O'Sullivan, E.P. & NAP 5 Steering Panel (2014) *Who operates when, where and on whom? A survey of anaesthetic-surgical activity in Ireland as denominator of NAP5*. *Anaesthesia* 69, 961-8.

<http://www.ntpf.ie/home/nwld.htm>

<http://www.ntpf.ie/home/PDF/ChildAdult%20Waiting%20Times.pdf>

<http://www.ntpf.ie/home/PDF/GI%20Endoscopy%20Hospital%20Trend%20Analysis.pdf>

<http://www.ntpf.ie/home/PDF/Hospital%20Trend%20Analysis%20of%20Waiting%20Times.pdf>

AAGBI (2010) *The Anaesthesia Team 3*. Association of Anaesthetists of Great Britain and Ireland, London.

BARNA (2012) *Standards of Practice*. British Anaesthetic and Recovery Nurses Association, London. An Bord

Altranais (2000) *Scope of Nursing and Midwifery Practice Framework*. An Bord Altranais, Dublin.

HSE (2013) *National Consent Policy*. Retrieved from http://www.hse.ie/eng/about/Who/qualityandpatientsafety/National_Consent_Policy/consenttrainerresource/trainerfiles/NationalConsentPolicyM2014.pdf

HSE (2013) *National Policy and Procedure for Safe Surgery*. Retrieved from <http://www.hse.ie/eng/about/Who/qualityandpatientsafety/safepatientcare/safesurg14june.pdf>

WHO (2009) *WHO Guidelines for Safe Surgery*. World Health Organization, Geneva.

Press Room. Association of Perioperative Registered Nurses Partners with Elsevier to Publish AORN Journal. Retrieved from www.nursingconsult.com/about/pressroom/pr_may_01_06.html

National Patient Safety Agency (28th March 2007). Promoting safer use of injectable medicines. Patient Safety Alert 20.

www.ismp.org/tools/guidelines/smartpumps/printerversion.pdf

What is Quality Improvement and How can it Transform Healthcare **Quality & Safety in Healthcare February 2007 16(1)2-3**

Institute for Healthcare Improvement (IHI) Plan-Do-Study-Act (PDSA) Worksheet ([http://www.ihl.org/IHI/Topics/Improvement/ImprovementMethods/Tools/Plan-Do-Study-Act+\(PDSA\)+Worksheet.htm](http://www.ihl.org/IHI/Topics/Improvement/ImprovementMethods/Tools/Plan-Do-Study-Act+(PDSA)+Worksheet.htm) accessed 29 February 2012



www.hse.ie/anaesthesia