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## Summary of Recommendations for children becoming critically ill in Local and Regional Hospitals

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1. FOREWORD

Paediatric Critical Care services care for infants and children whose conditions are life threatening and need constant, close monitoring and support from equipment and medication to restore and maintain normal body function. Care is provided in specialist areas (Critical Care Units CCU’s) or High Dependency Units (PHDU’s) that have high levels of trained staff, monitoring and equipment in line with national and International standards (ref) This Paediatric Model of Care (PMOC) document sets out the care of critically ill and/or critically injured neonates, infants and children presenting to hospitals in the Republic of Ireland (ROI) including the Regional (Model 4R), Major (Model 3) and local (Model 2) Hospitals. Critically ill children may present in Emergency Departments (ED), Children’s Assessment Units (CAS) or become critically ill whilst an inpatient.

This model of care has a number of key components:

- National agreement on basic level of Critical Care (adult and paediatric) Levels 1-3S (ref)
- Agreement on Regional Hospital level (Model 4R) re Regional High dependency Care
- Agreement on a Paediatric Critical Care Medicine (PCCM) delivery framework document for ROI
- Agree a local model of care for ill children at Local and Regional level with all professional groups involved in the care of children including Anaesthesia, Adult Critical Care (ACCM) Paediatrics, Transport Medicine (IPATS) and Paediatric Critical care Medicine
- Staffing - Clear outline of current and future staffing requirements for doctors, nurses, health and social care professionals in the short, medium and long term with reference to National and International standards
- Paediatric Minimum Data Set (PCCMDS) data is submitted to Paediatric Intensive Care Audit Network (PICANet) from all paediatric critical care providers in Ireland and the UK and this data is presented as Annual Report of PICANet.
- Development of a Model of Care for Paediatric Critical Care (PCCU) has taken time, effort and much discussion between all professionals involved in the care of critically ill children. This includes collaboration between Paediatrics, Paediatric Anaesthesia, Adult anaesthesia and Adult Critical Care (ACCU), Paediatric Critical Care Nursing and allied health professionals (AHP).
1.1. Current situation re Paediatric Critical Care Medicine in Republic Of Ireland

Currently, approximately 1600 children in ROI are admitted each year requiring critical care. (Ref PICANet) There are 2 Paediatric Critical Care Units (PCCU’s) in the 2 Supra-Regional Children’s Hospitals in ROI ref. However, up to 30% of all surgery carried out on children in Ireland takes place in designated Adult Regional (Model 4R), Major (Model 3) and local (Model 2) Hospitals.) A recent audit carried out to estimate the number of children requiring basic or urgent medical critical care management outside of the 2 children’s hospitals clearly outlines the large numbers of children treated at ward and HDU level by paediatricians in the adult hospital setting. We set out to agree and produce a guide to the service and standards required in order to deliver acceptable levels of care throughout Ireland whether the child is in a Supra Regional, Regional or Local Hospital. Up to now there had been no clear national agreed classification of Regional (4R), Major (Model 3) or Local (Model 2) Hospital services with regard to Paediatrics.

We set out to use the agreed current adult Hospital classification and produce an agreed Paediatric Critical Care Hospital Model Delivery Framework document for the first time.

This Model of Care clearly sets out the services which must be available locally for an adult hospital to care for children either surgically or medically and who are or have the potential to become critically ill. It also sets out the minimum standards required for critically ill children in the Supra Regional (Model 4S) Hospital including staffing.

We have also agreed in conjunction with Paediatric Medicine, Adult Critical Care and Anaesthesia the recommendations for safe and effective care for children in Regional (Model 4R), Major (Model 3) and local (Model 2) Hospitals. This includes agreed local policies on training, staffing and treatment criteria in children requiring HDU care treated locally.

Our thanks to all our colleagues who contributed to this project.
2. EXECUTIVE SUMMARY

2.1. Introduction

The aim of the Model of Care for Paediatric Critical Care Medicine is to set out what is required to establish safe, effective care for all critically ill children requiring Paediatric Critical Care Medicine (PCCM) in ROI. It complements the National Model of Care in Paediatric Anaesthesia (PAMOC), Paediatrics, Adult Critical Model of Care (ACCMOC) and Adult Anaesthesia Model of Care.

We have set out guidance on categorisation of Hospitals with respect to Paediatrics based on current provision of services in these Hospitals. (REF) The aim of this document is to provide a safe service to any child presenting to any hospital in ROI who is or may become critically ill.

This Model of Care provides a clear delivery framework for the care of critically ill children presenting to all hospital settings.

Care of the critically ill child can start at numerous points- e.g. Emergency Departments (ED), at ward level both within the Surpra-Regional (Model 4S) hospitals and at Regional (4R) Major (Model 3) or Local (Model 2) level. Any hospital receiving or admitting children should adhere to the minimum standards outlined in the National standards documents (ref).

The National Model of Care for Paediatrics proposes a hub and spoke Model of Care, with the new National Children’s Hospital linked into 3-4 Regional Centres which are in turn linked to Local hospital groups.

2.2. National Clinical Programme for Critical Care

The National Clinical Programme for Critical Care (NCPCC) is part of a National clinical programmes initiative which includes the Paediatric Critical Care, Adult and Paediatric Anaesthesia and Adult Critical Care Models of Care ((ref).
2.3. Governance of Model of Care of Paediatric Critical Care

As part of the Critical Care model Paediatric Critical Care and Neonatal Critical Care stand alongside Adult Critical Care under the umbrella of the National Critical Care Programme. This structure has been endorsed by the Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) and the Intensive Care society of Ireland (ICSI) The Models of Care for these respective programmes set out the configuration of service delivery and organisational models for the respective services.

2.4. Capacity Planning

Part of the remit of the Model of Care for PCCM is capacity planning for the short and medium term including the NCH but also major surge planning in the event of an epidemic or catastrophic event including mass casualty event. Major surge capacity planning is outlined by the National Emergency Management Planning Group.

2.5. Summary

The Paediatric component of the National Clinical Programme for Critical Care describes the Paediatric Critical Care Hospital Model Delivery Framework which follows the National Standards for Paediatric Critical Care Services 2013 Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) and agreed standards for critically ill children in all settings in ROI. We have worked at local level with Paediatricians, Adult Anaesthetists and Adult Critical Care physicians who receive critically ill children in Regional and Local level and agreed a strategy whereby children are stabilized locally and referred on either by IPATS or local transfer or treated locally in centres that achieve National standards in HDU. (Ref)
3. STRUCTURES & GOVERNANCE OF PAEDIATRIC CRITICAL CARE SERVICES
Local/Regional/Hospital Groups and National

Table 1: A Model for Governance as a Network for Paediatric Critical Care Services in Hospital Groups

- Hospital Group Boards
- Hospital Group Management Teams
- Children’s Hospital Group Clinical Directorate Structure
- Paediatric Network Managers (one based in each Hospital Group)
- Clinical Lead, Paediatric Intensivist
- Quality & Safety Board Committee
- Quality & Safety Executive Committee

Table 2: Proposed Model for Governance of Children’s Hospital Group

- Children’s Hospital Group Board
- Children’s Hospital Group Management Team
- Children’s Hospital Group Clinical Directorate
- Children’s Hospital Group Clinical Lead
- Quality & Safety Board Committee
- Quality & Safety Executive Committee
4. **PAEDIATRIC CRITICAL CARE**

4.1. **Definition**

The paediatric critical care unit (PCCU) is a specialised facility within a children’s hospital charged with the care of infants and children, which is staffed by a specialist team of intensivists, critical care nursing and allied health staff with specialty training in PCCM. PCCU is designated to provide an increased level of detailed clinical observation, invasive monitoring, focused interventions and technical support to facilitate the care of critically ill paediatric patients over an indefinite period of time.

A PCCU will care for patients that are typically aged between birth until their sixteenth birthday, diagnosed with life-threatening potentially recoverable conditions, post-operative patients who may benefit from close nursing or technical support and children with 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 integral to the care of critically ill child, and are facilitated within the PCCU.

The PCCU Team is comprised of paediatric intensivists, nursing, pharmacists, and allied professions; (such as clinical engineering, physiotherapists, dieticians, speech and language, occupational therapy, 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 agreed guidelines and standards particular to their professional regulatory bodies.

4.2. **Paediatric Critical care in Republic of Ireland- current situation**

Currently in Ireland there are two Paediatric Critical Care Units - Our Lady’s Children’s Hospital Crumlin, OLCHC and the Children's University Hospital, Temple Street, TSCUH. The total number of beds presently is 32 between the two sites (with 34 PCCU beds at full capacity when staffed) with over 1600 admissions per year. Both units are capable of delivering Level 3 and Level 3S care.
The PCCU can be accessed via the National Paediatric Critical Care Network number 1890-213-213 and www.picu.ie. (Ref) Any neonate, infant or child who is critically unwell or has the potential to become critically ill can access PCCU via this number. This will in turn lead to location of an appropriate PCCU bed and advice in resuscitation, stabilisation and transfer of the critically ill child to that appropriate facility. This number and advice is available 24 hours a day, 7 days a week. Transfer of critically ill neonates up to 6 weeks of age is also available in ROI.

This is a 24/7 service carried out by the National Neonatal Transport Service (NNTP) and greater than 50% of neonatal transports are to PCCU.

There are also a cohort of children who are cared for in Regional Hospitals classified as Level 1 Regional High Dependency - Level 1 RHDU (PRHDU’s) (see separate chapter (ref) or in Adult Critical Care Units. We do not currently have concise data on numbers of critically ill children cared for in either Adult Critical Care or Level 1 RHDU outside of Dublin. With the investment and rolling out of Intensive Care National Audit and Research Centre (ICNARC) in Adult Critical Care Medicine (ACCM) we intend to capture all data of children in ACCM.

Validated data from both PCCU’s has been collected and submitted annually since 2009 to Paediatric Intensive Care Audit Network of UK and Ireland (PICANet). This has allowed both PCCU’s to benchmark treatment and outcome data against International PCCU’s in the UK and NI. (See Chapter PICANet)

Following consultation with the National Paediatric Transport service (IPATS), Paediatrics and Paediatric and Adult Anaesthesia programs recommendations are made in this model of care for the procurement of a bed in Supra-Regional (Model 4S) PCCU and agreement with local minimum standards for stabilization and transport of the critically ill child.

4.3. Paediatric Critical Care Capacity Planning

Care of children in ROI is currently in a state of change. In the short term critically ill children are managed in 2 Supra-Regional Units in Dublin. With the opening of the NCH there will be one large CCU incorporating General and Cardiac CCU and a separate Neonatal ICU. This MOC pertains to the current patient population which includes premature neonates, infants and children < 16 years of age.
The opening of a separate Neonatal CCU in the NCH with separate staffing – both Medical and Nursing may alter the patient population in the general CCU. This has implications for staffing in all sections PCCU.

Planning for the future includes planning for the short medium and long term in terms of work-force and bed capacity planning for Paediatric Critical Care. This needs to take into account the time period (1.) up to the opening of the National Children’s Hospital and 2. Beyond and the short to medium term before this happens. (See staffing). It also important that planning is made for future expansion with population expansion taken into account.

Current data from PICANet shows us that up to 1600 children are cared for annually between both Children’s Hospitals Critical Care Units in ROI. (PICANet 2016).

International data suggests that this number will increase with medical technology and advancement in Critical Care. We must build into our planning the capacity to increase PCCM beds up to 50% which is planned for with the opening of National Children’s Hospital beds.

Some children may spend a short period of time in Adult Critical Care whilst waiting for transport to Supra Regional CCU or because their condition is expected to improve quickly. The decision to remain or transfer is the responsibility of the local Consultant caring for the patient with liaison to the PCCU team centrally.

There are also a group of children who are ill but who can be looked after locally by Paediatrics with agreed policies for escalation of treatment if required - see Chapter on local RHDU's out of Dublin. These teams should be working together within a Paediatric Critical Care delivery framework including Paediatric Transport (IPPATS). This network needs to provide the level of service appropriate to the local needs and in line with the quality standards for critically ill children.

However children needing advanced critical care i.e. > level 1 (except in specific designated Level 1 RHDU should be referred to PCCU via the 24/7 referral service and transferred out as soon as a bed is made available. Treatment of children in Adult Critical Care Units is not acceptable in the long term and if required should be done in consultation with the central Paediatric Critical Care Units. All Units treating critically ill children should fulfils the quality standards for PCCM. (Ref). Exceptions can be made in acute short term single organ failure where the decision to remain in Adult Critical Care is taken in conjunction with Adult Intensivists, Paediatrics and in consultation with Paediatric Critical care network.
4.4. Levels of Critical Care

National Levels of Critical Care have been accepted and agreed -from National Standards for National Intensive Care Services 2011, Joint Faculty of Intensive Medicine of Ireland (P4). The JFICMI was established in 2009 and developed the National Standards for Adult Critical Care. National Standards for Paediatric Critical Care were developed by the Paediatric Critical Care Group (PCCG) and endorsed by the JFICMI and ICSI.

The term Critical Care Unit refers to an HDU or an ICU. The National Standards for Paediatric Critical Care Services 2013 Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) define minimum requirements for an ICU in terms of resourcing, staffing, delivery and governance requirements. The National Standards also define minimal facility requirements for critical care delivery.

Summary of minimal requirements for Paediatric Critical Care delivery

Level 0-1 outside Superregional Hospitals- Level 1 RHDU

Level 1- 3S in Supra Regional Hospitals – National Children’s Hospitals

- 1:1 nurse/patient ratio for Level 3 critically ill patients
- National standards for Paediatric Critical Care Services state that it is desirable that Consultant sessions be provided by a specialist who is a Fellow of JFICMI or is trained to a level that allows accreditation.
- Direct access of continuous renal replacement therapy(CVVH)
- Clinical Microbiology, Radiology, with direct sessional support
- National Critical Care Audit
- Direct sessional support from Dietician, Pharmacist and Physiotherapist
- Radiology, Laboratory, arterial blood gases and blood bank on call 24/7
- As per Adult Critical Care Services Level 2 Critical Care or greater is only provide at Model 3, Model 4 and 4S (ref) and not at Model 2 Hospitals (Dept of Health 2013)
- Daily PICM Consultant sessions committed to PCCU alone
4.5. Alignment

This document aligns with the published models of care of other National Clinical Programmes specifically National Clinical Programmes for Paediatrics, Adult and Paediatric Anaesthesia and Adult Critical Care. (REF) PCCM includes children requiring continuous nursing supervision because of advanced respiratory support or two or more organ systems requiring support or one acute organ failure receiving support, plus one chronic failure.

4.6. Agreed model of Levels of Paediatric Critical Care (Joint Faculty of Intensive Care Medicine)

Level 1- High Dependency Care requiring nurse to patient ratio 0.5:1
A discrete area or unit where Level 1 PCC care is delivered. Close monitoring and observation is required, but not acute mechanical ventilation.
Patients who require basic respiratory/circulatory/neurological or renal support whose needs cannot be met on the acute ward and require the input of the critical care team or in the case of Regional Hospital HDU the agreed Paediatric cover as per standards.

Level 1 RHDU Care
In addition to providing enhanced observation and basic system supports, Level 1 Regional HDUs, due to the availability of subspecialty expertise, may continue to care for those requiring more complex care such as a continuation of long-term ventilation via tracheostomy or non-invasively. A consensus to care for such patients locally should be reached on a case by case basis following early communication with the lead centre.

Level 2- Critical Care requiring nurse to patient ratio of 1:1
The child requiring continuous nursing supervision who is receiving advanced respiratory support (complex NIV or invasive ventilation 🍅). (Ref) 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. A child meeting level 2 criteria should be treated within a PCCM lead-centre, except in a case where it is agreed between the Regional and lead-centre consultants that the child can be cared for safely locally.
Level 3- Critical Care requiring 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 with advances in technology.
Model of Care for Paediatric Critical Care

Hub paediatric critical care services (JFICMI Levels 1, 2, 3, 3S) based at OLCHC and CUHTS prior to completion of the NCH.

Regional hospitals. Level 0 and 1 care. On-site adult critical care service facilitates stabilisation, referral and transport for children needing ≥ Level 2 care.

Major hospitals. Level 0 and 1 care. On-site adult critical care service facilitates stabilisation, referral and transport for those needing ≥ Level 2 care.


Referral to PICU via single call no: 1890 213 213
Retrieval and/or repatriation by Irish Paediatric Acute Transport Service (IPATS)

Referral to PICU via single call no: 1890 213 213
Transfer and/or repatriation by local team and National Ambulance Service (NAS)
The Model of Care for Paediatric Critical Care sets out clear pathways for the care of the critically ill child. This presentation can start at numerous points in a hospital setting in the Republic of Ireland (ROI). This document includes the categorisation of hospitals in the ROI receiving and admitting children at Major, Regional and SupraRegional level. It includes the pathway for a child receiving planned treatment who unexpectedly needs Paediatric Critical Care in the adult hospital setting. The table sets out the minimum level of paediatric services which should be available for a hospital to achieve each of the respective hospital model designations.

4.7. Management of Critical Care in children in Health care facilities without dedicated Paediatric facilities- Local (Model 2) Major (Model 3) and Regional($R) hospitals

There are clear recommendations in the Paediatric Anaesthesia Model of Care document for hospitals who manage children for anaesthesia and surgery. It is recommended that a policy should be developed and documented jointly by representatives of anaesthesia, surgical and nursing staff and that this document should be reviewed at intervals of five years or less. In the event of a child becoming critically ill, 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. A 24/7 bridge phone 1890 213 213 exists for central referral to Model 4S hospital. www.PICU.ie

As per Model of Care for Paediatric Anaesthesia the following factors should be taken into account when developing a policy:

**Age**- Assessment of any borderline cases for suitability for surgery should occur pre-operatively through a multidisciplinary pre-operative assessment including surgeons, anaesthetists and paediatricians.

**Staff training and experience**

In Model 3 hospitals accepting children for surgery 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 2008)
Children requiring transfer to PCCU - Main recommendations

In Model 3 and 4R hospitals infants and children may require admission to critical care facilities as a planned part of their care, for example; after surgery, or because of trauma, an acute illness or because of extreme prematurity. Paediatric and neonatal intensive care is provided in designated units staffed by doctors and nurses with specialised training.

**Recommendation** – Babies, infants and children who are likely to need critical care after surgery should undergo their surgery in a hospital/unit with a designated PCCU or NICU. RCOA 2014

**Recommendation** – In all Models 3 and 4R hospital receiving or admitting infant and children hospital protocols for the management of critically ill children should be agreed and drawn up. Clinical management of these children in both specialist and non-specialist units will require close co-operation and multidisciplinary teamwork between nurses, paediatricians, surgeons, anaesthetists, intensivists and other relevant clinicians.

**Recommendation** - Local guidelines should be clear on the roles and responsibilities of the multidisciplinary team, including anaesthetic services as it is important that further stabilisation and management are not left in the sole remit of the anaesthetist. (DOH 2005). In the event of a child becomes ill unexpectedly there may also be occasions only a very short period of intensive care is required and that this does not necessitate transfer to PCCU. This will be based on the clinical judgement of the team caring for the child possibly in conjunction with input from the PCCU. This is acceptable provided there is a suitable facility within the hospital eg Adult Critical Care, there are staff with appropriate competencies and the episode will only last a few hours. If as may happen on subsequent review the child is not improved or has deteriorated, the initial decision should be re-evaluated and a plan to transfer should be activated as discussed above. PCCM MOC

**Recommendation** - There should be a nominated lead consultant and nurse within general critical care units who are responsible for the policies and procedures for babies, infants and children when admitted. (PICS 2015) (PAMOC 2014)
**Recommendation**- There should be in each hospital providing paediatric services, a nominated clinician responsible for the organisation of paediatric transport. Transfer of critically ill children to specialist centres is generally undertaken by paediatric emergency transfer teams. However, in some circumstances it may be necessary for the referring hospital to provide emergency transfer of a sick child, who is intubated and ventilated. In these circumstances it may be that the most appropriate anaesthetist to accompany the child is a consultant. (RCOA 2010).

**Recommendation**- In Model 3 and 4R hospitals there needs to be in place a rota for senior cover in the setting where the a senior anaesthetist needs to accompany the critically ill child to 4S hospital (Anaesthesia MOC 2017). At present in most Model 3 and 4R hospitals the out of hours emergency on call Anaesthesia cover is made up of one consultant plus one or two NCHDs. In these circumstances the choice of who should accompany a sick child for transfer to a PCCU is particularly difficult. The NCHDs may not be sufficiently experienced or competent in the transfer of a sick child. The consultant is also responsible for all other emergencies in the hospital which may include an obstetric unit. The Model of Care for Anaesthesia recommends the basic building block of on call Anaesthesia service in Model 3 and 4R hospitals is 2 consultants and 2 NCHDs out of hours. This flexible unit should allow for the most appropriate member of the team to accompany the sick child without a major detrimental impact on the emergency anaesthesia care available to other patients in the referring hospital.
## Model of Care for Paediatric Critical Care

### Figure 2: Alignment of Paediatrics with reference to PCCM to Local and Regional Hospitals

<table>
<thead>
<tr>
<th>Hospital Model</th>
<th>‘Hanly’ Report</th>
<th>ED</th>
<th>Paed Inpatient Ward</th>
<th>Paed Inpatient Obs Unit</th>
<th>Adult Anaes ICM</th>
<th>Paed Anaes. Level 2 (HDU)</th>
<th>Paed Medicine</th>
<th>Paed Surgery</th>
<th>Paed CCU</th>
<th>Paed Retrieval</th>
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<td>‘Local’ Hospital</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Level 1</td>
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<td>X</td>
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<tr>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Level 1 RHDU ***</td>
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</tr>
<tr>
<td>Model 4S (Supra-Regional)</td>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Joint Faculty of Intensive Care Medicine Levels of Critical Care: National Standards for Paediatric Critical Care Services*
Level 0 hospital ward clinical management Level 1 higher level of observation Level 1 RHDU active management up to and including continuation of non-invasive ventilation where established

Level 2 active management by critical care team to treat and support critically ill patients with primarily single organ failure (e.g. those requiring acute non-invasive ventilation or greater)

Level 3 active management by the critical care team to treat and support those with two or more organ failures

Level 3S Level three with national service.

**[www.PICU.ie](http://www.PICU.ie)  Bridge phone: 1890 213 213;**
The local Anaesthesia/ICM Consultant makes the clinical decision to transfer as needed, as appropriate.

***See chapter on Level 1 RHDU (Section 4.6);***

Table Legend: ED = Emergency Department, Anaes. = Anaesthesia; Paed = Paediatric; CCS = Critical Care Service; HDU = High Dependency Unit

4.8. Regional delivery of Paediatric High Dependency and Intensive Care

Management of Critical Care in children in Health care facilities without Paediatric Critical Care facilities- Major (Model 3) and Regional (4R) hospitals

As per MOC for Paediatric Anaesthesia, Adult Critical Care and MOC Paediatrics significant numbers of children in ROI requiring medical or surgical interventions will do so in non-specialist hospitals. However all children attending or being admitted to non-specialist centres have the risk of becoming critically ill and e

There are clear recommendations in the Paediatric Anaesthesia Model of Care document for hospitals who manage children for anaesthesia and surgery. It is recommended that a policy should be developed and documented jointly by representatives of anaesthesia, surgical and nursing staff and that this document should be reviewed at intervals of five years or less. In the event of a child becoming critically ill, 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. A 24/7 bridge phone 1890 213 213 exists for central referral to Model 4S hospital. [www.PICU.ie](http://www.PICU.ie)

As per PAMOC the following factors should be taken into account when developing a policy Age- Assessment of any borderline cases for suitability for surgery should occur pre-operatively through a multidisciplinary pre-operative assessment including surgeons, anaesthetists and paediatricians.

Staff training and experience
In Model 3 hospitals accepting children for surgery 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 2008)

**Children requiring transfer to PCCU-Main recommendations**

In Model 3 and 4R hospitals infants and children may require admission to critical care facilities as a planned part of their care, for example; after surgery, or because of trauma, an acute illness or because of extreme prematurity. Paediatric and neonatal intensive care is provided in designated units staffed by doctors and nurses with specialised training.

**Recommendation** – Babies, infants and children who are likely to need critical care after surgery should undergo their surgery in a hospital/unit with a designated PCCU or NICU. RCOA 2014

**Recommendation**- In the event of a critically ill child presenting to Model 3 or 4R hospitals either to ED or as an inpatient, the generalist Consultant Anaesthetist may be requested to assist in the resuscitation and implementation of critical care. The decision by the Anaesthetist to admit to Adult Critical Care (see recommendation below) for a short time or alternatively to transfer out as an emergency is made in good faith and on good grounds. These decisions are based on general competency skills of the Consultant Anaesthetist in the front line as such should be respected as the right decision. The competence and skill of the Adult Generalist Anaesthetist in Model 3 and 4R is recognised and supported by the Paediatric and Adult Anaesthesia and Critical Care Models of Care.

**Recommendation** – In all Model 3 and 4R hospitals receiving or admitting infants and children hospital protocols for the management of critically ill children should be agreed and drawn up. Clinical management of these children in both specialist and non-specialist units will require close co-operation and multidisciplinary teamwork between nurses, paediatricians, surgeons, anaesthetists, intensivists and other relevant clinicians.

**Recommendation**- Local guidelines should be clear on the roles and responsibilities of the multidisciplinary team, including anaesthetic services as it is important that further stabilisation and management are not left in the sole remit of the anaesthetist. (DOH 2005). In the event of a child becomes ill unexpectedly there may also be occasions only a very short period of intensive care is required and that this does not necessitate transfer to PCCU. This will be based on the clinical judgement of the team caring for the child, in particular the Consultant Intensivist/Anaesthetist in charge of ACCU, possibly in conjunction with input from the PCCU. This is acceptable provided there is a suitable facility within the hospital eg Adult Critical Care, there are staff with appropriate competencies and the episode will only last a few hours. If as may happen on subsequent review the child is not improved or has deteriorated, the initial decision should be re-evaluated and a plan to transfer should be activated as discussed above. PCCM MOC

**Recommendation**- There should be a nominated lead consultant and nurse within general critical care units who are responsible for the policies and procedures for babies, infants and children when admitted. (PICS 2015) (PAMOC 2014)
**Recommendation**- There should be in each hospital providing paediatric services, a nominated clinician responsible for the organisation of paediatric transport. Transfer of critically ill children to specialist centres is generally undertaken by paediatric emergency transfer teams. However, in some circumstances it may be necessary for the referring hospital to provide emergency transfer of a sick child, who is intubated and ventilated. In these circumstances it may be that the most appropriate anaesthetist to accompany the child is a consultant. (RCOA 2010).

**Recommendation**- In Model 3 and 4R hospitals there needs to be in place a rota for senior cover in the setting where the a senior anaesthetist needs to accompany the critically ill child to 4S hospital (Anaesthesia MOC 2017). At present in most Model 3 and 4R hospitals the out of hours emergency on call Anaesthesia cover is made up of one consultant plus one or two NCHDs. In these circumstances the choice of who should accompany a sick child for transfer to a PCCU is particularly difficult. The NCHDs may not be sufficiently experienced or competent in the transfer of a sick child. The consultant is also responsible for all other emergencies in the hospital which may include an obstetric unit. The Model of Care for Anaesthesia recommends the basic building block of on call Anaesthesia service in Model 3 and 4R hospitals is 2 consultants and 2 NCHDs out of hours. This flexible unit should allow for the most appropriate member of the team to accompany the sick child without a major detrimental impact on the emergency anaesthesia care available to other patients in the referring hospital.

Each centre whether ED, ward or theatre must have a nominated consultant who is responsible for policies and procedures related to emergency care. (Ref) R College of Anaesthesia 2014 and Paediatric Anaesthesia Model of Care (PAMOC).

If children undergo surgery and anaesthesia in a facility that does not have paediatric inpatient facilities they should have access at all times to a named paediatric consultant with acute care responsibilities. (PAMOC -2014 and RCSI UK 2013)

Whilst it is recognised that critical care facilities for children are not available in all hospitals that treat receive and admit children facilities for initiating critical care prior to transfer/retrieval to a designated PCCU should be available. This may involve short term use of Adult Critical Care Intensivists, Anaesthetists and local Paediatrician expertise. Paediatric resuscitation equipment must be available and maintained wherever children are treated and staff locally must maintain their skills in a team approach for resuscitation and stabilization of the critically ill child. PICS 2016 and PAMOC

An attempt is currently being made to standardize equipment used in resus and stabilization of critically ill children e.g. recommended ventilators and ET tube sizes as per age etc. It is also recommended and currently being agreed that all paediatric infusions be run at standardized
concentrations, facilitated by use of smart pumps and dosages agreed in advance with the Supra-
Regional centres and paediatric pharmacy. (Ref Pharmacy Chapter)

4.9. Regional Delivery of Paediatric High Dependency Care
Paediatric High Dependency Unit (PHDU) /Level 1 RHDU in Model 4R (Regional) Hospitals

4.9.1. Background

Considerable progress has been made in delivering intensive care for children in Ireland including the provision of state of the art Paediatric Critical Care Units (PCCU) in Dublin. The previous provision of critical care to a child in an adult CCU in a model 4R (Regional) hospital is no longer considered best practice. As soon as a child is stabilised there are clear pathways established for the transfer of the child to a PCCU. However ongoing care of the critically ill child outside of the PCCU has not progressed to the same degree, with considerable inequity across Ireland in how a child who requires High Dependency Care (HDC) is managed. High Dependency Care (H) is described as a requirement for close observation, monitoring or intervention that cannot be delivered in a normal ward environment, but at the same time does not require admission to a critical care unit.

Currently in ROI, an unknown volume of High Dependency Care is being delivered across a wide variety of settings and locations, often with poor information about activity levels and patient outcomes. The same child may be cared for locally within a model 4R (Regional) Hospital in one part of the country but require transfer to a PICU in another. This may in turn require the child to be transferred out, adding complexity, risk and cost which is potentially avoidable, and may not be in the best interest of the child.

A key priority is to establish robust collection and reporting of HDC activity data and through the service specification achieve standardisation of HDU provision nationally. The introduction of Adult ICU data collection (ICNARC) will include a section on the child in adult CCU and this data will then be transferred to PICANet.

A similar system of data collection on children in RHDU would be of value and will be included in the list of recommendations for RHDU.
A specific group of children, namely children on Long Term Ventilation (LTV) create challenges in the current system. The number of patients requiring LTV are increasing. For Example infants with severe chronic lung disease associated with prematurity, children with neuromuscular disorders, e.g. Spinal Muscular Atrophy or Duchenne Muscular Dystrophy, spinal cord injury, severe airway abnormalities, and children with disorders of respiratory drive. Currently some of these children can remain in a PCCU bed or Transitional Care (TCU) in the Supra-Regional Hospital for months, or even years, waiting on the establishment of a home care team, housing adaptations and other requirements. During much of this time they will be ‘stable’ and could have their care delivered outside of PCCU/TCU (closer to home) if only model 4R (Regional) hospitals had the necessary resources and staff training to care for a child with a tracheostomy on a ventilator. This is rarely possible within the current system.

Furthermore, once home if a child on LTV becomes unwell, for example develops a chest infection, and requires hospital admission for antibiotics and physiotherapy they will frequently require readmission to the national PCCU in Dublin as there are seldom staff with the right training and competencies to care for them at a hospital closer to home.

The combination of reducing demand on PCCU/TCU beds by caring for children requiring acute non-invasive ventilation (including CPAP) and children requiring LTV within a High dependency Unit environment closer to their home would have a profound impact on PCCU/TCU bed capacity at a national level and at the same time keep the child and family closer to home.

Currently there is no ring-fenced additional funding for RHDU activity delivered outside PCCU/TCU, providing a disincentive for Hospitals and clinicians (doctors and nurses) to undertake HDU activity.

It is also important to highlight that within a ward environment with limited staff resources, such as a general paediatric ward, diversion of staff resources to deliver HDU level of care can result in a diversion of care away from other patients and may lead to a closure of ward beds, thereby affecting ward capacity.

Without investment in staff and equipment in model 4R (Regional) Hospitals, and significant up-skilling of staff to enable them to feel confident to look after these patient groups this is currently difficult to achieve. With the provision of staff and resources in line with National and International standards for provision of HDU and the concentration of these sites to a limited number in a designated 4R Hospitals we could achieve this.
4.9.2. Terminology

Recent guidelines from the Joint Faculty of Intensive Care Medicine of Ireland (JFICMI 2013) have agreed on the following model to describe levels of Paediatric Critical Care (PCC):

**Level 1 - High Dependency Care requiring nurse to patient ratio 0.5:1**
A discrete area or unit where Level 1 PCC care is delivered. Close monitoring and observation is required, but not acute mechanical ventilation. Patients who require basic respiratory/circulatory/neurological or renal support whose needs cannot be met on the acute ward and require the input of the critical care team.

**Level 1 Regional HDU *****
In addition to providing enhanced observation and basic system supports, Level 1 Regional HDUs, due to the availability of subspecialty expertise, may continue to care for those requiring more complex care such as a continuation of long-term ventilation via tracheostomy or non-invasively. A consensus to care for such patients locally should be reached on a case by case basis following early communication with the lead centre. Examples of Level 1 RHDU would include the child requiring acute non-invasive ventilator support for respiratory failure, the child with diabetic ketoacidosis requiring frequent monitoring of acid base and blood glucose, the child who is ventilated at home via a tracheostomy who requires admission for intravenous antibiotics for an infection, or the child who has undergone complex elective surgery and requires advanced monitoring and pain relief post-operatively. It is anticipated that Level 1 RHDU will not be delivered in every hospital that admits children but will be concentrated in a smaller number of centres.

Whilst the goal should be to deliver Level 1 care outside of PCCU’s it is recognised that there will be situations when it is deemed clinically appropriate for a child requiring Level 1 care to be looked after within a PCCU, rather than in a Level 1 RHDU.

As a minimum, every Level 1 RHDU situated within a model 4R (Regional) hospital should be able to deliver acute (and chronic) non-invasive ventilation (both CPAP and bi-level support) and to care for a child with a tracheostomy on LTV.
4.9.3. **Conditions appropriate for treatment in a level 1 RHDU in a model 4R (Regional) Hospital**

Broadly any child requiring close observation, monitoring or intervention that cannot be delivered in a normal ward environment, but at the same time does not require admission to an intensive care unit, should be admitted to the level 1 RHDU his could include, but is not limited to:

- Upper airway obstruction requiring nebulised adrenaline on two occasions within a six hour period
- Apnoea - recurrent
- Respiratory distress requiring nasal high flow oxygen therapy
- Respiratory distress requiring non-invasive ventilation such as CPAP, if available locally
- Severe asthma requiring continuous nebulisers and/or IV bronchodilators
- Diabetic ketoacidosis requiring continuous insulin infusion
- Supraventricular tachycardia responding to medical treatment, such as IV adenosine
- Reduced conscious level (GCS 8-12) requiring hourly (or more frequent) GCS monitoring
- A child with upper airway obstruction requiring a nasopharyngeal airway
- A child established on long-term ventilation via a tracheostomy presenting with an acute illness but is not requiring significant escalation in their respiratory support
- Poor perfusion requiring >40 mls/kg volume boluses
- Significant derangement of fluid or electrolytes (e.g. severe hypernatremia) requiring frequent monitoring and adjustment of fluid therapy
- Status epilepticus requiring treatment with two or more anticonvulsants to stop the seizure
- Post-operative care of a child deemed to require close observation and more intensive nursing care and/or pain management
- Post-operative observation of a child after elective tonsillectomy / adeno-tonsillectomy stratified as severe obstructive sleep apnoea on pre-operative oximetry and/or sleep study

4.9.4. **Indications for transfer to a Level 3S PCCU**
Broadly, any child requiring treatment beyond what can be provided safely in the level 1 RHDU should be transferred urgently to a PICU. This could include, but is not limited to:

- A child requiring intubation and ventilation
- Reduced conscious level (GCS ≤ 8)
- A child established on long-term ventilation via tracheostomy requiring an escalation in ventilator support
- Circulatory failure not improving despite ≥60mls/kg volume boluses resuscitation
- Circulatory failure requiring vasoactive infusion
- Temporary external pacing
- Cardiac arrhythmia with cardiovascular instability, unresponsive to medical intervention, such SVT unresponsive to repeated dosed of IV adenosine
- Cardiopulmonary resuscitation in last 24 hrs
- Failure of two or more systems requiring support
- Acute renal failure requiring dialysis or hemofiltration
- Requirement for invasive arterial monitoring
- Requirement for central venous pressure (CVP) monitoring
- Requirement for intracranial pressure monitoring / External ventricular drain
- Requirement for exchange transfusion
- Requirement for intravenous thrombolysis
- Fulminant liver failure
- Requirement for plasma filtration

4.10. Staffing

4.10.1. Consultants

All children in the level 1 RHDU will be under the care of a named consultant paediatrician.

A unit running a level 1 RHDU must have 24 x 7 access to a consultant paediatrician on-call who can attend the unit within 20 minutes.

Whilst the day-to-day management of children within level 1 RHDU will be led by Paediatricians, a vital role will continue to be played by Anaesthetists and General/Adult Intensivists in multi-disciplinary teams if
deterioration occurs. Their experience and knowledge is critical to the overall management of the critically ill child including assessment, resuscitation, stabilisation and safe transfer. They will continue to provide expert acute airway management including intubation and invasive ventilation as part of acute stabilisation should a child require transfer to PCCU Together with the PCCU receiving team and the transport team they can provide advice and support to paediatricians in optimising care of the critically ill child within the model 4R (Regional) hospital level 1 RHDU

Recognising their previous experience, existing consultants working within a centre with a Level 1 RHDU are not expected to undertake additional training but should aim to use CPD opportunities to maintain and enhance their knowledge and skills relevant to PCC, such as completing a recognised paediatric resuscitation course, for example PLS or APLS (ALSG, 2016) or have completed an in-house education and training programme covering similar learning outcomes.

4.10.2. Nursing staff

Level 1 unit: there should be a minimum of one nurse on every shift, who is directly involved with caring for the critically ill child, who has successfully completed a validated/accredited education and training programme of study addressing all the required PCC skills to Level 1.

All staff should have up to date paediatric Basic Life Support (BLS) training. There should be a minimum of one nurse on every shift who is directly involved with caring for the critically ill child, who must have completed a recognised paediatric resuscitation course, for example PLS or APLS (ALSG, 2016) or have completed an in-house education and training programme covering similar learning outcomes.

As per current PCCM National Standards 2013 (ref) the recommended nurse: patient ratio for level 1 PCCUs should be 0.5: 1. In Level 1 Regional HDU this could be influenced by a number of factors, including patient diagnosis and complexity, severity of illness (PEWS score), and nursing skill-mix and seniority.
4.10.3. Continuing Professional Development (CPD) for Level 1/Regional HDU staff

Continuing Professional Development (CPD) for nurses, trainees and consultants working in RHDU will need to include a focus on appropriate PCC updates and other learning opportunities with standards set, and validated, by the national PCCU.

4.10.4. Non-consultant hospital doctor (NCHD)

A unit running a level 1 PCCU/RHDU must have 24 x 7 paediatric NCHD in-house cover at registrar level. The registrar must have successfully completed their membership exams (MRCPI Paeds / MRCPCH), or equivalent, or have gained adequate clinical experience while currently sitting their exams. The registrar must have up-to-date advanced resuscitation training (APLS).

4.11. Achieving and maintaining competence and skills/CPD

Training and competency requirements for both nursing and medical staff are proposed which are consistent with Level 1 RHDU. The requirements for Level 1 RHU’s may be a step-up from the current position but are required in order to deliver safe, effective, high-quality care to this patient group. There is recognition that some of the proposed staff competency and training standards may prove challenging to achieve in the immediate term. Rather than dilute down the required standard it is proposed that hospitals see these targets as developmental and agree on a timescale after which standards should be met.

It will be essential for all staff working in Level 1 RHU to keep up to date and refresh their knowledge and skills relating to care of the critically ill child. This includes medical staff (paediatric and anaesthetic) supporting the PCCU as part of their on-call commitments.
Model of Care for Paediatric Critical Care

Suitable opportunities might include spending time in another PCC unit to observe practice, undertaking further courses, and attending relevant training events and conferences. Each member of staff should plan their CPD as part of their annual appraisal/personal development plan.

Clinical nurse managers (CNMs) will be responsible for ensuring that suitable educational and training opportunities are available for all staff, including the broader multidisciplinary team, working in the level 1 RHDU. This should include appointment of a PCC nurse educator to support the network. In many instances this may be linked to the network retrieval/transport service. Consideration should be given to the development of clinical nurse specialists (CNS) and advanced nurse practitioners (ANP) roles in level 1 RHĐUs.

Care of the critically ill child in a model 4R (Regional) Hospital relies on close working across a number of disciplines, including anaesthesia, general/adult CCU and emergency medicine. Specialists from these areas will also require support for their educational and training needs, and should plan relevant CPD as part of their annual appraisal/personal development plan.

4.12. Equipment

There should be an alignment of equipment used across all centres providing PCC to children. Particular emphasis should be put on using similar non-invasive ventilation devices and patient interfaces (nasal prongs, facemasks, etc.). Guidance on equipment should be provided by the national PCCUs. In conjunction with the National Paediatric Transport Team (IPATS) a plan is currently being put in place that synchronises equipment locally with equipment used by the transport team – eg an agreed model of ventilator for use in children in emergency situations in all hospitals receiving or admitting children.

4.13. Medications

The national PCCUs, and their associated pharmacy support, should take the lead on drawing up a list of medications to be used in the level 1 PCCUs with dosing algorithms and guidelines on reconstituting and delivering the medications. This should include the implementation of National Drug Library and the use of standard medication of all drug infusions in Paediatric Critical Care and HDU as currently in use in both Supra-Regional Paediatric Hospitals.

A robust audit process is needed to record Level 1 RHDU activity, namely to which patients, where it is happening (‘right child, right care, right place’). In addition the outcome of RHDU episodes must be measured. In order to do this a national minimum dataset is needed that can capture both activity and outcome, using a standardised tool. This should include indication for admission to the RHDU, pre-existing medical conditions, diagnosis, treatment received, and outcome (discharge, transfer or death).

4.15. Audit and governance arrangements

Each centre providing level 1 RHDU should develop a robust governance structure and monitor performance. The governance structure must ensure that a) delivery of care and access to treatment is in line with local and nationally agreed protocols, b) training and audit requirements are met, and c) critical incident reporting occurs. Activity should be formally reviewed six monthly as part of an in-house clinical governance exercise.

Each centre providing level 1 RHDU will be expected to produce an annual report that describes the activity of the unit and outcomes of all children meeting CC criteria. This will be presented as part of an educational and training meeting hosted by national PCCUs and attended by all centres providing level 1 PCCU.

4.16. Resources and funding

At present a significant proportion of activity undertaken in PCCU’s could potentially be provided in level 1 RHDUs in model 4R (Regional) Hospitals. Funding streams which take into account patient complexity, could release important funds from current PCCU funding to support delivery of PCC activities outside of PCCU. This would need to be agreed at a national level, with an accurate measure of activity and case complexity. Support of this initiative involves recognising that effective delivery of HDC would reduce the burden on PCCUs and at the same time allow delivery of care closer to the child’s home.
4.17. Key recommendations

Support of this initiative involves recognising that effective delivery of high dependency care to children in model 4R (Regional) hospital in Ireland will reduce the burden on PCCUs in Dublin and at the same time allow delivery of care closer to the child’s home.

This is not achievable without investment in staff and equipment in model 4R (Regional) Hospitals, and significant up-skilling of staff. This is achievable provided the staff and resources are concentrated in a limited number of sites – it would not be deliverable across all in-patient sites.

Currently there is no ring-fenced additional income for Paediatric HDU activity delivered outside PCCU, providing a disincentive for hospitals and clinicians (doctors and nurses) to undertake HDU activity. A protected funding stream should be generated to align with activity levels including a case-mix model to capture case complexity.

An agreed model of care should be developed to support the care of children with tracheostomy and long term ventilation to be cared for in their homes with input from the community services and supported by the geographically closest model 4R (Regional) hospital

Paediatric HDU in model 4R (Regional) hospitals will be Level 1 - RHDU requiring nurse to patient ratio 0.5:1, in a discrete area or unit.

All children in the level 1 RHDU will be under the care of a named consultant paediatrician.
A unit running a level 1 RHDU must have 24 x 7 access to a consultant paediatrician on-call who can attend the unit within 20 minutes.
Whilst the day-to-day management of children within level 1 PCCU will be led by paediatricians, a vital role will be played by anaesthetists in managing the critically ill child to assist in the assessment, resuscitation, stabilisation and safe transfer.

Continuing professional development (CPD) for nurses, trainees and consultants working in Paediatric HDUs will need to include a focus on appropriate updates and other learning opportunities with standards set, and validated, by the national PCCUs.

Rather than dilute down the required standard it is proposed that hospitals see these targets as developmental and agree on a timescale after which standards should be met.

Clinical nurse managers (CNMs) will be responsible for ensuring that suitable educational and training opportunities are available for all staff. This should include appointment of a PCC nurse educator to support the network.

Consideration should be given to the development of clinical nurse specialists (CNS) and advanced nurse practitioners (ANP) roles in level 1 RHDUs.

There should be an alignment equipment used across all centres providing PCC to children. Particular emphasis should be put on using similar non-invasive ventilation devices and patient interfaces (nasal prongs, facemasks, etc.). Guidance on equipment should be provided by the national PCCU’s

The national PCCU’s, and their associated pharmacy support, should take the lead on drawing up a list of medications to be used in the level 1 RHDUs with dosing algorithms and guidelines on reconstituting and delivering the medications.

Implementation of the National drug Library and Standard concentration for all Paediatric Drug infusions as is currently in place in OLCHC is recommended for Level 1 RHDU and eventually in all paediatric patients in Local and Regional hospitals.

A robust audit process is needed to record how much activity is being delivered, to which patients, and where it is happening (‘right child, right care, right place’). This involves robust collection and reporting of Paediatric HDU activity data using standardised diagnostic and treatment definitions.
Each centre providing level 1 RHDU should develop a governance structure and monitor performance.

Each centre providing level 1 RHDU will be expected to produce an annual report that describes the activity of the unit and outcomes of all children meeting CC criteria. This will be presented as part of an educational and training meeting hosted by national PICUs and attended by all centres providing level 1 RHDU

4.18. Governance of patients admitted to Paediatric Critical Care Units in ROI

Patients requiring critical Care and high dependency Care (HDU) are admitted to the care of two Consultants following admission to PCCU.

A primary Consultant in Critical Care who is responsible for the overall multi-disciplinary management of the patient and a primary Hospital Consultant into whose care this patient will be discharged post treatment in PCCU. Responsibility and management of care of the acutely ill child will lie with the primary consultant in critical care. This should be reflected in the admission documentation of these patients. These patients should be admitted under a named consultant in critical care as per International practice. The primary hospital consultant could be a consultant with a sub-specialty interest or to general paediatrics.

4.19. Consultants with Lead Responsibility

There should be a nominated Clinical Lead for PCCM in each Unit (currently a nominated Medical Director) and an overall Clinical Lead to take responsibility for overall planning and performance of Paediatric Critical Care. Both these jobs should be for a defined period e.g. 4 years should be reappointed following nomination and a vote by colleagues.

The Lead Consultant should be supported by Consultants with Lead responsibility for the following areas;

a. Clinical Governance
b. Audit and Data collection
c. Research
d. Medical education and training
e. Organ donation
4.20. Model of Care capacity planning for PCCM ROI

(a) Future Planning of Bed Operations

As part of our internal clinical audit and research activities, admissions in OLCHC and TSCUH are manually categorised by the lead PICANet Research Nurse as General PICU, Cardiothoracic or Cardiology. This PICU-only classification is based on a manual review of the primary diagnoses, co-morbidities and procedures as coded in our PICANet dataset. Annual bed days used is taken as the summation of length of stay (Sum Total LOS) of all those admitted in each calendar year where length of stay is taken as the integer number of calendar days spanned by the PICU admission.

(b) Summary from PICANet (OLCHC + TSCUH Combined)

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Admissions</td>
<td>1483</td>
<td>1540</td>
<td>1609</td>
<td>1595</td>
<td>1509</td>
<td>1417</td>
</tr>
<tr>
<td>General PICU</td>
<td>979  (66.01%)</td>
<td>994  (64.55%)</td>
<td>1091 (67.81%)</td>
<td>1134 (71.1%)</td>
<td>1064 (70.51%)</td>
<td>989  (69.8%)</td>
</tr>
<tr>
<td>Cardiothoracic</td>
<td>427  (28.79%)</td>
<td>412  (26.75%)</td>
<td>391 (24.3%)</td>
<td>360 (22.57%)</td>
<td>322 (21.34%)</td>
<td>332  (23.43%)</td>
</tr>
<tr>
<td>Cardiology</td>
<td>77   (5.19%)</td>
<td>134  (8.7%)</td>
<td>127 (7.89%)</td>
<td>101 (6.33%)</td>
<td>123 (8.15%)</td>
<td>96  (6.77%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
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<tbody>
<tr>
<td>Bed Days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Admissions</td>
<td>10103</td>
<td>10061</td>
<td>10599</td>
<td>10663</td>
<td>10903</td>
<td>10226</td>
</tr>
<tr>
<td>General PICU</td>
<td>5597  (55.4%)</td>
<td>5680  (56.46%)</td>
<td>6248 (58.95%)</td>
<td>6910 (64.8%)</td>
<td>6950 (63.74%)</td>
<td>7048 (68.92%)</td>
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<tr>
<td>Cardiothoracic</td>
<td>3670  (38.31%)</td>
<td>3361  (33.41%)</td>
<td>3309 (31.22%)</td>
<td>2942 (27.59%)</td>
<td>3102 (28.45%)</td>
<td>2387 (23.15%)</td>
</tr>
<tr>
<td>Cardiology</td>
<td>636   (6.3%)</td>
<td>1020  (10.14%)</td>
<td>1042 (9.83%)</td>
<td>811 (7.61%)</td>
<td>851 (7.81%)</td>
<td>811 (7.93%)</td>
</tr>
</tbody>
</table>

(c) Future Configuration in NCH

The PCCU in the New Children’s Hospital will be configured according to General PICU (Non-Neonates), General PICU (Neonates) and all Cardiology/Cardiothoracic. Summary data of current activity follows below where it is noted that admissions initially categorised as neonatal will remain so irrespective of length of stay (LOS).
Current overall activity may be summarised in the following Figure where the horizontal lines represent equivalent annual bed days from $N$ beds expressed as $N*365$.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>OLCHC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>363</td>
<td>373</td>
<td>443</td>
<td>500</td>
<td>406</td>
<td>415</td>
</tr>
<tr>
<td>Sum Total LOS</td>
<td>2062</td>
<td>2186</td>
<td>2412</td>
<td>2946</td>
<td>2225</td>
<td>2665</td>
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<tr>
<td><strong>TSCUH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>361</td>
<td>369</td>
<td>385</td>
<td>366</td>
<td>343</td>
<td>321</td>
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<tr>
<td>Sum Total LOS</td>
<td>1537</td>
<td>1453</td>
<td>1642</td>
<td>1750</td>
<td>1540</td>
<td>1508</td>
</tr>
<tr>
<td><strong>Combined</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>724</td>
<td>742</td>
<td>828</td>
<td>866</td>
<td>749</td>
<td>735</td>
</tr>
<tr>
<td>Sum Total LOS</td>
<td>3599</td>
<td>3639</td>
<td>4054</td>
<td>4696</td>
<td>3765</td>
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<tbody>
<tr>
<td><strong>OLCHC</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>127</td>
<td>101</td>
<td>135</td>
<td>131</td>
<td>180</td>
<td>115</td>
</tr>
<tr>
<td>Sum Total LOS</td>
<td>1100</td>
<td>1007</td>
<td>1309</td>
<td>1416</td>
<td>2185</td>
<td>1582</td>
</tr>
<tr>
<td><strong>TSCUH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>128</td>
<td>151</td>
<td>128</td>
<td>137</td>
<td>135</td>
<td>138</td>
</tr>
<tr>
<td>Sum Total LOS</td>
<td>898</td>
<td>1034</td>
<td>885</td>
<td>798</td>
<td>1000</td>
<td>1293</td>
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</tr>
<tr>
<td>N</td>
<td>255</td>
<td>252</td>
<td>263</td>
<td>268</td>
<td>315</td>
<td>253</td>
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<tr>
<td>Sum Total LOS</td>
<td>1998</td>
<td>2041</td>
<td>2194</td>
<td>2214</td>
<td>3185</td>
<td>2875</td>
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<table>
<thead>
<tr>
<th>Cardiac Cardiothoracic</th>
<th>2010</th>
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<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OLCHC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>504</td>
<td>546</td>
<td>518</td>
<td>461</td>
<td>445</td>
<td>428</td>
</tr>
<tr>
<td>Sum Total LOS</td>
<td>4506</td>
<td>4381</td>
<td>4351</td>
<td>3753</td>
<td>3953</td>
<td>3178</td>
</tr>
<tr>
<td><strong>TSCUH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sum Total LOS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Combined</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>504</td>
<td>546</td>
<td>518</td>
<td>461</td>
<td>445</td>
<td>428</td>
</tr>
<tr>
<td>Sum Total LOS</td>
<td>4506</td>
<td>4381</td>
<td>4351</td>
<td>3753</td>
<td>3953</td>
<td>3178</td>
</tr>
</tbody>
</table>
The expression of sum total length of stay in terms of number of annual bed days would assume 100% utilisation of the available bed days. To simulate the PICS standard of 85% occupancy of the available beds, we multiply by a factor increase of \( \frac{100}{85} = 1.18 \).

Current activity follows from the Figure as:

- **General PICU (Neonates):** 250-300 admissions equivalent to 5-8 annual bed days at 100% utilisation and 5.9-9.4 beds at 85% utilisation.
- **General PICU (Non-Neonates):** 720-870 admissions equivalent to 9-13 annual bed days; 10.6-15.3 beds at 85% utilisation.
- **Cardiac/CT:** 420-550 admissions equivalent to 8-12 annual bed days; 9.4-14.2 at 85% utilisation.

### 4.21. Capacity Planning with respect to PCCU beds in ROI

Need to plan increased capacity in the New Children’s Hospital due to:

- Additional future intake from population growth.
- Extra cardiac cases from Northern Ireland.
- Establishment of Respiratory ECLS Programme
- Any transfer of Neonatal NICU/SCBU/HDU activity currently undertaken in Maternity Units.
- Improvement of bed occupancy to 85% down from current >95% in some instances.
Additional PICU activity may be considered within the framework of the following linear extrapolations of the current activity data as tabulated in the previous section.

(d) **Current Cardiac/Cardiothoracic**

![Graph showing linear extrapolation of total bed days for increased admissions.]

**Admission-based target:**
- Increased intake to ~600 annual admissions indicates 14 beds.
- Factor increase of 1.18 to simulate 85% occupancy = **16.5 beds**.

**Bed-based target:**
- 20 beds at 100% utilisation indicates 835 admissions when read from the green line in the Figure; 85% utilisation = 17 beds or 720 admissions.

(e) **General PICU (Non-Neonates)**
Admission-based target (1): Bed-based target (2):

- (1) Increased intake to ~1000 annual admissions indicates 14.5 beds.
- Factor increase of 1.18 to simulate 85% occupancy = 17.1 beds. (2) 20 beds at 100% utilisation indicates 1,350 admissions when read from the green line in the Figure; 85% utilisation = 17 beds or 1,160 admissions.

(f) General PICU (Neonates)

Note: 2015 data point was omitted from the linear regression.
Admission-based target:
Increased intake to ~350 annual admissions indicates 10.5 beds.
- Factor increase of 1.18 to simulate 85% occupancy = 12.4 beds.

Bed-based target:
15 beds at 100% utilisation indicates 435 admissions when read from the green line in the Figure; 85% utilisation = 12.75 beds or 395 admissions.

4.22. Model of Care medical staffing 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 for Paediatric Critical Care sets out the ideal staffing model for provision of Paediatric Critical Care Unit for children at the present time and in the future following the opening of the NCH. Templates and standards for these staffing recommendations are taken from International publications e.g. DNV 2008 and PICS standards 2015, and National Standards for Irish Paediatric Critical Care Services 2013. It allows for the estimation of future numbers of Paediatric Intensivists and allow for planning of staffing at NCHD and Consultant level in PCCU and the establishment of a formal training program in PCCU.
Previously the situation as regards Paediatric Critical Care has been delineated by the DNV report 2008- an interim report which made 13 recommendations. We are currently at 40% of the recommended staffing levels at NCHD and Consultant level in PCCU. However with the setting up and implementation of both paediatric retrieval and a national training programme for paediatric critical care we are working toward the recognition of PCCM as a sub specialty in the Medical Council as per Adult and Neonatal Critical care.

The level of staffing at Consultant and NCHD level is difficult to define without a definite date for the full implementation of the European Time Directive (EWTD). The anticipated numbers of NCHDS’s required needs to take into account the increase in numbers if EWTD or shift systems are put into place. There is currently no document available to give guidance on the projected rosters for NCHD’S i.e. 8 hr/10 hr or 18 hr rosters so specific NCHD numbers required for out of hours call is difficult to predict accurately.

The medical staffing numbers suggested below are based on the number of medical staff required to staff the calculated number of CCU beds available based on capacity planning (ref IAN) and which fulfil the quality standards document 2013 (JFICMI).

4.23. Model of Care - Recommendations for medical training and staffing

This model of Care describes the ideal model for the provision of safe effective care to critically ill children. The staffing with respect to PCCM is clearly outlined in the PICS Standards UK 2016-Ref L3-202 and National Standards for Paediatric Critical Care Services 2013 (4.5). This clearly outlines the training qualifications for:

1. WTE Consultants in Critical Care should have a minimum 2 years’ experience in an accredited PCCM training programme –of which 1 year should be in Paediatric Cardiac Critical Care
2. Consultants with a Special Interest in PCCM-these must have a minimum of 1 year PCCU training in an accredited PCCM programme.

Consultant in normal daytime hours

We recommend that there should be a minimum of 1 Consultant available to the Unit per 10-12 PICU beds in daytime hours and a minimum of 1 for every 25 beds out of hours as per NSPCCM /JFICM 2013 and PICS UK Standards 2015.Units of 16-24 beds should normally have 2 Consultants working on the Unit during normal working hours.
NCHD in in normal daytime hours

During normal working hours 1 trainee should not normally be allocated greater than 5/6 patients. Outside of normal working hours, for every 8 PICU beds we should aim to have one senior trainee available. Although rotas may vary depending on Unit size, number of Consultants, number of junior staff, length of shifts and implementation of EWTD the rotas of Intensivists and trainees should be organised to maximise continuity of patient care in PICU. It is desirable to provide for blocks of Critical Care Unit time for each Consultant and if possible trainee rather than changing on a daily basis. Further recommendations for staffing of PCCU are available in section of JFICMI 2013

5. CURRENT AND RECOMMENDED BED STATUS AND STAFFING LEVELS IN OLCHC /CUH PCCU

<table>
<thead>
<tr>
<th></th>
<th>OLCHC 2016</th>
<th>TSCUH</th>
<th>OLCHC + TSCUH</th>
<th>PICS Standards and DNV 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCCU beds open</td>
<td>21-23</td>
<td>6-9</td>
<td>28-32</td>
<td>34</td>
</tr>
<tr>
<td>CAPACITY</td>
<td>25</td>
<td>9</td>
<td>TOTAL CAPACITY</td>
<td>34</td>
</tr>
<tr>
<td>WTE PCCU Consultants</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>WTE Reg/SpR</td>
<td>7</td>
<td>4</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Admissions</td>
<td>&gt;1,100</td>
<td>&gt;450</td>
<td>&gt;1500</td>
<td></td>
</tr>
</tbody>
</table>

5.1. Pre-NCH

Up to the projected opening of the NCH there will continue to be 2 PCCU’s in Dublin giving us a total of 34 beds with between 28- 32 currently staffed due to issues with nurse recruitment. Because the 2 PCCU’s are across 2 sites (OLCHC and TSCUH) this has implications for staffing model and numbers required to run 2 Units across 2 sites. (See above)

Of particular importance is the staffing of the Units at NCHD level. With the setting up and implementation of PCCM training scheme this will provide a continuous supply of trainees who will remain in the PICU over a
2 year period and allow further advancement in teaching and research. We will advance and support the current movement of International trainees coming to Dublin as junior and senior Fellows.

A fellowship program has also been agreed with the College of Anaesthetists (COI) in the last 3-4 years. Currently PCCM is recognised for 1 year specialty training pre accreditation and 1 year post accreditation. **NCH PICU staffing** Based on our current validated PICAnet data (from 2009) and allowing for population expansion and the treatment of Belfast Cardiac children in ROI we have created a capacity modelling diagram which has allowed us to predict PCCU/CCCU bed numbers for NCH.

### NCH PICU bed numbers and staffing recommendations PICS Standards 2010/DNV 2008

<table>
<thead>
<tr>
<th></th>
<th>NCH PCCU beds</th>
<th>NCH CCCU</th>
<th>Total = 42-this is for PCCU/CCCU only</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTE Intensivists</td>
<td>8</td>
<td>8</td>
<td>Total Intensivists PICU and CICU =16</td>
</tr>
<tr>
<td>WTE NCHD’s</td>
<td>16</td>
<td>16</td>
<td>Total NCHD’s =32</td>
</tr>
<tr>
<td>24 hour Retrieval NCHDs</td>
<td>+4</td>
<td>+4</td>
<td>Total NCHD’s + retrieval =40</td>
</tr>
<tr>
<td>Retrieval Intensivists</td>
<td>+2</td>
<td>+2</td>
<td>Total Intensivists= 20</td>
</tr>
</tbody>
</table>

5.2. **National Clinical Programme for Critical Care**

The National Clinical Programme for Critical Care is a key component of the Clinical Strategy and Programmes Division in HSE.

5.3. **PICU Training Program**

A PCCU model of care document is currently being written by the PCCU cross city working group which will allow for the creation of a Paediatric Critical Care sub-speciality within Medical Council Specialty registration (as per Adult ICU program). The vision for PCCU is that this will sit under the umbrella of Joint Faculty of Intensive Care as a specialty in its own right with a fellowship exam. A training program for PCCU will then
follow on from this. Our trainees will be drawn from all specialties e.g. Anaesthesia, Paediatrics, Neonatology etc.

**Intensivists** The vision for Paediatric Critical Care will be that there will be a core group of full time Paediatric Intensivists with a background 2 year post fellowship training program in PCCU/CCCU drawn from many subspecialties. It will also allow for dual accreditation across Anaesthesia and Paediatrics and allow for a wealth of training and experience and a world class service.
6. **SURGE CAPACITY PLANNING FOR PAEDIATRIC CRITICAL CARE**

Paediatric Critical Care are increasingly faced with the challenge of ensuring patients have access to care during periods when demand exceeds available resources. This challenge is magnified when mass casualty incidents or epidemics occur. Surge capacity is a measurable representation of ability to manage a sudden influx of patients. It is dependent on a well-functioning incident management system and the variables of space, supplies, staff and any special considerations (contaminated or contagious patients, for example). Health care systems must develop and maintain outpatient and inpatient surge capacity for the triage, treatment, and tracking of patients at the facility or in alternative sites of care or alternative hospitals during infectious disease outbreaks, hazardous materials exposures, and mass casualty incidents.

Health care facility and system plans should maximize conventional capacity as well as plan for contingency capacity (adapting patient care spaces to provide functionally equivalent care) and crisis capacity (adapting the level of care provided to the resources available when usual care is impossible).

Development of surge capacity requires augmenting existing capacity as well as creating capacity by limiting elective appointments and procedures and practicing “surge discharge” of patients that can be effectively managed in non-hospital environments.

Effective surge capacity planning integrates facility plans (in hospital major incident planning) with a regional disaster response program involving other area health care institutions and considers hazard vulnerability assessments (HVAs) and historical natural disaster threats.

Funding sources should be available for surge capacity planning, training, research, equipment, supplies, oversight, and process improvement at the local, state and federal levels.

**Surge levels defined by Irish Critical Care Services Major Surge Planning Committee July 2011 (ref)**

- **Pre surge:** current critical care facility staffed and open capacity
- **Surge 1:** Opening of all critical care beds irrespective of reasons of current closure
- **Surge 2:** acceptance that isolation no longer an option and cohorting the next best option
Surge 3: Acceptance that neither isolation nor in-ICU an option. Define potential to provide critical care outside walls of ICU, but in areas of high dependency e.g. high dependency units, special care units, theatre, and recovery/PACU

Surge 4: further critical care expansion into non-ICU areas having exhausted above potential. May include theatres if deemed appropriate, specific wards etc.

Paediatric Critical care Major Surge Planning Template provides guidance for local major surge a capacity planning preparedness, leadership, surge level manpower (training of Nursing and medical staff) and potential impact on elective services. A local plan exists for both OLCHC and TSCUH.

Health Protection Surveillance Centre (HPSC) is provided with and regularly updates enhanced surveillance data on all children admitted to PICU with severe acute respiratory infections.

6.1. Relevant Legislation/Policies/Health Service

Health Service Executive: (July 2011) Critical Care Services Major Surge Planning
7. NATIONAL PAEDIATRIC INFECTIOUS DISEASES UNIT

7.1. Role of Critical Care with reference to paediatric patient with Category 4 pathogen e.g. Ebola –

Critical Care consultation and engagement is appropriate for patients with Category 4 infectious diseases pathogens when they fulfil standard CCM referral criteria. This patient population present with specific diagnostics and treatments relevant to critical care medicine and include management of hypovolaemia, electrolyte abnormalities, refractory shock, hypoxaemia, haemorrhage, septic shock, multi-organ failure, DIC, vasopressors, nutrition, secondary bacterial infections *inter alia* and therefore specific interventions and expertise relevant to all of these is a part of critical care practice.

7.2. Location / Isolation of the Paediatric patient with Ebola

The Mater Misericordiae University Hospital (MMUH) contains the National Isolation Unit (NIU) for adults presenting with Category 4 infectious disease pathogens e.g. Ebola in ROI. Recommendations were made in the past for a separate Paediatric Isolation Unit situated in the grounds of a 4S Paediatric hospital adjacent to the paediatric critical care units. However this has not come about. In the present moment in the event of a paediatric patient presenting with category 4 pathogen -Ebola and requiring critical care we do not have in ROI any critical care facility which reaches International guidelines with respect to the infrastructure, staffing or training required to look after these patients. The adult unit in the Mater is not suitable for the care of critically ill children. In the current situation the recommendation for the paediatric patient presenting with category 4 pathogens -Ebola is the transfer of these patients by a specialised transport team from Royal Free Hospital in London, UK and the treatment of these children in the paediatric critical care facility in the Royal Free Hospital.

With reference to the building of the National Paediatric Hospital (NCH) which is currently underway specific recommendations have been made by Consultant staff from Critical Care and Infectious Diseases that a specific Paediatric Isolation Unit be built adjacent to Critical Care but with the separate facilities required as per CDC guidelines. This Unit needs to follow International guidelines for isolation with respect to category 4 outbreaks –e.g. Ebola, but it also needs to have available fully equipped critical care facilities in line with critical care standards.
The Ebola Clinical Care Guidelines, a guide for clinicians in Canada, Interim Report August 29th 2014, updated October 28th, from the Canadian Critical Care Society, the Canadian Association of Emergency Physicians, and the Assoc. of Medical Microbiology and Infectious Diseases Canada4 provides useful guidance for the management of the critically ill Ebola patient, (ref. CCCS – CCAEP – AMMI Ebola Clinical Care Guidelines). These guidelines include specific considerations for the in-hospital location and environment of such a patient.

Planning needs to include identified clean gowning-up (full PPE) area separate from dirty areas, areas for removing PPE safely, and waste (see Waste section below). A work area is required outside of this isolated zone to allow case discussion and communication. IT and communication facilities need to be suitable for staff, patient and visitor use. The defined isolation and work area will need to be segregated physically from the rest of the intensive care unit where non-Ebola Virus Disease (non-EVD) patients are being cared for.

7.3. Personal Protective Equipment (PPE)

Use of PPE shall be as per The Management of Viral Haemorrhagic Fevers in Ireland, November, 2012 5 and Ebola Virus Risk Assessment for use in Hospital settings6 guidelines, or as advised by the National PPE group. Current standards include the use of Airborne Infection Isolation rooms for these patients when feasible for aerosol generating procedures (AGPs) [see CDC Guideline for the Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Haemorrhagic Fever in U.S. Hospitals August 20147].

7.4. Critical Care Staffing

The demands of care for a category 4 infection patient, the extra risks for the nursing and medical staff, and the difficulties inherent in working while dressed in PPE will requires shorter shifts and therefore greater numbers of nurses and an extra rota of doctors for ICM separate (or supporting) those already rostered to the care of the rest of the intensive care unit patients. Different hospitals will require different configurations of such staffing, but presuming that 6 hour shifts would be the maximum tolerable for any nursing staff in this context, there would be a need for a staffing ratio of 3:1 nursing to patient (normal 1:1) per standard shift.
This will significantly drain the numerical pool of ICU nursing staff for any institution and mandate closure of a number of ICU beds, impacting negatively on the ability of that centre to provide for other acutely ill patients. Restrictions to major elective surgeries and redistribution of ambulance take may be required.

7.5. **Clinical Care and Interventions for the Critically Ill**

The clinical decision as to the appropriateness of intubation and mechanical ventilation will be consultant based and patient specific. (See “Clinical Role of Critical Care” above).

The CDC has recently issued guidance with regard to haemodialysis for patients with Ebola Virus disease, both modalities of intermittent and continuous RRT.

http://www.cdc.gov/vhf/ebola/hcp/guidance-dialysis.html

7.6. **Laboratory and ICU Point of Care testing**

Laboratory and point-of-care testing shall comply with the EVD Laboratory Biosafety Guidance, HPSC, 15th August 2014. Note, the blood bank / blood transfusion service shall not cross-match blood for these patients and hence only O-negative or type specific (if known) will be made available.

7.7. **Recommendations re Paediatric Critical Care facilities for Infectious diseases**

1. In the time period up to the construction of the NCH critically ill children with life threatening infectious diseases in ROI should be transferred to the specialised isolation facilities in the Royal Free Hospital. There is currently no suitable isolation facilities available for this group in the ROI.
2. Transfer of these critically ill patients should be carried out by a specialised transport group from the UK.
3. Construction of a specialised Paediatric Isolation Unit should be part of the of NCH infrastructure
4. A Paediatric Infectious Diseases Unit in the NCH should be in proximity to the Critical Care Unit to facilitate staffing and training of the Unit in the event of an outbreak such as Ebola.
5. The infrastructure of a Paediatric Infectious Unit should be in line with International standards with respect to isolation and safety of both the patients and staff and the other patient population in the hospital.
7.8. Recommended Core Information sites:

1. Health Protection Surveillance Centre
   http://www.hpsc.ie/A-Z/Vectorborne/ViralHaemorrhagicFever/Ebola/

2. Centres for Disease Control and Prevention
   http://www.cdc.gov/vhf/ebola/

References:
   http://www.ficm.ac.uk/news-events/ficm-statement-ebola-clinical-managementguidance
5. The Management of Viral Haemorrhagic Fevers in Ireland, November,2012
   http://www.hpsc.ie/AZ/
   Vector borne/Viral Haemorrhagic Fever/Guidance/File,12936,en.pdf
   http://www.hpsc.ie/AZ/
   Vectorborne/ViralHaemorrhagicFever/Assessingaposiblecase/File,14074,en.pdf
7. CDC Guideline for the Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Hemorrhagic Fever in U.S. Hospitals August 2014
8. Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequence. Advisory Committee on Dangerous Pathogens. September 2014
9. Interim Routine Diagnostic Laboratory Biosafety Guidance for Processing Samples from Individuals with Suspected or Confirmed Ebola Virus Disease. August 2014

http://www.hpsc.ie/AZ/Vectorborne/ViralHaemorrhagicFever/Assessingaposiblecase/File,14766,en.pdf

10. Transportation of patients suffering from suspected or confirmed Viral Haemorrhagic Fever VHF June 2012

8. PAEDIATRIC RETRIEVAL AND TRANSPORT MEDICINE

Paediatric Transport Medicine integrates the specialties and disciplines of Paediatric Critical Care, Adult Critical Care, Anaesthesia, Emergency Medicine, Acute Surgery, Paediatrics, Neonatology, Nursing and the National Ambulance Service (NAS). This section describes the Governance, Clinical Co-ordination, Operational Tasking, and the Standardisation of Equipment, Training and Audit pertaining to paediatric transport and retrieval medicine.

8.1. Definitions

A national Retrieval-Transfer system facilitates the centralised nature of Paediatric Intensive Care medicine. Clinical service delivery within Supra Regional centres links Regional hospital paediatric departments.

8.2. Retrieval / Transport Service Requirements

In Ireland in 2014, there were 431 retrievals or transports into the PCCU’s. On average there are 320 unplanned admissions from other hospitals to the PICU’s per year. Specific data is required for future planning but it is likely based on current data that Transport Retrieval will need to accommodate 400-450 patients per year to include unplanned and planned paediatric critically ill patient movement.

8.3. Governance

This Model of Care (MOC) provides a framework within which paediatric transport medicine services will operate. This will lie the overall structure of Irish paediatric critical care services and that of the National Transport Medicine Programme / Service (NTMP/S). The National Retrieval Steering Committee of the NTMP/S, and the Neonatal & Paediatric Expert Steering Group set the standards and expectations for the practice of transport medicine. Both of these NTMP/S committees ratify this MOC and this represents the clinical standards to which the practice of transport medicine will be held.

The NTMP/S Clinical Lead for Paediatrics is a post-holder within the structure of the NTMP/S.
8.4. Categories of Transport Team in Paediatric Critical Illness

There are two types of paediatric critical care transport teams; a specialist Paediatric Critical Care Model (PCCM) transport team and a non-specialist transport team (NSTT).

**Specialist Transport Teams**: In Ireland, the specialist paediatric critical care transport medicine teams operating under the governance of the NNTP/S are known as the Irish Paediatric Acute Transport Service (IPATS) and the Neonatal Transport Program (NNTP).

**The NNTP** currently provides the majority of patient transport to the PICU’s. It is a 24/7-365 day daytime service and retrieves circa 700-800 neonates per year.

<table>
<thead>
<tr>
<th></th>
<th>OLCHC</th>
<th>TSCUH</th>
<th>Total</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Admissions 2015</strong></td>
<td>250</td>
<td>221</td>
<td>471</td>
<td>100%</td>
</tr>
<tr>
<td>Neonatal &lt;4 weeks /preterm</td>
<td>125</td>
<td>74</td>
<td>199</td>
<td>42.2%</td>
</tr>
<tr>
<td>&gt; 4 weeks</td>
<td>125</td>
<td>147</td>
<td>272</td>
<td>57.8%</td>
</tr>
<tr>
<td><strong>Transport teams</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPATS</td>
<td>29 (3, 26)</td>
<td>39 (4, 35)</td>
<td>68</td>
<td>&lt;4 weeks 3.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;4 weeks 23%</td>
</tr>
<tr>
<td>NNTP</td>
<td>132 (110, 22)</td>
<td>85 (63, 22)</td>
<td>217</td>
<td>&lt;4 weeks 87%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;4 weeks 16%</td>
</tr>
<tr>
<td>NISTAR</td>
<td>7 (4, 3)</td>
<td>0</td>
<td>7</td>
<td>&lt;4 weeks 2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;4 weeks 1%</td>
</tr>
<tr>
<td>Non-Specialist Transport Team (NSTT)</td>
<td>82 (8, 74)</td>
<td>97 (7, 90)</td>
<td>179</td>
<td>&lt;4 weeks 7.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;4 weeks 60%</td>
</tr>
<tr>
<td><strong>Admissions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekend/BH</td>
<td>66 (22, 44)</td>
<td>50 (12, 38)</td>
<td>116</td>
<td>&lt;4 weeks 29%</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>&gt;4 weeks 71%</td>
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<tr>
<td>Weekdays</td>
<td>184</td>
<td>171</td>
<td>355</td>
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</tr>
</tbody>
</table>
8.5. Paediatric Retrieval: IPATS- Governance and Structure

IPATS is currently delivered from the Paediatric Critical Care services of Our Lady’s Children’s Hospital Crumlin (OLCHC), and Temple Street Children’s University Hospital (TSCUH) under the stewardship of the NTMP/S. Each doctor practicing with IPATS will report to the clinical director and CEO of the hospital which holds his / her substantive contract. In the case of a locum tenens consultant, the doctor reports to the hospital that holds the substantive contract. In the case of a nurse, or nurse practitioner, the nurse will report to the Director of Nursing (DON) in the hospital where the nurse is employed. The clinical competencies of a doctor and a nurse on the IPATS team are defined by the IPATS training document.

The reporting structure and governance of a NSTT is to the institution where the clinician is employed. The operational standards to which the NSTT team should achieve are defined by the NTMP/S and should be in agreement with the recommendations published by the joint document of the Association of Anaesthetists of Great Britain and Ireland with the Faculty of Paediatrics RCPI.

8.6. Organisation of the Service

**Referral** is via a single point of telephone contact for referring clinicians, accepting Paediatric Intensivists, accepting specialists, and transport medicine clinicians in order to facilitate access to immediate specialist clinical advice.

**Allocation of PICU bed** is via a clear algorithm for the accepting PICU’s so as to identify a PICU bed and provide appropriate care.

**Triages aim** to provide and dispatch transport teams within a clinically appropriate time window and work with referring hospital teams to guide stabilization patients before transfer to accepting PICU.

**Transfers abroad- IPATS ultimate aim is provides transport** and / or logistical support for high-risk critically ill infants, children and adolescents for continuing medical care not available in Ireland. It also aims to repatriate (or facilitate) the repatriation of patients from Paediatric Intensive Care Units to continue their care in an institution in ROI.

IPATS also aims that when both the clinical appropriateness and IPATS service needs allow, to repatriate patients from PICU’s to facilities nearer the patients’ home.
8.7. Scope of Practice for IPATS-b see appendix

8.8. Hours of clinical service (1st phase of Paediatric Retrieval Service roll-out)

Paediatric service will be operational between the hours of 10:00 until 22:00 on a Monday to Friday with the exception of national holidays. It is expected that the team will have returned to base by 22:00. The decision to accept a transfer which would likely finish after 22:00, is at the discretion of the retrieval team of the day. It is hoped that the service will expand to a 24-hour service, 7 days per week, 365 days per year when additional funding and appropriate staffing are in place.

8.9. Acceptance criteria for transfer into PICU

To activate a transfer the referring consultant will be required to make an initial telephone referral to PICU hot line (1890-213-213). This will be a consultant-to-consultant referral only. The referring hospital will follow the existing guidelines for such referral requests. The IPATS team will not accept referrals outside of this protocol. The patient must be accepted by the receiving Intensivist to require PICU before the team is activated. The IPATS team will be activated by a call conference from the accepting Intensivist or contacted at the earliest opportunity. This will ideally be a consultant-to-consultant conversation wherever possible.

8.10. Neonatal Patients - see Neonatal Model of Care

Neonatal patients will ordinarily be transferred by the National Neonatal Transport Programme (NNTP). Exceptions to this will be considered only by request from the Consultant Neonatologist on duty for the NNTP. Neonatal patients, who present to acute medical services after having been discharged from a NICU or Neonatal unit, can be transported by IPATS if they fall within the age and weight criteria defined above.

Time-Critical Patient Transfers. Patients with lesions (e.g. certain paediatric neurosurgical or cardiac lesions) deemed ‘time critical’ by an appropriate specialist should not wait for IPATS and should be immediately transported by the local referring hospital.

Activation of IPATS team the decision to activate the transport team is based upon the clinical information provided by the referring unit either by a direct telephone referral or personal communication.
In the event of death of a patient in transfer, the IPATS team will follow NTMP policy and proceed to the accepting hospital, or return to the sending facility, depending on proximity.

8.11. Mode of Transport, Equipment and Resources

IPATS is a ground (road), rotary wing (helicopter) and fixed wing (plane) transfer service.

8.12. Training and Education

New staff will be expected to complete a competency document in line with the NTMP/S – IPAPS policy. Further to that, all doctors engaged with transport and retrieval will undergo an induction programme for focused education and mentoring for transport medicine.

8.13. Documentation

All calls concerning individual patients will have basic details recorded PICU staff and a unique identification number attached which is defined by the NAS episode number and IPATS clinical record number.

8.14. Parents/Legal Guardian and Consent

Parents/Legal Guardian will be kept fully informed of all aspects of their infant / child’s care. These discussions will be recorded in the patient’s transfer records.

8.15. Parental Presence

Where possible and appropriate, one parent may be invited to travel with their infant / child. Presence of a parent during retrieval/transport is entirely the remit of the IPATS clinician on site.

8.16. Non-Specialist Transport Teams

It is important that in the event that there is a delay or unavailability of an NTMP/S retrieval team, the local regional hospital should have a policy and contingency plan to temporarily care for a critically ill child with guidance from the retrieval team consultant or the consultant Intensivist on call in the receiving hospital.
8.17. Within-Ability Stabilization at Scene

Each hospital receiving or admitting children must have a protocol in place to resuscitate and stabilize a critically ill child. Part of this team are previously nominated Team Leader in Anaesthesia and Paediatrics who have set up an agreed protocol for treatment of these patients. (Ref MOC Anaesthesia)

8.18. Components of the Transport Team

A critically patient must be transported by a minimum of two clinicians, typically a doctor and a nurse. The doctor with advanced airway skills should accompany all ventilate
9. NURSING IN PAEDIATRIC CRITICAL CARE

9.1. Introduction

As long ago as 1959 the Platt Report contended that children have different healthcare needs to adult patients and consequently require care suited to their specific needs. In more recent years, a number of high profile national and international inquiries into serious adverse incidents and deaths relating to the care of children have recommended that children should be cared for by children’s nurses with the requisite knowledge, skills and educational preparation (Clothier 1994, Department of Health UK 2001, Carlisle 2002, Department of Health and Children 2005, Royal College of Nursing 2014).

Paediatric critical care nursing is a sub-specialty of children’s nursing that requires additional skills and knowledge to care for critically ill children and their families, which must be met with the requisite education and training to support nurses in this role. Nurses working in the Paediatric Critical Care Unit (PCCU) in Ireland today are operating within a healthcare environment that is influenced by legislation, health policy and a changing demographic and epidemiological profile of patients. Work trends are constantly changing and healthcare services are striving towards a consumer-responsive and cost effective health care service. Nurses will be required to further expand their roles and develop skills and expertise to care for infants and children with increasingly complex care needs.

Furthermore, children’s healthcare in Ireland is undergoing the most significant change to its organisation and delivery with the forthcoming National Model of Care for Paediatric and Neonatal Healthcare in Ireland and the development of the new children’s hospital (NCH). Therefore, the purpose of this document is to:

1. Describe the current PCCU nursing context
2. Consider the future for PCCU nursing
3. Consider the strategies and dependencies required to support the development of the PCCU nursing service into the future; including education requirements, competencies, skill mix and workforce planning
9.2. Current situation

There are currently 3 children’s hospitals in Ireland; Our Lady’s Children’s Hospital, Crumlin (OLCHC), Temple Street Children’s University Hospital (TSCUH) and The National Children’s Hospital (Tallaght), all of which are located in Dublin. PCCU services are currently provided in OLCHC and TSCUH.

9.3. OLCHC

The PCCU in OLCHC has a maximum capacity of 25 beds, but is funded for 23 beds over two units and two floors:
- Floor 2: an 8 bedded unit that is predominantly used for cardiology and cardio-thoracic patients
- Floor 1: a 17 bedded unit (with 2 beds unfunded) consisting of 10 Paediatric Critical Care (PCCU) beds and 5 High Dependency (HDU) beds. The 5 HDU beds can be used as PCCU beds if needed, based on patient dependency levels.

In addition, a 7 bedded Transitional Care Unit (TCU) provides care for children with complex care needs who are technology dependent and/or long term ventilated. Prior to the establishment of TCU, these children would have been cared for in PCCU.

9.4. TSCUH

The PCCU in TSCUH has a maximum capacity of 9 beds.
- A separate 6 bedded neonatal HDU provides care for infants up to 5kgs requiring high dependency care only. Infants requiring invasive ventilation are transferred to PCCU.

Children with complex care needs who are technology dependent and/or long term ventilated are currently cared for across the ward areas within the hospital.
9.5. Current Workforce in PICU

The Paediatric Intensive Care Society (2015) have indicated an establishment of at least 7.01 qualified nurses per bed for children in the PCCU setting. The current staffing numbers in the PCCUs are outlined in Table 1 below, and allow for:

5.5 nurses per paediatric critical care bed and 3.5 nurses per high dependency bed.
We recognise that this is the minimum safe standard that we apply when challenged with staffing numbers.

Table 1: Current PCCU workforce arrangements

<table>
<thead>
<tr>
<th>Data</th>
<th>OLCHC</th>
<th>TSCUH</th>
<th>NCH</th>
</tr>
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<tbody>
<tr>
<td>Abbreviations</td>
<td>PCCU</td>
<td>Paediatric Critical Care Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CICU</td>
<td>Cardiac Intensive Care Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HDU</td>
<td>High Dependency Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DNM</td>
<td>Divisional Nurse Manager</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CNM</td>
<td>Clinical Nurse Manager</td>
<td></td>
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<tr>
<td></td>
<td>CNF</td>
<td>Clinical Nurse Facilitator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HCA</td>
<td>Health Care Assistant</td>
<td></td>
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<tr>
<td></td>
<td>ANP</td>
<td>Advanced Nurse Practitioner</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SN</td>
<td>Staff Nurse</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WTE</td>
<td>Whole Time Equivalent</td>
<td></td>
</tr>
<tr>
<td>Beds</td>
<td>PCCU x 18 beds</td>
<td>Beds x 9</td>
<td>PCCU/CICU x 42 beds</td>
</tr>
<tr>
<td></td>
<td>HDU x 5 beds</td>
<td>HDU x 6</td>
<td></td>
</tr>
<tr>
<td>Current funded staffing of PICU</td>
<td>DNM x 1 WTE (not exclusive to PICU)</td>
<td>DNM x 1 WTE (not exclusive to PICU)</td>
<td>DNM x 1 WTE- Cardiac and General Critical Care only-42 beds</td>
</tr>
<tr>
<td></td>
<td>CNM3 x 1 WTE (Manager)</td>
<td>CNM3 x 1</td>
<td>CNM3 x 2 (Manager)</td>
</tr>
<tr>
<td></td>
<td>CNM3 x 1 WTE (ECLS)</td>
<td>CNM2 Shift Leaders x 5.1 WTE</td>
<td>CNM3 x 1 (ECLS)</td>
</tr>
<tr>
<td></td>
<td>CNM2 Shift Leaders x 11.5 WTE</td>
<td>SN x 41.22 WTE</td>
<td>CNM 2 Shift leader x 21 WTE</td>
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<td>SN x 116.5 WTE</td>
<td>SN x 1.9 WTE</td>
<td>CNM 2 x 1 WTE (ECLS)</td>
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<tr>
<td></td>
<td>CNF x 3.5 WTE</td>
<td>CNF x 9 WTE</td>
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<tr>
<td>Model of Care for Paediatric Critical Care</td>
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</table>

<table>
<thead>
<tr>
<th>Foundation Course Coordinator x 1 WTE</th>
<th>PCCU Graduate Diploma Coordinator x 1 WTE</th>
<th>Research Nurse CNM 2 x 1 WTE</th>
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<tr>
<td></td>
<td>ICIP nurse x 0.8 WTE</td>
<td>Audit nurse x 0.5 WTE</td>
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<td></td>
<td>HCA x 1.8 WTE</td>
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<td></td>
<td></td>
<td>HCA x 5 WTE</td>
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<table>
<thead>
<tr>
<th>Nursing Shift Arrangements</th>
<th>Nursing Shift Arrangements</th>
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<tbody>
<tr>
<td>39 hours/week</td>
<td>39 hours/week</td>
<td>39 hours/week</td>
</tr>
<tr>
<td>11.14 hours per shift</td>
<td>11.5 hour shifts</td>
<td>12 hour shifts</td>
</tr>
<tr>
<td>Shift Leader every shift</td>
<td>Shift leader every shift</td>
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<table>
<thead>
<tr>
<th>Nurse: Patient ratio</th>
<th>Nurse: Patient ratio</th>
<th>Nurse: Patient ratio</th>
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<tbody>
<tr>
<td>Operate on levels of care</td>
<td>Operate on levels of care</td>
<td>Operate on levels of care</td>
</tr>
<tr>
<td>0.5:1, 1:1, 2:1 as per PICS standards 2015</td>
<td>0.5:1, 1:1, 2:1 as per PICS standards 2015</td>
<td>0.5:1, 1:1, 2:1</td>
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<table>
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<tr>
<th>Nursing turnover rates over past 5 years</th>
<th>Nursing turnover rates over past 5 years</th>
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<tbody>
<tr>
<td>2016 – 14%</td>
<td>2015 – 9.6%</td>
<td>2014 – 6%</td>
</tr>
<tr>
<td>2015 – 22%</td>
<td></td>
<td>2013 – 6%</td>
</tr>
<tr>
<td>2014 – 15.8%</td>
<td></td>
<td>2012 – 13%</td>
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<tr>
<td>2013 – 12.6%</td>
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<td>2011 – 9.3%</td>
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<table>
<thead>
<tr>
<th>Initiatives around recruitment</th>
<th>Initiatives around recruitment</th>
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<tbody>
<tr>
<td>Local, National and International recruitment campaigns ongoing in collaboration with HR department</td>
<td>Continuous recruitment drive advertised on hospital web site plus Nationally and Internationally</td>
<td>Local, National and International recruitment campaigns ongoing in collaboration with HR department</td>
</tr>
<tr>
<td>Structured career pathway for PCCU nurses</td>
<td>Structured Career Pathway for PCCU Nurses</td>
<td>Encourage students whilst on placement to consider PCCU as a career</td>
</tr>
<tr>
<td>Encourage students whilst on placement to consider PCCU as a career</td>
<td>Encourage students whilst on placement to consider PCCU as a career</td>
<td>Encourage students whilst on placement to consider PCCU as a career</td>
</tr>
<tr>
<td>Back to Nursing Campaign Local ward to unit rotation programme</td>
<td></td>
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</tr>
</tbody>
</table>
### Model of Care for Paediatric Critical Care

| ECLS Team | 20 WTE from overall PCCU complement provide 24/7 cover to this service and patient cohort. | N/A | 23 WTE CNM3 Coordinator CNM2 deputy |
| CVVH Team | 20 WTE from overall PCCU complement provide 24/7 cover to this service and patient cohort. | 10.5 WTE are fully trained in CVVH and TPE, and 6 WTE have nearly completed their hours | CVVH Nurse x 38 WTE |
| Retrieval Service | 1.5 WTE (from 116.5 WTE) dedicated to retrieval ANP x 1 (currently in training) | | |

**Concerns and Initiatives around retention**

Problems with burnout and constant level of activity. Leavers seek promotion, better cost of living and relocation. A highly marketable workforce.

Range of initiatives –
- Investment in induction, orientation
- Robust career pathway
- Specific training for ECLS, CVVH & Retrieval
- Developmental pathways/Performance management
- Consultative forums
- Flexible rostering
- Financial support for career development
- Staff facilities and family friendly arrangements

Problems with burnout, intensive work environment. Relocation and increased of living in Dublin.

Initiatives as discussed by OLCHC and TSCUH should be maintained. Other initiatives would include –
- The development of a CNM 1 grade for all nursing staff competent in CVVH, ECLS and Transport.
- The potential to skip an increment while working in PCCU. Transport facilities and car parking -24 hour access to the hospital over 7 day period.

### 9.6. Nursing Attrition, Recruitment and Retention

An international shortage of healthcare professionals has evolved over the last twenty years. In 2006, the World Health Organisation (WHO) estimated a global shortage of 4,300,000 healthcare professionals and more recently detailed a shortage of 2,400,000 nurses in India alone (Senior, 2010). Ireland in general, and children’s nursing in particular, are not immune to these international trends.
Many factors are cited for these shortages, including the increasingly complex nature of paediatric healthcare which directly creates the need for more nurses. From a supply perspective, factors influencing the recruitment and retention of nurses include a diminution in the number of nurse training positions, an aging workforce, increased turnover due to employee dissatisfaction, recruitment freezes arising from reduced health spending, and an over-reliance on developing countries as a nursing market (Clarke, 2010, Humphries et al., 2012, Buchan et al., 2013).

Nursing recruitment and retention has been a priority in PCCU for the past two decades. It is widely accepted that children should be nursed by appropriately qualified nursing staff and in the case of critically ill children they should be nursed in appropriately staffed PCCUs. Nurses are an integral part of the intensive care team and their contribution is indeed vital in ensuring that OLCHC and TSCUH can provide a high quality critical care service. The current PCCU workforce is predominantly a young workforce, and information from both PCCUs show that retention of this cohort of nurses is heavily influenced by the cost of living in Dublin, long commutes and parking availability.

An additional factor which influences retention of staff and increases the need for effective and robust recruitment strategies is the proportion of aging workforce who are within 5 years of retirement. It is estimated that approximately 13% of the current PCCU workforce will retire within the next 5 years. This experienced and senior cohort of nurses make a significant contribution to the PCCU and consideration must be given to means by which they can be supported to remain in the workforce for longer.

9.7. Skill Mix

Historically Ireland has been an exporter of nurses, particularly to the United Kingdom (UK), United States (US) and Australia. However, from the late 1990s, Ireland began to experience nursing shortages due to reduced training numbers, increased turnover and expanding healthcare services. In response Irish hospitals, supported by the Department of Health (DOH), began an aggressive overseas recruitment programme in 2000 targeted at the Philippines and India which were recognised exporters of nurses. This significantly changed the profile of nursing in Ireland from 2000-2010, when 35% of new recruits into the Irish nursing labour market were non-EU migrant nurses (Nursing & Midwifery Board of Ireland (NMBI), 2015). Consequently Ireland became proportionately more reliant on the international nursing market than the UK, US or Australia (Humphries et al., 2012).
There is increasing evidence that skill mix impacts on the quality and safety of patient care and outcomes (Aiken et al. 2016). The development of clinical competence for PCCU nurses is underpinned by Benner’s theory of Novice to Expert (1984), and these stages of competence are used in the PCCU to determine the skill level at which each nurse is practising (Appendix 1):

The novice nurse has little or no experience of the situations in which he/she is expected to perform. The novice nurse will perform safely and effectively with constant supervision.

The advanced beginner has prior experience and operates on general guidelines and has the ability to perceive recurrent meaningful patterns in clinical practice. A practitioner at this level will still require support and guidance with critically ill patients.

The competent practitioner has in depth knowledge and exposure and is capable of delivering safe and effective care to critically ill PCCU patients without direct supervision.

The proficient nurse understands a situation as a whole because they perceive its meaning relative to long-term goals. The proficient nurse learns from experience what typical events to expect in a given situation and how plans need to be modified in response to these events. The proficient nurse can recognise when the expected normal picture does not materialise.

9.8. Education and Training - Planning for the future

The PCCU nursing mission is to constantly improve the health and wellbeing of children and adolescents in a safe environment which is driven by quality healthcare and supported by excellence in knowledge, education and research. A children’s nurse has achieved a competent standard of practice following successful completion of an approved academic and practical programme of nursing education at undergraduate or post-registration level. Following this, continuing professional development (CPD) takes place after completion of nursing registration education programmes. It consists of continuing education and learning experiences that are designed to augment the knowledge, skills and attitudes of a registered nurse (NMBI 2015). The Nurses and Midwife Act (2011) creates a legislative imperative for employers of registered nurses to facilitate the individual nurse’s maintenance of her/his professional competence, pursuant to a professional competence scheme.
A continuing education programme is required to ensure staff remain competent with rapidly evolving critical care therapies. It should be compliant with the requirements for training, accreditation and maintenance of professional skills of all critical care professionals (JICMI 2011). The transition challenges for a new nurse into the PCCU are substantial and well recognized. Teamwork and collaboration are important foci to create and maintain a healthy work environment. Maintaining and enhancing knowledge, skills and competencies are factors in improving overall recruitment and retention. The PCCU nurse will have unique knowledge and skills to care for and manage critically ill children and their families.

9.9. PCCU CPD Pathway

The PCCU has a robust and systematic professional development pathway to support nurses practicing in the PCCU environment. This CPD pathway is outlined in Table 2:

Table 2: CPD Pathway for PCCU Nursing

<table>
<thead>
<tr>
<th>Programme</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>Six weeks (2 weeks theory and 4 weeks supervised practice with preceptor)</td>
</tr>
<tr>
<td>Basic Ventilation Study Day</td>
<td>Mandatory study day</td>
</tr>
<tr>
<td></td>
<td>Undertaken following 6 months experience</td>
</tr>
<tr>
<td>Paediatric Critical Care Foundation Programme</td>
<td>Level 8 Programme (QQI) in partnership with UCD</td>
</tr>
<tr>
<td></td>
<td>9 month course</td>
</tr>
<tr>
<td></td>
<td>Undertaken following 12 months experience</td>
</tr>
<tr>
<td></td>
<td><strong>Aim of Programme</strong>: further develop the nurse’s body of knowledge,</td>
</tr>
<tr>
<td></td>
<td>skills and attitudes to enable them to develop a therapeutic and</td>
</tr>
<tr>
<td></td>
<td>holistic approach to care of the critically ill infant/child and their</td>
</tr>
<tr>
<td></td>
<td>families in the Paediatric Critical Care Unit environment.</td>
</tr>
<tr>
<td></td>
<td><strong>Expected Outcomes</strong>: On completion of the Foundation Programme nurses will be practicing at an advanced beginner level.</td>
</tr>
<tr>
<td>Advanced Ventilation Study Day</td>
<td>Undertaken following the Foundation Programme</td>
</tr>
<tr>
<td>Graduate Diploma Critical Care Nursing (Children)</td>
<td>Level 9 (QQI) in partnership with UCD</td>
</tr>
<tr>
<td></td>
<td>9 month Programme</td>
</tr>
<tr>
<td></td>
<td><strong>Aim of Programme</strong>: This programme will build on existing knowledge</td>
</tr>
<tr>
<td></td>
<td>and skills in caring for infants and children within the paediatric</td>
</tr>
<tr>
<td></td>
<td>critical care setting.</td>
</tr>
</tbody>
</table>
**Expected Outcomes:** Possessing this advanced knowledge will enable utilisation of a range of therapeutic interventions, and enhances a nurse’s ability to review differing approaches and trends in the care and treatment of infants and children in paediatric critical care nursing. On completion of the Graduate Diploma in Critical Care nurses will be practicing at a senior level.

**Further CPD opportunities**

PCCU nurses have the opportunity to develop further in areas of CVVH, ECLS and Retrieval, supported by further education and training programmes within the PCCU and through the Centre for Children’s Nurse Education.

Nurses are also supported to attend Paediatric Life Support and Advanced Paediatric Life Support study days.

Additional study days that support the PCCU nursing CPD pathway are:

- Preceptorship
- Intravenous
- Infection prevention and control
- Breastfeeding
- PaedAIM
- Quality
- Total Parenteral Nutrition
- Enteral feeding
- Child protection
- Basic and advanced ventilation days
- Medication management

**Advanced Nurse Practitioner**

Advanced nurse practitioners adjust the boundaries of nursing; pioneering and developing clinical roles sensitive and responsive to the changing needs of critically ill children and their families. The development of the role of the ANP is influenced by international, national and local drivers which have impacted significantly on the current provision of nursing and medical staffing.

The future aim is to have a team of 10 WTE PCCU ANPs.

These individuals will be expert nurses with a strong foundation and dedication to PCCU.
Vision for ANP

- CICU x 3 WTE
- PCCU x 3 WTE
- Outreach team x 4 WTE.

Duties would include:
- Autonomy in clinical practice
- Expert practitioner in the specific speciality
- Pioneering professional and clinical leadership
- Audit and Research

Outreach ANP:

To develop an independent 24 hour outreach team throughout the hospital a team of 4 ANPs would be required. Role of an outreach ANP would include:
- Respond to PEWS calls
- PCCU follow up on discharge.
- Initiating treatment at ward level.
- Respond to ‘2222’ calls.

PCCU & CICU ANP:

3 ANPs will be allocated to PCCU and 3 ANPs allocated to CICU, with the intention of progressing to providing a 24 hour service 7 days per week.

Duties will include:
- Contribution to the management of children’s illness/health.
- Monitoring and managing the delivery of a quality health service within the PCCU
- Stabilization of a child/infant while providing physical and psychological care measures
- Leading and developing practice
Innovation and practice development based on evaluation and research. The development of an outreach ANP in regional paediatric/neonatal centres is pivotal to a model of care that reflects the national vision for caring for children in hospital. Role will include assessment and instigation of early intervention of treatment for paediatric and neonatal patients in regional centres. The lead centre will be available for further advice or to arrange transfer to the national centre.

9.10. Supporting Documentation

The hospitals have developed numerous clinical and nursing guidelines to support clinical practice. Nurses in the PCCU have been actively involved in developing these, for example:

- Treatment of major conditions such as meningococcal disease, sepsis, diabetic ketoacidosis, status epilepticus, status asthmaticus, Drug administration and medication management, Intubation/extubation guidelines and Suctioning, Care of the neurosurgical patient, Pain management, Tracheostomy management, ECLS/CVVH, End of life care, Infection control, Breast feeding

9.11. ECLS Service

Extra Corporeal Life Support (ECLS) is an advanced life support system acting as a modified form of heart lung bypass facilitating the support of neonates and children with severe respiratory or cardio-respiratory failure who have continued to deteriorate despite receiving optimal conventional therapies.

The ECLS programme was established in 2005 to support a small but critically ill group of initially cardiac children who could not survive without ECLS.

OLCHC ECLS programme is a member of the Extracorporeal Life Support Organisation (ELSO), an international organization which supports health care professionals who are involved in ECLS. The agreed dataset of patient data is collected by ELSO, which allows us to compare our patient population and outcomes internationally against other ECLS centres. ELSO data can be used for educational purposes and to support clinical research. ELSO guidelines are utilised for training ECLS Specialists and maintaining competencies.
9.12. Training

Training for ECLS specialists consists of 3 days of didactic lectures and demonstrations, followed by 44 hours of supervised training and a written exam. Specialists maintain their skills every year by maintaining a minimum of 69 pump hours, attending a refresher day, sitting a written exam and performing practice water labs at regular intervals. OLCHC currently has 20 WTE ECLS specialists trained providing 24/7 cover.

9.13. Respiratory ECLS

At present the ROI Respiratory ECLS service is not funded by the HSE, therefore any infant/child requiring respiratory ECLS is referred abroad. Currently approximately 8 - 10 infants/children per annum require respiratory ECLS and up to 60% are referred from Neonatal ICU’s outside of the PCCU’s. With respect to Infants and children inpatients in OLCHC emergency ECLS can be initiated by the cardiac ECLS team, but only on the proviso that a bed is and a bed is sought outside the state. This state of affairs is neither satisfactory nor best practice.

The time from commencement of ECLS to transfer has been 6-52 hours, depending on bed availability, the availability of a suitable transport team, a suitable vehicle and weather conditions.

Based on a recent audit carried out it is clear that the cost of funding ECLS abroad over an 8 year period has cost in excess of 8 million Euro. With further expansion of infrastructure and staffing and at a lower cost it is clear that it would be possible to supply respiratory ECLS to the children of ROI avoiding sending respiratory failure patients requiring ECLS abroad with its added risk and difficulty to the families of these children.

The risks associated with the transfer abroad of critically ill neonates along with the additional stress and anxiety for families make it difficult to justify continuing to refer this patient group abroad when the costs associated with the referral could be redistributed towards the expansion of the service at OLCHC.

Recommendations for expansion to respiratory ECLS service

The ELSO guidelines (2014) advise:

- ECLS Centres should be located in tertiary centres with a tertiary level PCCU.
- In order to be cost effective and to develop clinical expertise an ECLS Centre should be developed in geographic areas that can support a minimum of 6 ECLS patients per year.
ECLS Centres should be actively involved in the ECLS Organisation (ELSO) including participation in the Central Register.

- Availability of haematology, blood transfusion and biochemistry services on a 24 hourly basis.
- Support services of paediatric cardiology and cardiothoracic surgery and availability of cardiac theatres, respiratory, radiography and ultra-sonography, biomedical engineering, general surgical, radiology, neurology, nephrology, genetics, occupational therapy and developmental expertise.
- Facilities to provide long term follow up of this cohort of patients.

Based on the above criteria and cardiac ECLS activity to date, the development of a National Paediatric ECLS Centre in Ireland is supported.

Many international ECLS programmes were started to support neonates in respiratory failure due to conditions such as Meconium Aspiration Syndrome, Persistent Pulmonary Hypertension and Congenital Diaphragmatic Hernia. This group of patients currently have the best outcomes with ECLS, with over 71% survival rate (ELSO 2016).

In 2016 the average run length for neonatal respiratory cases was 7.5 days (ELSO 2016). In 2016 the average run length for paediatric respiratory cases was 11.7 days (ELSO 2016).

Based on figures extrapolated from Ireland and the UK (4 centre meeting 2015) we can reasonably assume that the demand for respiratory ECLS in the future will be:

- 6 –12 neonatal cases per year, but on average 5 neonates per year have been transferred overseas from Irish Republic from 2011-2015
- 4 paediatric cases per year

However, from data received it is clear that the referral rate for assessment for ECLS must be considered. Assuming 5 PCCU bed days per patient would be required for assessment, this would result in an additional 100 PCCU bed days (for neonatal group) as a minimum. As these neonates do not currently come to OLCHC this should be considered as additional activity for this hospital. Also while neonatal cases will be transferred back to referring centres following their ECLS run, paediatric patients will not. This patient group will remain in PICU and inpatient ward areas in OLCHC.
In order to accommodate respiratory ECLS, the team will need to expand to 25WTE. To avoid closure of beds during an ECLS run (nurse ratio 2:1 as per PICS standards) a further 5 WTE staff nurses will need to be accounted for in the unit complement.

<table>
<thead>
<tr>
<th>ECLS SPECIALISTS</th>
<th>CURRENT COMPLEMENT</th>
<th>FUTURE COMPLEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20WTE</td>
<td>25WTE</td>
</tr>
</tbody>
</table>

9.13.1. CVVH and Plasma Exchange

OLCHC currently have 16.5 WTE trained CVVH specialists providing cover 24/7.

Training consists of a day of didactic lectures and practical demonstrations, followed by 30 hours of supervised training. Specialists maintain their skills by attending a yearly refresher day, maintaining 40 hours per year of CVVH care and by attending practical sessions for lining and priming the pump. We are affiliated with PICANet for renal data collection and to audit current practices to potentially drive future research into best practice.

Plasma Exchange is available to the PCCU patient population, but at present is delivered by Apheresis specialists. It is planned that this service will be provided by PCCU nursing in the future.

In TSCUH there are 10.5 WTE fully competent in CVVH and TPE. There is a competency document which the practitioner must complete before taking CVVH alone, which includes an 8 hour study day followed by 33 hours of supervised training. Thereafter, the practitioner attends a yearly updated lecture and practical sessions to ensure continued competence. TSCUH is also affiliated with PICANet.


In Ireland, the specialist paediatric critical care transport medicine team is known as IPATS: Irish Paediatric Acute Transport Service. IPATS is an arms-length service from the Paediatric Critical Care services of OLCHC, and TSCUH.
The term ‘arms-length’ refers to the distinction between the operational standards, funding, organisation and reporting structure of IPATS, which is to the National Transport Medicine Programme (NTMP).

Clinical performance, professionalism and professional accountability and staffing of the IPATS service are to the hospital where the nurse is employed under the following criteria:

Each nurse, or nurse practitioner, will report to the Director of Nursing (DON) in the hospital where the nurse is employed.

The clinical competencies of a nurse on the IPATS team are defined by the IPATS training document as it pertains to transport medicine.

It is understood that the nurses are competent and proficient in the practice of Paediatric Critical Care Medicine (PCCM) prior to undertaking training for IPATS and becoming part of the team.

The role of the ANP in Transport is critical to the future model of this service.

Minimum Standards/criteria for nursing staff are defined by the NTMP.

9.14.1. Training and Education

- All new nursing staff will undergo a Paediatric Retrieval and Transport Induction course hosted by the NTMP.
- Subsequently, nursing staff will be expected to complete a competency document in line with the Paediatric Critical Care and Neonatal Transport Group standards.
- All nursing staff are required to undergo training on all equipment, resources and modes of transfer and keep up to date with relevant policy changes.
- Training will be recorded on the Education database and reviewed on an annual basis.
- Post the Paediatric Retrieval and Transport Induction course, all nursing staff will complete three “buddy” shifts, and will complete training competencies as set out by the programme. If extra shifts are deemed necessary, these will be facilitated post discussion with Retrieval Consultant and Retrieval Coordinator.

- Currently the NTMP provides funding towards Advanced Nurse Practitioner training in the UK for suitable candidates.
- Advanced Nursing Practitioners play a pivotal role in international paediatric retrieval teams. They provide direct expert clinical care for paediatric patients in the retrieval environment. They perform at an advanced level independently but with the support of the Retrieval consultant enhancing the robustness of the retrieval service.

<table>
<thead>
<tr>
<th>Projected posts for ANP for Retrieval Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 – 1 WTE post</td>
</tr>
<tr>
<td>2018 – 1 WTE post</td>
</tr>
<tr>
<td>2019 – 2 WTE posts</td>
</tr>
<tr>
<td>2020 – 3 WTE posts</td>
</tr>
</tbody>
</table>

9.15. PICU Advanced Nurse Practitioners (ANP)

Advanced practice in Ireland refers to registered nurses and registered midwives who engage in continuing professional development (CPD) and clinical supervision to practice as expert practitioners and demonstrate exemplary clinical leadership (NMBI). The ANP provides health care to patients and families and demonstrates a high level of independence. ANPs collaborate with the critical care team in developing and delivering a plan of care that is dynamic. ANPs combines clinical practice with education, research, consultation and leadership.

9.16. Future Essential Requirements

The PCCU environment should have appropriate facilities for families, patients and staff:

- There should be an area off the unit where families can sit and have time with relatives.
- Families should be provided with a kitchen for food preparation and an area with toilet and shower facilities that include a baby changing area.
- Families should be provided with breast feeding and expressing facilities on the unit or as close to the unit as possible.
• Families should be provided with accommodation that is in close proximity to PCCU.

• Families should have access to 24/7 chaplaincy and bereavement support. Medical social workers, interpreters and patient advocacy should also be easily available to families.

• Patients should have a play therapist available to them so that play, distraction and stimulation can be provided for.

• A psychology team is necessary to provide psychotherapy to parents as they go through the PCCU experience.

• A PCCU liaison officer for parents will be needed to provide ongoing support for parents and families.

• In addition, the PCCU should have access to an out of hour’s pharmacist which would be of benefit to patients.

• Access to out of hours ward clerk cover to support service delivery would be extremely beneficial as this would maximise nurse patient contact and provide efficiencies in the service where telephones could be answered without delay, admission and discharge paperwork efficiencies would be enhanced and the intercom for families could be answered at all times in an appropriate timeframe.

• Staff require changing, showering and eating facilities.

• A quiet room should be provided for staff to self-care during break times away from the eating area.

• A library for staff to have access to IT and journals should be provided.

• Given the critical nature of the environment staff should also have access to a psychology team and bereavement counselling.

9.17. Conclusion

PCCU requires a Model of Care tailored to the specific patient population and unique considerations of the environment. The role of the Intensive care nurse, current workforce shortages and alternate staffing models are some of the challenges that need to be explored as subjects of further research so that we can create some solutions whilst looking at new ways to care for critically ill patients in the future.
References


http://qualitysafety.bmj.com/content/early/2016/11/03/bmjqs-2016-005567.full.pdf+html


Nursing and Midwifery Board of Ireland (2015) Scope of Practice for Nursing and Midwifery. NMBI, Dublin.


10. **PAEDIATRIC NEURO-CRITICAL CARE**

Pending
11. **PHARMACY**

11.1. **Introduction**

The substantial use of medications to maintain comfort and sustain life in patients in PCCU requires considerable clinical pharmacist input, particularly as many of the agents are high-risk medications, further compounded by the complexity of prescribing for paediatric patients. The clinical pharmacist has been shown to be an essential member of the critical care multidisciplinary team, providing not only clinical input from their daily medication review for patients resident in the unit, but also showing benefit in reducing incidences of adverse events, costs and mortality rates. (Bond and Raehl, 2007, Horn and Jacobi, 2006, Kopp et al., 2007, Krupicka et al., 2002, Montazeri and Cook, 1994, Silas and Tibballs, 2010, Schneider et al., 1998, Maaskant et al., 2015)

Paediatric patients, particularly those in critical care, are at particular risk from medication errors. Risk factors include the requirement for individualised weight-based dose calculations for patients weighing less than 1kg to over 100 kg, widespread manipulation of adult dosage forms due to lack of paediatric licensed preparations and increased severity of illness and number of medications, particularly by the intravenous route. (AAP Steering Committee on Quality Improvement, 2011, Kaushal, 2001, Lesar et al., 2006, Ghaleb et al., 2010, Bumanglag et al., 2012) 10% of all incidences reported to the Irish national incident reporting scheme relate to medications, the most common incident type.(State Claims Agency)

Interventions proposed to improve medication safety, include ward-based clinical pharmacists and the increased use of technology across the entire medication use process. (AAP Steering Committee on Quality Improvement, 2011, Council on Clinical Information Technology Executive Committee, 2013, Maaskant et al., 2015, Rinke et al., 2014, Manias et al., 2014). All medications are currently ordered electronically in PCCU in OLCHC but lack of adequate pharmacy resources has to date resulted in the failure to implement electronic prescribing in TSCUH.

The use of standardised concentration infusions (SCIs), replacing traditional weight-based paediatric infusions, and the use of smart pump technology have both been advocated by international safety agencies to reduce the particular risks associated with paediatric infusion errors (Institute for Safe Medication Practices, 2009, National Patient Safety Agency, 2007, Larsen et al., 2005, Iacovides et al., 2014, Irwin et al., 2008, Hilmas et al., 2010).
A cross-site multi-disciplinary project has ensured that the majority of all infusions are currently run via a standardised infusion pump drug library. A broader scale national project is underway to extend this system to neonatal patients in maternity hospitals, including during transport.

At the time of writing, funding was being sought for the requisite resources to ensure full national implementation occurs. Paediatric patients outside of the two tertiary care centres requiring stabilisation prior to retrieval do not currently have access to this system for delivery of continuous by the infusions. Currently all medications, including high-risk medications for infusion, are prepared at the bedside by nursing staff. Enhanced utilisation of nursing resources, reduction in medication wastage and substantial benefits from a medication safety perspective would be realised by the provision of a Centralised Intravenous Additive Service (CIVAS).

Adequate pharmacy resources are required to ensure continued development of health information technology PCCU, in line with Ireland’s current eHealth strategy. Priority future developments include expansion of electronic prescribing to the PCCU in TSCUH and to theatres at both sites, the introduction of ready-to-use infusion solutions and the use of bar-coded single use medications.

The importance of the role of hospital pharmacists in the design, specification of parameters and evaluation of health technology within the medicines processes is well recognised. (European Association of Hospital Pharmacists, 2014, American Society of Health-System Pharmacists, 2011)

Currently there are no national guidelines or standards with regards to pharmacy resources for PCCU. Currently neither PCCU is in line with UK standards(Paediatric Intensive Care Society UK, 2010) nor adult recommendations (NCPCC, 2014, Society of Hospital Pharmacists of Australia, 2011).

11.2. Education/Training and Competencies

Currently there is no specialist training for PCCU pharmacists.

The Hospital Pharmacists Association of Ireland (HPAI) is currently involved in negotiations with the DOHC/HSE regarding the implementation of new career structures, as detailed in the Report on the Review of Hospital Pharmacy (November 2011).
If successful, this will help to validate specialist pharmacist posts.

The Pharmacy Education and Training Reform Programme underway in spring 2013 comprised:

- Core Competency Framework for Pharmacists in Ireland; published in August 2013 by the Pharmaceutical Society of Ireland (PSI). This document was designed to help provide a platform for the development of advanced/specialist practice frameworks.
- A CPD model was finalised in 2013 and in the 2014 the Irish Institute of Pharmacy (IloP) was established at the Royal College of Surgeons in Ireland (RCSI). The latter will facilitate training and education for specialisation and advanced practice.

11.3. Current Service Provision

**Technician Services** OLCHC has a twice-weekly ward top-up to ensure there is efficient drug supply of all stock medicines to the unit. TSCUH does not currently have a PCCU technician service.

**PCCU Pharmacists** Monday to Friday daily clinical review of patients resident in PCCU, including providing advice on therapeutic drug monitoring, drug handling in critically ill children, including during the utilisation of CVVH and ECLS, IV infusion compatibilities and the management and weaning of sedatives and analgesia.

- Orders/dispenses all non-stock medicines (OLCHC only). In TSCUH, the PCCU pharmacist oversees the dispensary supply of medicines to PCCU.
- Safe prescribing training of PCCU medical trainees
- Reporting of PCCU medication errors and medication safety issues
- Input to PCCU clinical and nursing guidelines, SOPs and drug monographs
- Educational lectures to PCCU nursing staff from both sites as part of the Graduate Diploma in Nursing (Paediatric Critical Care), CVVH and ECLS Specialist Training Courses

11.4. Proposed Model of Care

**Recommendation 1: (based on UK PICS Standards 2010)**

Increase PCCU pharmacy resources to:

- 0.1 WTE post per Level 3 Critical Care bed, at Senior Pharmacist grade or higher.
- 0.07 WTE post per Level 2 Critical Care bed, at Senior Pharmacist grade.
11.5. Adequate clinical pharmacist resourcing would facilitate the following:

- All patients in PCCU to receive a daily clinical pharmacy review of all medications. Current resources often only allow partial unit review.
- PCCU pharmacists’ attendance at morning and evening ward rounds.
- Extend the number of patients for whom individualised weaning schedules can be provided. Current weaning is sub-optimal and may be delaying extubation and discharge from PCCU.
- Medicine Reconciliation on all admissions to and discharges from PCCU in line with recent HIQA recommendations ‘Principles of Good Practice in Medication’ (2014). The transcription from electronic to paper orders is a particularly problematic area at the point of discharge from PCCU.
- Allow all medication related guidelines and protocols to be completed and kept up to date
- Facilitate research in medication use in PCCU to reduce the extensive lack of evidence based practice
- Regular rotation of all senior pharmacists (or equivalent future grade) to PCCU at each respective site for training purposes and to facilitate covering in the absence of the PCCU pharmacists.

Recommendation 2:

- Appointment of a lead clinical PCCU pharmacist and a joint PCCU pharmacy working group to agree clinical governance structures that will facilitate further standardisation of all guidelines, including IV administration guidelines electronic drug files, drug formulary and protocols across both sites. This would also facilitate input into paediatric specific national guidelines.

Recommendation 3:

Provision of further Informatics Pharmacy resources to:

- Support and deliver implementation of a national drug library of paediatric standard concentration infusions to all sites involved in the stabilisation, transfer and care of critically ill neonatal and paediatric patients
- Allow review of current clinical information management system (CIMS) configuration in TSCUH to facilitate the implementation of electronic prescribing at that site using the OLCHC drug file.
- To facilitate the increased use of pharmacy informatics such as automated dispensing cabinets and barcoded single use medications
**Recommendation 4:**
Provision of a dedicated part-time pharmacy resource allocated to IPATS and the National Neonatal Transport Team to improve current paper-based medication processes and to assist in the development of guidelines for the stabilisation of all neonatal and paediatric patients in non-specialist centres prior to transfer to a PCCU bed.

**11.6. Requirements for Successful Implementation of Model of Care**

Summarise in the following table format:

<table>
<thead>
<tr>
<th>Infrastructure</th>
</tr>
</thead>
</table>
| - Centralised Intravenous Additive Service (CIVAS) for the preparation of all intravenous medications  
- Smart-pump and associated drug files for all paediatric patients in regional hospitals without PCC beds.  
- Access to a national electronic paediatric drug formulary for all sites, including during retrieval.  
- In the absence of a National Electronic Health Record, access to electronically generated medication reports at point of discharge from PCCU |

<table>
<thead>
<tr>
<th>Human Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current</strong></td>
</tr>
</tbody>
</table>
| OLCHC: Current PCCU pharmacist cover = 1.0 WTE, less regular and requisite dispensary cover/pharmacy department duties.  
TSCUH: Current PCCU pharmacist cover = 0.5WTE | Paediatric Intensive Care Society (PICS) Standards for the Care of Critically Ill Children (4th Ed.) Version 2 (June 2010): 0.07 to 0.1 WTE Clinical Paediatric Pharmacists for each single level 2 or 3 intensive care bed. This equates in PCCU, OLCHC to 1.61 – 2.3 WTE for 23 beds, and in TSCUH to 0.63 – 0.9 with appropriate ward cover in their absence. |
Specific requirements in education and training

Specialist training for PCCU pharmacists. This is dependent on successful completion of the on-going protracted negotiations on the between the HPAI and the DOHC/HSE on implementation of the 2011 Report on the Review of Hospital Pharmacy.

Interdependencies with other clinical programmes

Model of Care for Paediatrics
Model of Care for Paediatric Anaesthesia

11.7. Programme Metrics and Evaluation

- Medication Error reports
- No. of PCCU patients without daily clinical pharmacist review
- No. of paediatric centres without access to appropriate and current paediatric medicines information
- No. of infusions not administered not via a smart-pump drug library
12. PHYSIOTHERAPY

12.1. Introduction

Physiotherapy is an integral and important part of the treatment and management of infants and children with a wide range of complex conditions in the Critical Care Unit. The Physiotherapy Departments in OLCHC and TSCUH provide a 24/7/365 Service to all respiratory patients in the hospitals including the Critical Care Units. Physiotherapy is the only AHP group that provide an on-call and weekend service.

12.2. The Role of the Physiotherapist in the Paediatric Critical Care Unit includes:

- Respiratory Physiotherapy
- Modified Broncho-alveolar Lavage (MOD BAL)
- Active assisted and passive range of movement for patients on ECLS
- Early mobility and rehabilitation for different patient groups
- Early neuro-rehabilitation for neurosurgical patients
- Mandatory on-call training package for non-critical care Physiotherapists
- Evidence based practice PCCU Physiotherapy Clinical guidelines
- Induction of new staff members
- Undergraduate training

12.3. On-call and Weekend Respiratory Physiotherapy Service:

The Physiotherapy Departments in OLCHC and TSCUH provide a 24-7, 365 day service to all respiratory patients in the hospital but largely the Critical Care Units, with TSCUH providing some orthopaedic and neurosurgical cover also.

In each setting there is 1WTE physiotherapist allocated to cover weekend duty Friday, Saturday and Sunday night on-call and Saturday and Sunday day duty.

There is 1WTE physiotherapist allocated to on-call duty each weekday night.
12.4. Education, Training and Competencies

In addition to managing a clinically complex caseload and supervising junior staff, education and training of non-critical care physiotherapy staff providing an on-call and weekend service demands experienced Senior and Clinical Specialist Physiotherapy staff. The rotation of junior staff through PCCU also achieves competency for the on-call and weekend service.

Currently there is no specialist training for PCCU Physiotherapists in Ireland. Due to the unique nature of the job role it is necessary to attend courses and conferences overseas to maintain, develop and share expertise e.g. there exists a working group in the UK for PCCU physiotherapists, which is affiliated to the APCP (Association of Paediatric Chartered Physiotherapists). The meetings are educational and are run on a six monthly basis. Attendance from Ireland would be highly recommended.

Mandatory on-call training and ongoing CPD is completed regularly by each PCCU and non PCCU physiotherapist in order to maintain competencies.

The Physiotherapy Departments in OLCHC and TSCUH also have a commitment to the training of undergraduate physiotherapists.

Each member of the Physiotherapy Department is eligible for membership of the Irish Society of Chartered Physiotherapist (ISCP), The National Physiotherapy professional body which entitles the member to use the title Chartered Physiotherapist. Chartered Physiotherapists represent the highest standard of practice and service and set the benchmark for professional practice in Ireland.

The Physiotherapy Profession is also currently undergoing regulation by CORU, Ireland’s multi profession health regulator. CORU aims to protect the public by promoting high standards of professional conduct, education, training and competence through statutory registration of health and social care professionals.

12.5. Allocation of Staff

In either of the paediatric hospitals there is no physiotherapist specifically allocated to the Critical Care Units alone.
Based on our statistics in OLCHC there are **2.3 WTE** Physiotherapy posts allocated to cover 25 PICU beds. In TSCUH the staffing provision is **1 WTE** physiotherapists for the 9 bedded PICU.

The National Institute for Health and Care Excellence CG 83, *Rehabilitation after Critical Illness*, NICE 2009, suggests staffing levels are **1WTE physiotherapist to 4** level 3 Critical Care beds. *Physiotherapy staffing should be adequate to provide both the respiratory management and rehabilitation components of care.*

The UK Intensive Care Society Standards Committee (National AHP and HCS Critical Care Advisory Group, 2003) recommend a staffing ratio of **1.0 WTE physiotherapists to 4.8 Critical Care beds**, assuming occupancy at 100%, a physiotherapy referral rate of 90% and a single physiotherapy session of 30 minutes each day or **0.2 WTE** dedicated physiotherapists per critical care bed.

No Paediatric specific Physiotherapy staffing: critical care bed ratios exist.

### 12.6. Future

The National Children’s Hospital has planned for 42 PCCU beds. It is imperative that future workforce planning in relation to physiotherapy services includes serious consideration to staffing of the day to day, on-call and weekend service for this bed number, ensuring adequate skill-mix and senior level support.

Staffing levels should also reflect the demand for the provision of on-call training and competency skills for non-critical care staff and the need for specialised overseas education opportunities in order to maintain and develop this level of expertise.

<table>
<thead>
<tr>
<th></th>
<th>Current staffing (both sites)- 34 PCCU beds</th>
<th>Proposed NCH staffing – 42 PCCU beds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weekend Duty</strong></td>
<td>2 WTE</td>
<td>4 WTE</td>
</tr>
<tr>
<td><strong>Day to Day Duty</strong></td>
<td>3.3 WTE</td>
<td>8.2 WTE</td>
</tr>
</tbody>
</table>
13. OCCUPATIONAL THERAPY

Occupational therapy is an essential component of the MDT in the Critical Care Unit and plays an integral role in the rehabilitation process. Occupational therapists facilitate early mobilisation, restore function, prevent further decline, and coordinate care including transition and discharge planning (AOTA, 2012). Occupational Therapists have a good understanding of the match between the patient’s needs, abilities and environment, which assists the patient’s successful transition to the home, community or next level of care, (AOTA, 2012).

13.1. Role of the Occupational Therapist in the Critical Care Unit

The initial role of the occupational therapist in the PCCU includes the prompt identification of changes in body structures and functions that place a child at risk of longer term impairments (College of Occupational Therapists 2015). An experienced occupational therapist carries out assessments when the child is medically stable enough to assess their ability to engage and participate in different occupations. Consideration is given to the child’s tolerance, response to the environment, communication ability, sensory processing and liaison with the family/caregivers and MDT team.

Roles may include:

- Provision of positioning aids for optimal positioning & to support respiratory care
- 24 hour postural management and pressure care interventions
- Prescription and provision of specialised seating
- Prescription and fabrication of thermoplastic splints to maintain or increase joint ROM
- Advice on moving and handling to facilitate activities of daily living
- Advice to support carer-child bonding and contact
- Prescription and advice on adaptations to PCCU environment to limit sensory overload
- Parental coaching to interpret the child’s sensory processing cues
- Assessment and management of tone
- Commencement of rehabilitation
- Supporting discharge from PCCU and transitions to ward or home
- Supporting children and their families to adapt to any loss of function
To date, Occupational Therapy staffing has not included on-call services for critical care; nor has it included weekend working. HSE services (under the direction of Haddington Road) will move towards seven-day service provision, and it is essential that consideration be given to increasing Occupational Therapy resources working in critical care. This will ensure sufficient staffing numbers for continuity of care for this patient cohort, and will further enable development of this vital role.

13.2. Competencies

Occupational therapists working in this area must be at a minimum of senior grade in order to take a clinical lead role within this area. This requires at least 3 years’ experience post qualification from an Undergraduate Bachelors or Master’s degree in Occupational Therapy and CORU registration. All Occupational Therapy staff, including students, working in critical care environments should receive clinical and professional supervision. At present there is no standard training that needs to be maintained on an annual basis to work the critical care environment. Staff are required however to commit their continuing professional development to achieve and maintain competence in assessment and interventions appropriate to critical care. Core competencies for Clinical Specialist, senior and staff grade occupational therapists have been outlined by the Association of Occupational Therapy of Ireland (AOTI) and the Therapy Projects Office. Competencies for occupational therapists specifically working in the critical care setting should be developed. These may incorporate domains such as: 1) Principles of Critical Care 2) Interventions for critically ill children 3) Communication 4) Optimising rehab and quality of life 5) Care planning and collaborative practice 6) Professional and ethical practice in the context of critical care

13.3. Allocation of Staff

Current there is no dedicated occupational therapist working in a critical care unit in the Children’s Hospital Group or nationally. Children referred for occupational therapy are allocated a therapist based on the admitting specialty area and/or the relevant competencies required as per the child’s case. Workforce planning for the new children’s hospital urgently requires review of this to ensure appropriately skilled and dedicated staffing for the Paediatric Critical Care units are part of the workforce. Staffing resources need to be a combination of clinical specialist, senior and staff grades.

<table>
<thead>
<tr>
<th>OLCHC current staff</th>
<th>TSCUH current staff</th>
<th>NPH proposed staff (UK ratio)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>8.75 Therapists</td>
</tr>
</tbody>
</table>
13.4. Future

The establishment of dedicated occupational therapy posts within the critical care unit is a necessity for the Children’s Hospital Group to address the primary needs of vulnerable and critically ill children. Additional staffing is an essential requirement to support future service developments.
14. SPEECH AND LANGUAGE THERAPY

14.1. Role of the Speech and Language Therapist

Children and infants who are admitted to a Paediatric Intensive Care Unit are at risk for a range of communication, feeding and swallowing disorders. Oral feeding is a complex skill requiring the integration of breathing, sucking and swallowing in the context of overall motor stability and incoming sensory stimuli (Arvedson et al., 2010; da Costa et al., 2010a). It depends upon brainstem central pattern generators whose activity is increasingly influenced by chemosensory and oral tactile input (Amaizu et al., 2008; Bingham, 2009). For the preterm infant the transition to oral feeding from gavage (tube) feeding can be a challenge as it requires ability to coordinate the muscles of the jaw, lips, tongue, palate and pharynx, upper trunk and respiratory systems in order to support a safe swallow. It is also dependent on normal sensory functioning, for example the presence of reflexes of rooting, gagging, swallowing, as well as intra-oral and pharyngeal sensation. Therefore, both sensory and motor systems must reach a critical stage of development for the infant to be able to feed orally. Speech and communication is also integrally related to the development of these same subsystems, as well as depending on overall developmental skills and progression.

Children who had birth trauma, prenatal and perinatal asphyxia, and a multitude of genetic syndromes with accompanying structural and neurologic impairment are also at high risk for swallowing and feeding dysfunction. In addition to specific aspects of oropharyngeal dysphagia, swallowing and feeding problems in infants and young children can result from or be exacerbated by neurologic, airway, respiratory, craniofacial, gastrointestinal, nutritional, and behavioural/interaction factors.

In Paediatric Critical Care the following patient groups are likely to require specialist speech and language therapy input:

- Tracheostomy
- Sick neonates
- Ventilated patients
- Acquired brain injury
- Neurosurgery and Neurology
- Complex cardiac conditions
- Complex respiratory conditions
- Craniofacial
• Complex ENT and airway presentations
• Minimally conscious patients
• Life Limiting Conditions/end of life care

Intubation and tracheostomy have long been associated with high risks of dysphagia (swallowing difficulties) and aspiration. The prevalence of swallowing dysfunction after extubation has been reported in 20-83% of adult patients intubated for longer than 48 hours. Swallowing problems may be undiagnosed in the Critical Care population due to silent aspiration, yet they have a greater impact in this vulnerable group. Long duration of mechanical ventilation is independently associated with post-extubation dysphagia, which is independently associated with the need for tracheostomy, longer hospitalisation and poor patient outcomes.

14.2. Feeding/Swallowing/Dysphagia

Speech and Language Therapists have extensive knowledge of anatomy, physiology, and functional aspects of the upper aero-digestive tract for swallowing and speech across the age spectrum including infants and children. The upper aero-digestive tract includes oral, pharyngeal, and cervical oesophageal anatomic regions. Speech-language pathologists also have extensive knowledge of the underlying medical and behavioural aetiologies of swallowing and feeding disorders. In addition, they have expertise in all aspects of communication disorders that include cognition, language, and behavioural interactions, many of which may affect the diagnosis and management of swallowing and feeding disorders. Because of the complexities of assessment and treatment in most persons with swallowing and feeding disorders, speech-language pathologists and other professionals work as a team with families, caregivers, and patients. Those teams may vary in their composition of specialists depending on the setting, population, and needs of individuals. (ASHA 2002)

14.3. Communication/Speech and Language

Communication difficulties will arise associated with ventilation, intubation and other co-morbid conditions that the patient may present with in the critical care unit (i.e. prematurity, acquired brain injury, tracheostomy, complex neurological conditions).
Speech and language therapists have clinical expertise in the assessment and management of communication difficulties, whether they arise due to the nature of the underlying medical conditions (e.g. COPD), are due to concomitant conditions (e.g. neurogenic conditions), or are due to the presence of equipment/technologies used to support life (e.g. tracheostomy).

SLT expertise is therefore integral to the Critical Care multi-professional team (MDT) approach, providing specialist knowledge and skills which all people with complex communication or swallowing needs should be entitled to access.

14.4. Minimally Conscious Patients (MCS) and Vegetative State (VS)

The essential defining characteristics of MCS are a limited level of awareness of self and/or surroundings with a limited ability to respond or communicate (Giacino JT et al 2002). However, among individuals in minimally conscious state (MCS) there is definite evidence of awareness despite profound cognitive impairment (Wilson et al 2007). SLTs in conjunction with occupational therapists, and clinical neuropsychologists have become increasingly involved in the assessment and management of VS and MCS patients. The expertise of these groups of clinicians in supporting and refining diagnostic assessment has been recognized and indeed recommended (Gill-Thwaites & Munday 1999). Speech and Language Therapists working with minimally conscious patients have an important role in determining suitable oral stimulation and hygiene protocols in addition to providing environmental stimulation to encourage responsiveness and general communication.

14.5. The role of the SLT in Critical Care working within the MDT is to:

- Use specialist skills to inform differential diagnosis regarding the nature and cause of communication and swallowing difficulties, including higher level cognitive-linguistic difficulties/cognitive difficulties and disorders of consciousness.
- Carry out specialist instrumental assessment for swallowing difficulties such as Fibre optic Endoscopic Evaluation of Swallowing (FEES) and Video fluoroscopy where appropriate.
- Provide specific communication and swallowing rehabilitation, goals, programmes, equipment and advice to optimise and maintain function, in liaison with the MDT.
- Provide screening, assessment and advice on laryngeal injuries and dysphonia, and tracheostomy speaking valve use.
Model of Care for Paediatric Critical Care

- Provide training to the MDT and carers regarding communication and swallowing difficulties, in areas such as screening and managing non-complex difficulties.
- Assess and manage swallowing and communication in ventilator-dependent and tracheotomised patients, contributing to the MDT assessment of weaning and the ability of the patient to safely swallow oropharyngeal secretions and oral diet and fluids.
- Identify communication and swallowing difficulties that may impact on the patient’s ability to function in their normal environment, and support appropriate discharge destination planning and referral to rehabilitation if required (including patients with higher level cognitive communication difficulties).
- Carry out clinical audit and engage in collaborative research (e.g. user experience) and evaluate patient outcomes of SLT intervention. (Intensive Care Society 2015; Paediatric Intensive Care Society 2015)

14.6. Current service provision in the Dublin Acute Paediatric Hospitals

14.6.1. Temple Street Hospital Speech and Language Therapy Department

There is no Speech and Language Therapist specifically allocated to the Critical Care Unit alone. There is an approximate average of 1.2 WTE dedicated towards assessing and treating patients under the following specialities: Neurology, Neurosurgery, Cleft Lip and Palate and general paediatric dysphagia referrals which would include Neonatology and ICU referrals. This would also include an assignment to Video fluoroscopy Feeding Clinics.

14.6.2. Our Lady’s Children’s Hospital Crumlin

- 0.5WTE Senior SLT post for Transitional Care Unit (i.e. long term ventilator dependent 7 bedded unit)
- 1.5 WTE Senior SLT post in Cardiology
- No specific allocation to ICU or Critical Care
- No specific allocation to Neonatal services
14.7. Proposed Requirements to implement model of care for National Paediatric Hospital

14.8. Quality improvement

- Speech and language therapists must maintain and update knowledge and skills according to:
  - IASLT Tracheostomy Management Clinical Guideline 2016 (in press)
  - RCSLT Knowledge and Skills Framework: Video fluoroscopic Evaluation of Oropharyngeal Swallowing: Paediatric Competencies 2013
  - RCSLT FEES guidelines 2015
  - RCSLT Five good communication standards 2013
  - RCSLT Speech and language therapy in adult critical care position paper 2014
  - IASLT Feeding, Eating, Drinking and Swallowing Standards of Practice 2012
  - IASLT Feeding, Eating, Drinking and Swallowing Standards of Practice for Neonates and Babies 2013
  - Communication matters, AAC Service Standards, 2012.
- Participation in regular and ongoing audit, research and quality improvement.
- Development and review of clinical guidelines for speech and language therapist’s working in ICU.
- Access to supervision and training.
- Ensure implementation of training to facilitate good communication standards for vulnerable patients as per RCSLT 2013.

14.9. Education, Training and Continuing Professional Development

- Adherence to CPD standards as outlined by the Irish Association of Speech and Language Therapists and the statutory registration board for health and social care professionals (CORU)
- Maintenance of dysphagia competencies in neonates, paediatrics and instrumental procedures.
- Maintenance of skills in tracheostomy and long term ventilated patients for both communication and feeding
- Engaging in training of other health care professionals involved in the multidisciplinary team
15. MEDICAL SOCIAL WORK

The medical social worker is an integral part of Paediatric Critical Care by providing essential psychosocial support to the parents and families of the children attending the unit. The emotional and practical support provided to parents at this time is an essential part of their understanding and management of the family crisis that surrounds the serious ill-health of a child.

15.1. Role of the Medical Social Worker in the Critical Care Unit

The Medical Social Worker’s main role is to support patients and their families with any psychological, emotional, social or practical difficulties associated with their child’s illness or condition. A Medical Social Worker provides families with:

- Help in coping with illness and the impact of a child’s illness on parents. This can be especially important for those dealing with a new diagnosis or a serious deterioration in a child’s health status.
- Counselling and support in relation to managing traumatic events causing their child to be admitted to the Critical Care Unit
- Support and liaison in situations where other family members have been involved in the trauma causing admission
- Support and assessment of parents with pre-existing vulnerabilities that may impact on their ability to parent during the child’s admission (eg addiction issues, mental health history).
- Assessment and support to parents where the child’s admission is the result of neglect or abuse, including linking with the appropriate authorities in relation to same and ensure that the Hospital undertakes its responsibilities in these situations under national child protection guidelines
- Support for families whose children are facing end of life care and working with them to make the most suitable and appropriate arrangement for end of life care
- Bereavement support and counselling
- Advice on practical and financial matters including accommodation for parents, liaising and organising financial support as needed, preparing letters and forms for various support schemes,
- Working with families and staff in situation where there is conflict or disagreement, especially when parents do not understand or agree with the plan for on-going care of their child.
Model of Care for Paediatric Critical Care

- Working with families where cultural or religious aspects of their lives present challenges to them while their child is in the Critical Care Unit.
- Supporting and advocating for families where parents are not in an on-going relationship but who wish to be involved in their child’s care during the critical period in the unit.
- Liaising with the staff of the Critical Care Unit where a family’s social issues present challenges in their presentation or management in a Critical Care Unit.

15.2. Competencies

In order to carry out the complex and challenging work of a Medical Social Worker in a Paediatric Critical Care Unit, the social workers working in this unit should be at Senior Medical Social Work Grade or experienced Main Grade. At this level, the medical social worker will:

- Possess advanced clinical skills in social work including the areas of child protection, end of life care, bereavement work and dealing with family with complex social background
- Be well experienced in providing clear communication with medical nursing and HSCP colleagues in a complex and challenging environment
- Have the ability to mentor and supervise staff with less experience
- Be experiences in a co-working model with a social work colleague, should the need arise
- Have an in-depth knowledge of national policies and legislation pertinent to the care of children

15.3. Allocation of Staff

At TSCUH, there is current 1.5 WTE Senior Medical Social Worker providing full cover to the PICU. In OLCHC, medical social work cover is provided by the social worker allocated to the speciality the child is admitted under.

15.4. Future

In order to address the size and volume of work that will be created for Medical Social Worker in the New Children’s Hospital it is critical that the number of senior and main grade medical social workers are appointed to ensure that the families of the children admitted there are adequately supported.
It is expected that 4 Senior Medical Social Workers and 4 experienced Main Grade social worker would be the minimum required to serve 42 PCCU beds and 18 NICU beds.
16. Psychology

The role of the Psychologist in the Paediatric Intensive Care Unit (PICU) has been acknowledged internationally as crucial in assisting patients and their families in coping with the devastating effects of a critically ill child. A large body of literature has accumulated over the last 20 years which recommends that psychological support within the PICU for child, parent, family and staff is an essential requirement for good patient outcomes and a healthy and efficient workforce. Rees et al., (2004) carried out a retrospective cohort study and concluded that post-traumatic stress disorder diagnosis and symptomatology is significantly more common in families where a child has been admitted to PICU. Their recommendations suggested consideration should be given to providing psychological support for the children and parents during their PICU admission. Less well recognised, however, are the problems posed for those who work in an intensive care unit that provide the complex medical and nursing care required by critically ill, often dying patients.

The significant increased psychological need of patients, parents and staff appears to be due at least in part to advances in critical care which have led to increased survival, raised expectations of parents in terms of survival and their increased involvement with the decision-making about their child’s care on PICU (Colville et al., 2015). A small number of parents without past mental health issues appear to develop significant psychological reactions above the normal level of distress expected when their child has a prolonged PICU admission which can interfere with medical intervention when unaddressed and cause significant stress to staff.

The patient journey through PICU is often complicated with many aspects to treatment and care. Parents can often struggle with the complexity of the situations they are presented with and require more than parental support that is provided by the medical, nursing and social work teams presently. Often parents require the unique skill set of a Psychologist and the provision of some form of Psychotherapy. This is in line with the National Standards document for Paediatric Critical Care Services in Ireland (Joint Faculty of Intensive Care Medicine of Ireland, 2013). The role for dedicated Psychology provision in the PICU is also outlined in The Faculty of Intensive Care Medicine Guidelines for the Provision of Intensive Care Services (2015) with recommendations that:
A Senior Psychologist should:

- Provide psychological support to patients, relatives and staff with evidence showing that all three groups suffer from significant stress and traumatic reactions.
- Staff provision may include group stress management and drop-in sessions in efforts to support and retain staff with onward referrals as needed outside the organisation.
- Provide training to increase staff knowledge and understanding of psychological reactions and psychological outcomes of patients.
- Increase staff competency in providing basic psychological support to Critical Care patients, particularly those who are distressed, agitated, hallucinating or delusional.
- Play a role within the MDT, attending ward rounds, and being available for consultation by other staff on matters relating to communication, sleep, effects of sedation, anxiety, stress, mood, delirium and family issues.
- A psychologist should also be involved with developing holistic care plans for long-stay patients in conjunction with Medical Social Worker colleagues.

All available guidelines in Ireland and internationally advocate that to fulfil all of these important roles, a large unit should employ a full-time Senior Psychologist. At the very least, units should have access to dedicated sessions from a Senior Psychologist. This is not currently the situation in Ireland with psychology provision available only on a limited emergency rota basis.
17. Clinical Nutrition & Dietetics

17.1. Introduction

Critically ill infants and children have complex, frequently changing nutritional requirements. They are at significant risk of both undernutrition and over nutrition, as well as cardiovascular, respiratory and immune system dysfunction and necrotising enterocolitis. Undernutrition occurs more frequently, with 24-53% of children developing significant protein-energy malnutrition during their PICU stay. This can lead to impaired wound healing, muscle and immune function and increased rates of sepsis (Meyer & Marino, 2015). The impact of undernutrition is more significant in paediatric and neonatal populations (Ehrenkranz et al, 2006).

Substantial input from the dietitian is essential in this patient group. Dietitians have unique expertise in nutritional assessment; calculation of nutritional requirements; provision and monitoring of enteral and parenteral nutrition support; assessment and monitoring of growth; provision of therapeutic diets and transition to normal, age-appropriate feeding.

The presence of dedicated dietetic services for ICU is associated with better nutritional performance and better patient outcomes (Mehta et al, 2012; Roberts et al, 2003; Olsen et al 2005; Sneve et al, 2008). The implementation of feeding protocols improves nutritional intake in critically ill children (Meyer et al, 2009). A dietitian working in a PCCU must be clinical specialist or senior level, with extensive experience of nutritional assessment and anthropometry in paediatrics; nutrition support and disease-specific dietary interventions.

17.2. Current Service Provision

Our Lady’s Children’s Hospital Crumlin

<table>
<thead>
<tr>
<th>23 CCU beds across 2 units</th>
<th>1.0 WTE senior dietitian*</th>
</tr>
</thead>
</table>

- *0.5 WTE funded, 0.5 WTE allocated from departmental resources
- This allocation allows only the highest priority patients to be assessed and reviewed, at the expense of less complex patients and non-clinical duties.
- In 2015, there were 181 new and 2061 review patient contacts. This figure is consistent with previous years
Model of Care for Paediatric Critical Care

Temple Street Children's University Hospital

| 9 CCU beds | 0.5 WTE senior dietitian* |
| 6 HDU beds | 0.5 WTE senior dietitian* |

- *These posts are allocated from departmental resources with no dedicated funding
- These allocations are frequently inadequate, resulting in diversion of dietetic resources to provide prioritised cover. This compromises service provision in other clinical areas within the hospital
- In 2015, there were 295 new and 1736 review patient contacts in ICU and HDU. This represented an increase of more than 45% when compared to 2014

17.3. Clinical Service Delivery

A clinical specialist dietitian should take a lead role in developing and delivering the clinical nutrition and dietetic service in the Paediatric Critical Care Unit. All admissions to PCCU should be screened, and where nutrition support is indicated, referred to the dietitian for assessment.

The dietitian should lead the development of guidelines for out of hours enteral and parenteral nutrition support and educate the multidisciplinary team on their use. The dietitian should attend ward rounds and multidisciplinary team meetings. The dietitian should ensure appropriate transfer of nutritional care when patients are discharged to other clinical areas and other institutions (including in Northern Ireland).

17.4. Quality Improvement

Participation in regular and ongoing audit, research and quality improvement.
Development and review of clinical guidelines and nutrition care pathways and algorithms for PCCU.
Education, Training and Continuing Professional Development:
• Adherence to CPD standards as outlined by the Irish Nutrition and Dietetic Institute (INDI) and the statutory registration board for health and social care professionals (CORU)

• Development of and participation in a regular and ongoing programme of education of all ICU staff and other dietitians

• ICU-specific competencies for dietitians should encompass clinical, strategic, educational and research roles.

17.5. Requirements to Implement Model of Care

<table>
<thead>
<tr>
<th>Current Staffing</th>
<th>Proposed Staffing (interim)</th>
<th>Proposed Staffing for NCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 WTE senior dietitian, OLCHC</td>
<td>3.8 WTE senior dietitians</td>
<td>1.0 WTE clinical specialist dietitian</td>
</tr>
<tr>
<td>1.0 WTE senior dietitian, Temple Street</td>
<td></td>
<td>5.0 WTE senior dietitians</td>
</tr>
</tbody>
</table>

• Current or planned PCCU beds should be associated with dedicated staffing of 0.1 WTE post per bed, at clinical specialist or senior grade. (Intensive Care Society Standards Committee, 2003)

• There are currently 32 CCU beds and 6 HDU beds across both sites.

• It is anticipated that there will be 42 critical care and 18 neonatal intensive care beds in the NCH.
18. BIO MEDICAL ENGINEERING
Healthcare Technology (Clinical Engineering & Medical Physics) - Role in the PCCU.

18.1. Introduction

Optimal and safe use of medical technology requires more than the devices to be properly procured, commissioned and maintained. It requires a multidisciplinary team approach where clinicians and allied health professional work together to advance care through the application of technology at the point of care.

Currently in the PCCU environment Clinical Engineers are employed as health professionals who play an important role in providing specialist skill and knowledge of the technology and the environment in which the equipment is used. Healthcare Technology Management is a term used to describe this approach which combines clinical and technical skills. Given the diversity of equipment used in Paediatric critical care setting, the clinical engineers who support the PCCU will be dedicated group who will specialise in supporting this department.

18.2. Supporting and Advancing Care: The role of the Clinical Engineer in the Paediatric Critical Care

The clinical engineering role is an integral part of the MDT in paediatric critical care and the expertise of clinical engineers is essential in providing specialist engineering skills and knowledge at the point of care to support the specialist medical devices and therapies.

These include but are not limited to:

- High Frequency Ventilation (Oscillator)
- Neurally adjusted ventilatory assist (NAVA)
- Delivery of Nitric Oxide
- Paediatric retrieval and transport team
- Internal hospital paediatric transport
- Application of CPAP and BIPAP
- Transport of ECLS patients between departments within the hospital
Administration of volatile anaesthetics to invasively ventilated patients (AnaConDa).
Humidification and delivery of nebulised therapies including AIRVO
Integration, management and support of medical devices into clinical information systems.

18.2.1. Out of hours cover

One current situation clinical engineers support a 9-5 service during normal working hours. However, in 24/7 service provision demanded in PCCU environment this needs to be augmented with a 24 hour on-call service by clinical engineers to ensure can be availability for emergency support out of hours. This has staffing implications.

18.3. Teaching and Training

Training in the optimal and safe use of medical devices is required not only during commissioning but over the life of that device. Training deals with the practical operational aspects of a medical device or technology in a clinical setting. Training helps ensure patient safety and reduces adverse events. Without it, the risks of adverse events increase. The clinical engineering team in PICU recognising the importance of user training, will provide this to medical and nursing staff, operating in co-operation with the medical and nursing leadership and training departments within critical care.

18.4. Research and Development

The Healthcare Technology Department (HDT) which includes Clinical Engineers will contribute to research of a general medical and scientific significance. Clinical engineering staff working within the PCCCU has the opportunity to participate in research and development activity usually concerned with the development of new medical devices and systems. This includes developing methods for data collection and analysis, developing new devices to make measurements or indeed the development of one off devices or software to allow the research to progress. This also includes keeping up to date with current and future developments and improvements involving medical devices and their associated consumables and accessories.
18.5. Equipment management

The healthcare technologies in the paediatric critical care are an essential infrastructure and represent a considerable financial investment. This includes planning for the upkeep and replacement of equipment over time, optimizing their utilization and ensuring they are maintained appropriately. The Healthcare Technology Department will assume responsibility for medical device asset management across the hospital, and the clinical engineering team in PCCU will do so for equipment in that area.

Over the course of its life a device will need to be maintained and three types of maintenance activities need to be considered:

Scheduled maintenance consists of all proactive activities whose purpose is to prevent failure and maintain functionality of the device.

Unscheduled maintenance covers all reactive actions which are initiated as a result of a reported real or suspected fault or failure of a device or system.

Performance verification includes all proactive processes that assure devices which appear to be working are in fact working optimally.

With the opening of the National Children’s Hospital (NCH) these maintenance activities will be managed by clinical engineers/medical physicists supported by contracted services provided by the equipment manufacturers. An Equipment Support Plan will be established for each device and documented in a centralized electronic equipment asset management system.

18.6. Maintenance and repair of medical devices within Paediatric Critical Care in the NCH

The PICU clinical engineering operational policy will be written to ensure that equipment which is not suspected of failure is kept close to the point of care ready for use. Where equipment is suspect, it will be triaged at the point of care and if repair can be affected at the point of care it will be. It is only if this cannot be achieved that equipment will be transported to the main department for maintenance action. The main Healthcare Technology Department located at lower ground floor will be augmented by dedicated Healthcare Technology support workshops and equipment storage in the paediatric critical care.
Model of Care for Paediatric Critical Care

This will provide a base for the clinical engineering staff assigned to support the paediatric critical care, and also other members of the team based in the main department who will need to attend to activity in the unit as required.

18.7. Education/Training and Competencies

All clinical engineering and medical physics staff working in the PCCU will have the relevant qualifications and experience for their grades in accordance with HSE guidelines.

Clinical engineers working unsupervised in critical care should be at a minimum of senior grade. This requires staff to hold a recognised Level 7 or higher qualification in one of the following engineering disciplines; Electronic, Electrical, Instrument Physics, Industrial Instrumentation, Applied Physics, Mechanical, Mechatronic or Biomedical Engineering, or hold a recognised qualification at least equivalent to one of the above; and; have a minimum of three years postgraduate satisfactory and relevant experience in an appropriate medical industry field with at least two years in a clinical engineering environment.

The minimum qualifications for the Principal Clinical Engineering grade are the same but the experience requirement is for five-year postgraduate experience in an appropriate medical industrial field with at least three years of which should be in a clinical engineering environment.

All clinical engineering staff, working in critical care environments should receive scientific, clinical and professional supervision. Staff will be expected to commit to continuing professional development to achieve and maintain competence in accordance with professional norms.

18.8. Governance of PCCU Clinical Engineering Staff in NCH

The Bio- Medical Engineering Department within OLCHC provides an essential service to PCCU, Theatre and the wards. This is a unique service which is integral to the successful application of medical devices in all these 3 different clinical situations. Clinical Engineers working within the PCCU fall within the remit of Medical Director of PCCU and in the development of The Healthcare Technology Department (HDT) which includes Clinical Engineers it is critical that there is a close relationship between Medical PCCU clinical staff and HDT department.
18.9. Staffing of Bio – Medical Engineering in the NCH

The exact compliment of Clinical Engineering staff assigned to the paediatric critical care unit in NCH has yet to be determined and will be influenced by the final agreed operating model. It will also be influenced by the final operation model of support for EHR and Clinical Systems which has yet to be determined between Healthcare Technology Department and ICT. Nevertheless, it is envisaged that three healthcare technology staff will be based in the unit and supported by close involvement of at least three others who will be part of the critical care support team providing services from the main department. To ensure a flexible, holistic and sustainable approach it is best to regard these as WTE posts rather than named individuals assigned solely to support of paediatric critical care.

18.10. Current Clinical Engineering Staff Dedicated And Assigned To PCCU

OLCHC
- 2 WTE Senior Clinical Engineer- (6 within hospital environment)
  - 0.5 WTE Principle Clinical Engineer

TSCUH
- none

Proposed clinical engineering staff dedicated and assigned to PCCU

NCH
- 1 WTE Principle Clinical Engineer
- 2 WTE Senior Clinical Engineers
  - (Additional support drawn as required from hospital Healthcare Technology Department)
References

HSE approved qualifications for Clinical Engineering Grades.
https://hse.ie/eng/staff/Jobs/Eligibility_Criteria/Clinical_EngineeringTechnicians.html

HSE Medical Devices / Equipment Management Policy.
AAMI EQS6: Recommended practice for medical equipment management program.
19. DATA MANAGEMENT

The increasing complexity of care given in PICU dictates that a fully integrated clinical information system is required for the effective, efficient, electronic charting of medical/nursing flow sheets, medical notes, device data logging (clinical telemetry), medication ordering, administration and safety. Consequently, the Philips IntelliSpace Critical Care and Anaesthesia (ICCA) clinical information system was installed in OLCHC and TSCUH in 2012 and it is the core responsibility of the PICU Data Manager (ICCA system administrator) and the Informatics Pharmacist under direction/governance of the PICU Medical Director to maintain ICCA on a continuous basis.

Since OLCHC/TSCUH PICU is committed to the international benchmarking of quality of care, it is also the duty of the data manager alongside the research/audit nurse to continue to submit admissions data to the Paediatric Intensive Care Audit Network. PICA Net is an international audit of paediatric intensive care which collects data on all children admitted to PICUs in the UK and Ireland and is coordinated by the Universities of Leeds and Leicester. OLCHC has been submitting anonymised data since 2009 and TSCUH since 2010; data declared is in accordance with Irish data protection law.

19.1. Roles and Responsibilities

The role of PICU data manager broadly divides in two as:

System Administration and Clinical Informatics Management

- ICCA System Administration: configuration of ICCA, medical device integration, trouble shooting, vendor relations, liaison with other hospital departments, user management and systems integration.
- Pharmacy Informatics: joint responsibility alongside the Informatics Pharmacist for the implementation/configuration of medication ordering, administration and safety.
- User Training: training in the use of ICCA for medical/nursing staff and for medications ordering for those with prescriber permission.
- Systems Reporting: medical handover, admission/discharge documentation, medication administrations report, line insertion/care audit.

Data Extraction, Processing and Analysis

- PICANet: management, extraction and processing of data for submission to PICANet.
- NOCA/SARI: notification and case submission to external audits such as the National Office of Clinical Audit and the Severe Acute Respiratory Infection surveillance programme.
• Authoring of PICU annual report.
• Research/Audit: data extraction, analysis and statistics support for research/audit activities including provision for MSc/PhD projects, requests for cohort data and service planning.
• Lead analyst for research publications, poster and oral presentations.
Both aspects of the role of data manager abide by:
• Data Protection: ensure that patient-sensitive data remains secure and in accordance with ICT data protection policy and Irish data protection law.
• Risk Assessment: presentation, support and follow-up of concerns raised at risk assessment meetings (Risky Huddle) relating to charting in ICCA, care audit and data analytics.
• Good Clinical Practice: registered and maintained GCP accreditation is required in order to facilitate participation in multi-centre studies.

19.2. Skills

Given the complexity of data systems in PICU, it is advisable that the PICU data manager skill-set should primarily be sourced from the IT and data analytics sector; it is not sufficient to up-skill candidates from a medical/nursing background. IT knowledge takes absolute precedence over medical knowledge and shortcomings in medical guidance will be provided for by the inter-disciplinary expertise of the PICU medical team.

The data manager skill-set should encompass most of the following:
• System administration of a complex medical/charting clinical information system, medical device integration, user training and vendor negotiation.
• Database management, reporting, data validation and dataset extraction; SQL (structured query language), Microsoft Access, MySQL, MS SQL reporting services.
• Demonstrable expertise in MS Office (Excel, Word, Access, PowerPoint) and complex data manipulation, presentation and graphing therein.
• Extensive experience of clinical audit and/or research.
• Ability to process/analyse data and write data extraction code in at least one computer language; Visual Basic, C, C++, C#, PHP, Python, R, SAS, SPSS or similar. Internal formulae and calculations in ICCA are written in Visual Basic.
• Compliance with data protection law at all times.
19.3. Allocation of Staff

Currently, OLCHC employs 1.0 WTE data manager specialising in ICCA system administration, clinical informatics management and user training and 0.6/0.4 WTE in OLCHC/TSCUH specialising in reporting, data extraction, data processing, analytics and research/audit although facets of both posts are interchangeable. There are also 1.0/0.5 WTE Clinical Audit/Research Nurses in OLCHC/TSCUH who are responsible for the submission of data to PICANet, data validation, liaison with medical/nursing staff regarding data entry and provision of medical knowledge support to the PICU data managers.

The new NCH with a 60-bedded PICU configured across the four requirements of Cardiac, General PICU, Neonates and HDU would need 4.0 WTE data managers in order to effectively and safely manage system administration, training of nursing/medical staff, bedside trouble shooting, reporting, data validation and analysis; 1.6 WTE per 23 beds in OLCHC extrapolates to 4.17 per 60 beds.

The number of Clinical Audit/Research Nurses will also need to increase and should be accounted for in the submission from Nursing.

19.4. Data Protection

Recording, processing, storing and reporting of patient data is to remain in accordance with hospital ICT policy and Irish data protection law. Freedom of information requests are facilitated by the PICU data manager but must be formally requested and released through the Hospital’s Information Office and in accordance with the permissions and direction of the PICU Medical Director. Requests for cohort data and data analysis for the purposes of clinical audit and research must be submitted via a Data Request Form and permission sought from the PICU Medical Director. The PICU Medical Director is to retain Data Control at all times. Patient identity is pseudo-anonymised as standard unless medically directed otherwise and only in accordance with data protection policy.

19.5. Data Governance

Currently, there is no data governance arrangement between OLCHC and TSCUH and as such no patient data is shared across the two sites. The intended policy of one service, two sites does not currently extend to the seamless transition and integration of electronically charted patient records.
19.6. Recommendations

The post of PICU Data Manager should report directly to the PICU Medical Director whilst the portion of work pertaining to the upkeep of the pharmacy functionality in ICCA should also hold joint responsibility with the PICU Informatics Pharmacist.

The clinical functionality of ICCA as determined by its configuration and use should remain the responsibility of the PICU Medical Director and change implemented as part of the clinical decision making process. As such, the positions of ICCA system administrator, PICU data manager and Informatics Pharmacist should not be subsumed by the department of ICT and conversely the roles and associated responsibilities will not set precedence for ICT.

Relations with stakeholders from ICT, theatre, medical records, HIPE and other hospital departments are to be maintained through the PICU Medical Director.
20. Management of Critical Care in children in Health care facilities without Paediatric Critical Care facilities- Model 3 and 4R hospitals

There are clear recommendations in the Paediatric Anaesthesia Model of Care document for hospitals who manage children for anaesthesia and surgery. It is recommended that a policy should be developed and documented jointly by representatives of anaesthesia, surgical and nursing staff and that this document should be reviewed at intervals of five years or less. In the event of a child becoming critically ill, 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. A 24/7 bridge phone 1890 213 213 exists for central referral to Model 4S hospital. www.PICU.ie

As per PAMOC the following factors should be taken into account when developing a policy

**Age**- Assessment of any borderline cases for suitability for surgery should occur pre-operatively through a multidisciplinary pre-operative assessment including surgeons, anaesthetists and paediatricians.

**Staff training and experience**
In Model 3 hospitals accepting children for surgery 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 2008)

**Children requiring transfer to PCCU-Main recommendations**

In Model 3 and 4R hospitals infants and children may require admission to critical care facilities as a planned part of their care, for example; after surgery, or because of trauma, an acute illness or because of extreme prematurity. Paediatric and neonatal intensive care is provided in designated units staffed by doctors and nurses with specialised training.

**Recommendation** –Babies, infants and children who are likely to need critical care after surgery should undergo their surgery in a hospital/unit with a designated PCCU or NICU. RCOA 2014

**Recommendation**- In the event of a critically ill child presenting to Model 3 or 4R hospitals either to ED or as an inpatient, the generalist Consultant Anaesthetist may be requested to assist in the resuscitation and implementation of critical care. The decision by the Anaesthetist to admit to Adult Critical Care (see recommendation below) for a short time or alternatively to transfer out as an emergency is made in good faith and on good grounds. These decisions are based on general competency skills of the Consultant Anaesthetist in the front line as such should be respected as the right decision. The competence and skill of the Adult Generalist Anaesthetist in Model 3 and 4R is recognised and supported by the Paediatric and Adult Anaesthesia and Critical Care Models of Care.
Recommendation – In all Model 3 and 4R hospitals receiving or admitting infants and children hospital protocols for the management of critically ill children should be agreed and drawn up. Clinical management of these children in both specialist and non-specialist units will require close co-operation and multidisciplinary teamwork between nurses, paediatricians, surgeons, anaesthetists, intensivists and other relevant clinicians.

Recommendation – Local guidelines should be clear on the roles and responsibilities of the multidisciplinary team, including anaesthetic services as it is important that further stabilisation and management are not left in the sole remit of the anaesthetist. (DOH 2005). In the event of a child becomes ill unexpectedly there may also be occasions only a very short period of intensive care is required and that this does not necessitate transfer to PCCU. This will be based on the clinical judgement of the team caring for the child, in particular the Consultant Intensivist/Anaesthetist in charge of ACCU, possibly in conjunction with input from the PCCU. This is acceptable provided there is a suitable facility within the hospital eg Adult Critical Care, there are staff with appropriate competencies and the episode will only last a few hours. If as may happen on subsequent review the child is not improved or has deteriorated, the initial decision should be re evaluated and a plan to transfer should be activated as discussed above. PCCM MOC

Recommendation – There should be a nominated lead consultant and nurse within general critical care units who are responsible for the policies and procedures for babies, infants and children when admitted. (PICS 2015) (PAMOC 2014)

Recommendation – There should be in each hospital providing paediatric services, a nominated clinician responsible for the organisation of paediatric transport. Transfer of critically ill children to specialist centres is generally undertaken by paediatric emergency transfer teams. However, in some circumstances it may be necessary for the referring hospital to provide emergency transfer of a sick child, who is intubated and ventilated. In these circumstances it may be that the most appropriate anaesthetist to accompany the child is a consultant. (RCOA 2010).

Recommendation – In Model 3 and 4R hospitals there needs to be in place a rota for senior cover in the setting where the a senior anaesthetist needs to accompany the critically ill child to 4S hospital (Anaesthesia MOC 2017). At present in most Model 3 and 4R hospitals the out of hours emergency on call Anaesthesia cover is made up of one consultant plus one or two NCHDs. In these circumstances the choice of who should accompany a sick child for transfer to a PCCU is particularly difficult. The NCHDs may not be sufficiently experienced or competent in the transfer of a sick child. The consultant is also responsible for all other emergencies in the hospital which may include an obstetric unit. The Model of Care for Anaesthesia recommends the basic building block of on call Anaesthesia service in Model 3 and 4R hospitals is 2 consultants and 2 NCHDs out of hours. This flexible unit should allow for the most appropriate member of the team to accompany the sick child without a major detrimental impact on the emergency anaesthesia care available to other patients in the referring hospital.
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