



*"Right Care, Right Now"*

# Model of Care for Adult Critical Care



## NATIONAL CLINICAL PROGRAMME FOR CRITICAL CARE



Feidhmeannacht na Seirbhíse Sláinte  
Health Service Executive

Tús Áite do  
Shábháilteacht **1** Othar  
Patient Safety **1** First



Endorsed by:



**Joint Faculty of  
Intensive Care Medicine of Ireland**

College of Anaesthetists of Ireland • Intensive Care Society of Ireland  
Royal College of Physicians of Ireland • Royal College of Surgeons in Ireland

 ***Intensive Care Society of Ireland***



**CRITICAL  
CARE**

**Published October 2014**

## TABLE OF CONTENTS

<i>Abbreviations</i> .....	5
<i>Glossary</i> .....	6
<i>1.0 Foreword</i> .....	8
<i>2.0 Executive Summary</i> .....	9
<i>3.0 Background</i> .....	11
<i>4.0 Critical Care Clinical Governance Structures</i> .....	15
<i>5.0 Model of Care for Adult Critical Care</i> .....	18
<i>6.0 National Clinical Programme for Critical Care</i> .....	33
<i>Appendices</i> .....	59
<i>References</i> .....	68

## ABBREVIATIONS

NCPCC	National Clinical Programme for Critical Care
CCMDS	Critical Care Minimum Data Set
CRBSI	Catheter-related blood stream infection
CRRT	Continuous renal replacement therapy (see CVVH)
CVVH	Continuous veno-venous haemofiltration (see CRRT)
ECLS	Extra-corporeal life support (see ECMO)
ECMO	Extra-corporeal membrane oxygenation (see ECLS)
HCAI	Healthcare-associated infection
HDU	High Dependency Unit
HSE	Health Service Executive
ICNARC	Intensive Care National Audit and Research Centre, UK
ICSI	Intensive Care Society of Ireland
ICU	Intensive Care Unit
JFICMI	Joint Faculty of Intensive Care Medicine of Ireland
MRB	Multiresistant bacteria
MRSA	Methicillin-resistant <i>Staphylococcus aureus</i>
NCEPOD	National Confidential Enquiry into Patient Outcome and Death, UK
NOCA	National Office of Clinical Audit
OOHCA	Out-of-hospital cardiac arrest
PHEC	Pre-hospital emergency care
RAIN	Risk-Adjustment In Neurocritical care, an ICNARC-based study into factors associated with good outcomes in patients with severe traumatic brain injury.
SLT	Speech and Language Therapy is a therapy profession governed by the Speech and Language Therapists Registration Board (CORU). The role of the Speech and Language Therapist (SLT) in Critical Care is to assess and manage oropharyngeal dysphagia and/or communication disability in the context of provision of Level 2 and Level 3 care for the critically ill patient (single and or multi-organ failure).
TBI	Traumatic brain injury
VRE	Vancomycin-resistant enterococcus

## GLOSSARY

Audit	The National Clinical Programme for Critical Care conducts an annual audit to provides quality assurance concerning the outcomes of critically ill adult patients in the participating Critical Care Services of the Audit.
Bed Bureau	An electronic critical care bed capacity information system
Care Model	An approved normative healthcare delivery framework
Catheter-related blood stream infection (CRBSI)	A blood stream infection attributable to an indwelling catheter.
Census	Annual enumeration of adult critical care bed stock and critical care staff establishment in acute hospitals in Ireland.
Chain of Survival	A critical care pathway across the healthcare system for the critically ill patient who has sustained an out-of-hospital cardiac arrest.
Clinical Governance	Clinical Governance is defined by the HSE as “Corporate Accountability for Clinical Performance” in the domains of quality, safety, access and cost.
Critical Care	Critical care refers to two related processes. Firstly, ‘critical’ refers to discernment or recognition of a crucial and a decisive turning point, the deterioration of the patient’s condition, followed, secondly, by ‘care’ i.e. intervention including resuscitation and transport to a critical care service. Critical care resuscitation and treatment interventions include a complex range of general and specialty procedures, supports and diagnostic procedures. Thus, the critically ill patient benefits from appropriate and timely critical care in the health system with a greatly increased probability of survival.
Critical illness	Critical illness is a life-threatening patient condition requiring critical care intervention for patient survival.
Critical Care Minimum Data Set (CCMDS)	The minimum dataset to be acquired on each critically ill patient for analysis by audit.
Critical care pathway	An organisational construct along which the care journeys of critically ill patients continue until their critical care needs are met.
Critical Care Service	Critical Care Service is appropriate for the care of patients requiring Level 2, Level 3 and Level 3(s) Critical Care. Care is generally delivered within a Highdependency unit (HDU) or Intensive Care Unit (ICU).
Healthcare - associated infection (HCAI)	Infection arising in a patient in a healthcare facility after 48 hours.
Hospital Model	A tiered categorisation of the healthcare service delivery capability of the hospital system.
‘hub-and-spoke’	An integrated delivery framework
Levels of critical care for critical care.	The level of critical care is best defined by the patient’s clinical condition and his/her level of need

Level 2 care	Active management by the critical care team to treat and support critically ill patients with primarily single organ failure.
Level 3 care	Active management by the critical care team to treat and support critically ill patients with two or more organ failures.
Level 3(s) care	Level 3 with regional/national service.
Major surge	An unusually high increase in (critical care) demand that overwhelms the critical care resources of an individual hospital and/or region for an extended period of time.
Neurocritical care	Speciality Level 3(s) care required and delivered to a critically ill patient who has an acute severe brain injury or cord injury.
Retrieval	Safe and timely inter-hospital transfer and transport of the critically ill patient, based on critical care needs.
Surges	Variances in the volumes of critically ill patients requiring Level 2 or Level 3 care referred appropriately to a Critical Care Service.
Surviving Sepsis Campaign Guideline	The third edition of "Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2012" appeared in the February 2013 issues of Critical Care Medicine and Intensive Care Medicine. This contains a bundle of 23 separate guidelines for the management of the acutely ill patient with severe sepsis or the critically ill patient with severe sepsis.
Therapy	A clinical professional in the critical care delivery setting e.g. Dietician, Pharmacist or Physiotherapist.
Ventilator-associated pneumonia (VAP)	A respiratory tract infection arising in a critically ill patient receiving invasive ventilatory support 48 hours after commencement.

## 1.0 FOREWORD

Critical care is an essential component of the acute hospital system; safe, effective and timely care of the critically ill patient is an acute healthcare system priority. Critical care describes the range of services delivered to a patient with a life-threatening critical illness condition; such care is aimed at avoiding mortality. Critical care involves the highest level of continuing care and treatment of the critically ill patient, with the primary objective being patient recovery and return to earlier health and functional capacity.

Timely access to an appropriate level of critical care improves survival and critically ill patient outcomes. However, despite the best efforts of the critical care team, the burden of illness is sometimes overwhelming, and death is inevitable. In such cases, the maintenance of patient dignity and comfort becomes the priority, and, with the agreement of the patient's family, the focus of care changes to allow a natural death with minimal suffering.

As critical care is resource intensive, it is vital that critical care services are effectively and efficiently planned. Currently in Ireland, such care is delivered by an expert, highly skilled and motivated multidisciplinary team operating with limited resources.

Historically, acute hospitals and their critical care services in Ireland have been fragmented and duplicated. However total critical care bed capacity remains inadequate, which impacts on the capability of the acute hospital sector to meet the needs of critically ill patients in a safe, effective and timely manner – particularly during major surges.

The Model of Care for Adult Critical Care aligns with the many Department of Health, Health Service Executive (HSE) and Health Information and Quality Authority (HIQA) reform and regulatory initiatives, with the objective of strengthening the acute healthcare system's capability to

meet the needs of critically ill adult patients. This model of care is the result of collaboration with the representative professional bodies in Ireland; the Joint Faculty of Intensive Care Medicine of Ireland; the Intensive Care Society of Ireland; the Irish Association of Directors of Nursing & Midwifery; the Office of Nursing and Midwifery Services Director, Divisions within the Health Service Executive; representatives from Health and Social Care Professionals including pharmacists and service user consultation.

To date, the most comprehensive examination of the requirements of a national critical care service in Ireland has been the Prospectus report 'Towards Excellence in Critical Care (Prospectus, 2009)'; and the key components of the Model of Care for Adult Critical Care are consistent with the key recommendations set out in that report. In addition, the 2009 Prospectus report remains the current and definitive reference document on critical care in Ireland.

This model of care sets out capability requirements – capacity planning, a 'hub-and-spoke' configuration of critical care delivery, training and education, workforce planning, audit, clinical guidelines and clinical governance structures – to strengthen and improve critical care service quality and safety in Ireland, and address current risks.



Dr Michael Power,  
Clinical Lead, National Clinical Programme for Critical Care,  
Clinical Strategy & Programmes Division, Health Service  
Executive.



## 2.0 EXECUTIVE SUMMARY

### National Clinical Programme for Critical Care

The National Clinical Programme for Critical Care (NCPCC) is part of the National Clinical Programmes initiative and has designed the Critical Care Model – a ‘hub-and-spoke’ delivery model for the acute hospital system, so that critically ill adult patients can access an appropriate level of critical care in a safe, effective, efficient and timely manner.

The 2009 Prospectus report *Towards Excellence in Critical Care* was commissioned by the HSE and was prepared by a panel of international experts. The Critical Care Model builds on the Prospectus report.

### Critical Care Model

Timely access to organised critical care capacity leads to improved outcomes for critically ill patients. The ‘hub-and-spoke’ organisational model was proposed in the 2009 Prospectus report. In other fields, e.g. cancer services and severe trauma services, ‘hub-and-spoke’ service arrangements lead to improved outcomes.

The Prospectus report describes ‘hub-and-spoke’ hospitals with Intensive Care Units (ICUs) and, crucially, ‘local’ hospitals without ICUs (Prospectus, 2009). In the Prospectus model the ‘hub’, ‘spoke’ and ‘local’ hospitals are linked as a hospital network or Hospital Group, with transport services or connectivity across hospitals.

The National Clinical Programme for Critical Care adopts the Prospectus Critical Care ‘hub-and-spoke’ configuration as its service delivery and organisational model for critical care services with connectivity across Hospital Groups in the acute hospital system (see schematic in Section 5.0).

### Critical Care Service

In Ireland, the modern ICU or High Dependency Unit (HDU) where critically ill patients receive critical care, is described

as a Critical Care Service by the Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) ‘National Standards for Adult Critical Care Services 2011’. Critical Care Services (HDUs and ICUs) are located in aligned Model 3 or Model 4 hospitals.

### Levels of critical care

Critically ill patients receive critical care in a Critical Care Service, based on their need for levels of critical care. The Level of Critical Care is defined by the JFICMI ‘National Standards for Adult Critical Care Services 2011’. All critically ill patients are vulnerable. In addition, there are increasingly vulnerable cohorts of high-risk, critically ill patients who require critical care in ‘hub’ hospitals; such patients include critically ill children presenting to an adult hospital, critically ill pregnant women, frail elderly patients, patients with severe sepsis, immunosuppressed patients, severe trauma patients and high-risk surgery patients.

### Connectivity – National Adult Critical Care Retrieval Service

The HSE (through the National Clinical Programme for Transport Medicine) is implementing the National Adult Critical Care Retrieval Service. This service is developing the existing retrieval service for critically ill adult patients, which is currently provided by Mobile Intensive Care Ambulance Service (MICAS). The remit of the Service is to ensure the timely ‘hospital to hospital’ transfer of Level 3 ICU critically ill patients (this usually means ventilated), as needed and as appropriate.

The National Critical Care Retrieval Service will operate a seven-days-a-week transport service, resourced by additional dedicated retrieval staff in Cork, Dublin and Galway.

## Capacity building

The principal priority of the National Clinical Programme for Critical Care is capacity building. In the Introduction to the 2009 Prospectus report, it states: '...having sufficient critical care capacity and the right configuration of beds will dictate the quality of critical care provided to our sickest patients in hospital' (Prospectus, 2009, p. 5). The report states that 'at present our critical care service is falling short of what is required on both counts, and as a result critical care patients may be put at risk.' (Prospectus, 2009, p.5) In addition, recommendation 3 of the report is: 'The number of critical care beds should be increased by 45%...and this will need to increase sequentially...over the period 2010 to 2020' (Prospectus, 2009, p. 17).

Between 2008 and 2013, overall national critical care bed capacity decreased by 32 beds.

The Model of Care for Adult Critical Care, concurs with the recommendations for expansion of critical care services, as set out in the 2009 Prospectus report. An immediate priority must be to restore the loss of critical care bed capacity since 2008 (i.e. some 32 critical care beds nationally).

Where critical care bed capacity is lost from smaller hospitals as part of the reconfiguration of acute hospital services, there must be an equivalent expansion of the resource at the 'hub' hospital – capacity redeployment.

Capacity estimates obtained from the annual National Clinical Programme for Critical Care Census and the National Critical Care Audit inform national critical care capacity planning.

A web-based 'Bed Bureau', an ICU Bed Information System (ICU-BIS), will track critical care bed availability on a daily basis, in order to facilitate inter-hospital clinical transfer of patients as needed and as appropriate.

## Major surge capacity

Inevitably, there are times when demand for critical care is extraordinary. During such critical care major surges, critical care capacity may be overwhelmed (as occurred during the influenza A (H1N1) pandemics). When this happens, the Major Surge Capacity Plan is activated, as stipulated by the Major Critical Care Surge Committee.

## Summary

The National Clinical Programme for Critical Care describes a 'hub-and-spoke' Model of Care for Adult Critical Care, which is a centralised critical care delivery model, designed to meet the complex needs of critically ill patients across the acute healthcare system. Critically ill patients require timely and safe access to adequate critical care bed capacity to achieve good outcomes.

The modern ICU or HDU is described as a critical care service where critically ill patients receive either Level 3 ICU Care or Level 2 HDU Care. The Model of Care for Adult Critical Care aligns with previously published strategies for example: Acute Hospital Groups, Smaller Hospitals' Framework and all other National Clinical Programmes models of care, to provide for a safe and effective critical care pathway.

This document provides a strategic framework to meet the complex and specialty needs of critically ill adult patients in a safe, timely and effective manner across the acute healthcare system.

## 3.0 BACKGROUND

Ireland's acute healthcare system is currently undergoing major reform of its governance, delivery and financing structures. The National Clinical Programme for Critical Care builds upon important reform initiatives such as:

- (a) National Clinical Programmes
- (b) Department of Health
  - i. The Future Health strategic framework (Department of Health, 2012)
  - ii. The Establishment of Hospital Groups as a transition to Independent Hospital Trusts (DOH, 2013) (referred to in this document as Hospital Groups) and Securing the Future of Smaller Hospitals - A Framework for Development (DOH, 2013b) (referred to in this document as the Smaller Hospitals' Framework)
- (c) Health Information and Quality Authority
  - i. National Standards for Safer Better Healthcare (HIQA, 2012)
  - ii. The HIQA reports (ie 'Ennis' 2009, 'Mallow' 2010 and 'Tallaght' 2012 Reports)
- (d) Building a Culture of Patient Safety (2008) - The Commission on Patient Safety and Quality Assurance.
- (e) International evidence base

### 3.1 National Clinical Programmes

As part of overall reform of the acute healthcare system, the Health Service National Clinical Programmes initiative was developed, with three main aims:

- To improve the quality of care delivery to all
- To improve access to all services
- To improve value and cost effectiveness

These three aims follow Berwick's health system reform titled 'Triple Aim', whereby Berwick sets out strategic objectives for an acute healthcare system (Berwick, 2008). Accordingly, in the context of overall acute healthcare system reform, it is timely to provide a framework or model for future critical care service delivery which aligns with overall reform of the acute hospital sector.

The Model of Care for Adult Critical Care aligns with previously published strategies for example: Hospital Groups, Smaller Hospitals' Framework and all other National Clinical Programmes strategies, which provide for a safe and effective critical care pathway.

The Model of Care for Adult Critical Care and the National Clinical Programmes are supported by acute healthcare system capabilities – safe and effective practices, adequate resource allocations, healthcare professional competencies, integrated governance structures and compliance with national standards.

### 3.2 Department of Health

*Future Health: A Strategic Framework for Reform of the Health Service 2012 – 2015*

The Department of Health, the Minister for Health and the Government are driving reform of the acute healthcare system in Ireland. The Department of Health published Future Health: A Strategic Framework for Reform of the Health Service 2012 – 2015 (Department of Health, 2012) which sets out a strategic framework of four reform pillars for the health system in Ireland: health and wellbeing, service reform, structural reform and financial reform.

The current structural reform of the acute hospital system which is underway, the Hospital Groups and the Smaller Hospitals Framework, will provide critical care capability and safety.

Many injury prevention initiatives – for example road safety initiatives – continue to improve health by preventing head injury and severe trauma.

Financial reform in the context of critical care will result in accurate critical care cost estimates based on critical care activity, medications and consumables for provider reimbursement.

The National Clinical Programme for Critical Care aligns with the Department of Health Special Delivery Unit (SDU) Unscheduled Care Strategic Plan (Q1, 2013). The SDU plan provides a strategic framework to improve capability in each of the following domains: data and information, capacity planning, continual operational process improvement, communication and engagement, leadership and governance (Department of Health, 2013c).

### 3.3 Hospital Groups and the Smaller Hospitals Framework

The Department of Health outlined details of an acute hospital delivery system in two reports: The Establishment of Hospital Groups as a transition to Independent Hospital Trusts (2013) and Securing the Future of Smaller Hospitals: A Framework for Development (2013).

The Hospital Group report refers to a tiered arrangement of the acute hospital system with the designation of 'four generic hospital models' (Department of Health, 2013). Within the Hospital Models framework, there is a clear delineation for critical care. For example, a Model 2 Hospital does not have a critical care service, whereas a Model 3 or Model 4 Hospital does have such a service. Thus, the Critical Care 'hub-and-spoke' configuration is in line with the strategy set out in the Department of Health reports.

### 3.4 Health Information and Quality Authority (HIQA)

National Standards for Safer Better Healthcare 2012 HIQA has defined quality and safety themes for the acute healthcare system. HIQA refers separately to quality themes and capacity and capability themes.

The quality themes are:

- Person-centred care and support
- Effective care and support
- Safe care and support
- Better health and wellbeing

The capacity and capability themes are

- Leadership, governance and management
- Workforce
- Use of resource
- Use of information

These themes are adopted by the National Clinical Programme for Critical Care as its 'value set'. Accordingly, this document enables initiatives and structures to meet all of these regulatory standard themes or values.

#### 3.4.1 The HIQA Reports - 'Ennis', 'Mallow' and 'Tallaght':

The Model of Care for Adult Critical Care complies with the recommended acute healthcare delivery model i.e. the 'System of Care' contained in the HIQA 'Ennis', 'Mallow' and 'Tallaght' reports, respectively. The HIQA regulations require the care of complex, acutely ill and critically ill patients to be centralised in regional or supra-regional multispecialty centres with appropriate governance arrangements.

In its 'Mallow' report (Health Information and Quality Authority, 2009b), HIQA referred to a 'System of Care' model and set out ten health system delivery or 'System of Care' (SOC) regulatory recommendations. Three of these System of Care recommendations (SOC 4, SOC 5 and SOC 6) refer directly to critical care service delivery.

The HIQA 2011 'Mallow' report found a lack of a systems approach or systemic organisation of acute care delivery. HIQA stated that 'the safety and quality of the service was dependent on the professionalism and willingness of all clinical staff... rather than a resilient and reliable system of care'.

The HIQA 2009 'Ennis' report (Health Information and Quality Authority, 2009) found that acute, complex and specialist services were "not sustainable" at low-volume hospitals. HIQA stated: 'Continuing these acute services,

including Level 2 or Level 3 critical care in [its] current structure exposes patients to potential harm.’ (HIQA, 2009) HIQA recommended that all critically ill patients should be transferred to regional, high-volume critical care services.

### 3.5 Commission on Patient Safety and Quality

#### Assurance – Building a Culture of Patient Safety 2008

In January 2007 the Minister for Health and Children established the Commission on Patient Quality and Safety Assurance to develop a framework with recommendations to ensure patient safety and the delivery of high-quality health and personal social services in Ireland.

The Commission’s report Building a Culture of Patient Safety (2008) articulated a Vision or framework around which the Irish health system should be based as one in which ‘knowledgeable patients receive safe and effective care from skilled professionals in appropriate environments with assessed outcomes.’

The Commission’s Vision was a key driver of the development of a critical care service delivery model for the critically ill patient.

A critically ill patient is vulnerable and incapacitated and, consequently, has little or no knowledge of their critical illness and related conditions. Accordingly, a critical care vision may be described as follows: vulnerable, critically ill patients receiving safe and effective critical care from competent professionals in appropriate environments with assessed outcomes in communication with families and next of kin.

### 3.6 Evidence base: international evidence Berwick’s ‘Triple Aim’

To improve the health system, Berwick (2008) refers to the simultaneous pursuit of the ‘Triple Aim’ of quality, access and cost objectives. Berwick refers to three “inescapable

design constraints” or “preconditions” of a health system to achieve the ‘Triple Aim’. The first of these is the need for an “integrator” or an integrative structure. The “integrator” is an entity that accepts responsibility for all three components of the Triple Aim for a specified population, a single organisation (not just a market dynamic) that can induce coordinative behaviour among health service suppliers to work as a system for the defined population.

Accordingly, for critically ill patients, a critical care service delivery model is a vital component of an integrative approach.

#### Centralised critical care delivery

There is evidence that multidisciplinary, multispecialty critical care in centralised (or regionalised) high-volume Critical Care Units is associated with superior outcomes (Kahn (2006); Hutchings (2009); Davenport (2010); Kim (2010).

In the health policy literature, the principal finding or principal critical care health system problem identified by the PrOMIS Conference (Prioritizing the Organization and Management of Intensive Care Services in the United States) was that preventable morbidity and mortality result from the lack of a systems approach to the organisation and delivery of adult critical care services in the United States (Barnato, 2007). Thus, the critical care policy literature supports centralised or regionalised delivery of critical care to complex critically ill patients with multi-organ failure and multispecialty input requirements.

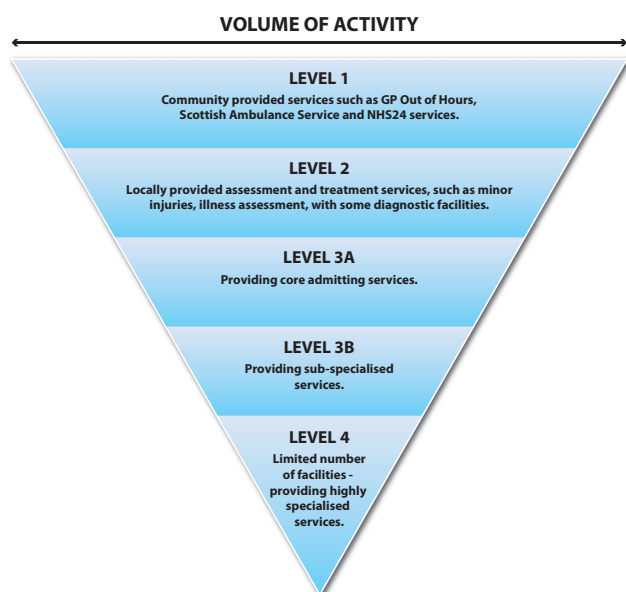
In the UK, critical care “modernisation” i.e. centralisation with increased critical care resources was associated with increased health system-wide critical care survival (Hutchings, 2009).

Similarly, for patients with severe trauma, Davenport (2010) has shown increased survival in patients with a centralised or regional model.

### Tiered delivery

The 2005 NHS Scotland report, Building a Health Service Fit for the Future recommends a tiered framework for acute or “unscheduled” care (Scottish Executive, 2005). The report found that there were a number of levels of demand for unscheduled care in the acute healthcare system. It proposed a tiered acute healthcare framework with increasing complexity and specialisation.

## LEVEL OF UNSCHEDULED CARE



**FIGURE 1:**  
Levels of “unscheduled” care. Centralisation of high-acuity, high complexity patients (Scottish Executive, 2005)

The NHS Scotland “tiered” centralisation of acute healthcare services originated with the ‘hub-and-spoke’ configuration for cancer services reform. In 1995, in the UK, the report A Policy Framework for Commissioning Cancer Services, chaired by Sir Kenneth Calman, in providing for effective, accessible and efficient cancer services, recommended a service network structure. Specifically, the report stated: ‘The new structure should be based on a network of expertise in cancer care reaching from primary care through Cancer Units in district hospitals to Cancer Centres’ (Expert Advisory Group on Cancer, 1995). A hub-and-spoke model for cancer services in the West Midlands, UK, with five levels of cancer care, provided a tiered, connected centralised model for complex (cancer) care (Kerr (1996).

Subsequently, Kerr provided this hub-and-spoke model to NHS Scotland’s acute sector reform plan for ‘unscheduled’ care. In 2005, Scotland’s health minister approved the tiered acute healthcare delivery model for NHS Scotland. Tiered acute sector pathways and arrangements are also provided in Canadian and Australian health systems.

## 4.0 CRITICAL CARE CLINICAL GOVERNANCE STRUCTURES

### Clinical governance

The National Clinical Programme for Critical Care adopts the clinical governance structures set out in:

1. The Joint Faculty of Intensive Care Medicine of Ireland National Standards for Adult Critical Care Services 2011
2. The Governance Committee of the National Critical Care Audit, National Office for Clinical Audit (NOCA)
3. The Code of Governance Framework for the Corporate and Financial Governance of the Health Service Executive Version 4, 2011 (HSE, 2011)
4. National Clinical Programmes: Checklist for Clinical Governance (National) 2011 (HSE, 2011b)

The JFICMI's National Standards for Adult Critical Care Services 2011 defines the critical care clinical governance structure as having a Medical Director (Director of Critical Care Medicine) who "will lead critical care services across the hospital, including steering critical care policy, strategy, and operational activities and audit." The Director of Critical Care Medicine leads the hospital's multidisciplinary Critical Care Committee, which reports directly to the Clinical Director of the designated hospital Directorate e.g. Perioperative Directorate.

In addition, Model of Care for Adult Critical Care defines a Hospital Group critical care structure or committee at Hospital Group level reporting to clinical governance structures to further coordinate critical care service delivery across Hospital Groups.

The HSE National Clinical Programmes Clinical Governance Checklist for Clinical Governance (2011) defines clinical governance as 'corporate accountability for clinical performance'. The Checklist document further defines the reach of clinical governance for a hospital provider as "effective governance arrangements which recognise the interdependencies between corporate, financial and clinical governance across the service and integrates them

to deliver high-quality, safe and reliable healthcare".

Critical care clinical governance reform implies 'embedding responsibility, accountability and safety as key priorities' with service providers (Prospectus, 2009).

Similarly, the HSE Special Delivery Unit (SDU) has defined a provider accountability framework in terms of quality, access and resource to deliver a safe, high-quality patientcentred service.

The Clinical Governance structure of a Critical Care Service provider is 'nested' in the clinical governance structure of the acute hospital provider and, in turn, of its acute Hospital Group. The acute hospitals and the acute Hospital Groups are in turn nested in the overall corporate, administrative, financial, policy and regulatory framework of the acute healthcare system.

Thus, the National Clinical Programme for Critical Care adopts the JFICMI National Standards for Adult Critical Care Services 2011 and the National Clinical Programmes Clinical Governance framework, and describes a linear reporting relationship where the Critical Care Committee of a critical care service reports directly to the Clinical Director of the designated Directorate e.g. Perioperative Directorate.

Section 4.8 of the JFICMI National Standards for Adult Critical Care Services 2011 describes the governance of critical care decision-making as follows: 'Patients referred for critical care management will be assessed by the critical care clinical team, and the decision, to admit, retrieve, transfer or leave management with the referring team will be decided by the critical care team in conjunction with the referring team.' Accordingly, the critical care clinical team under the supervision of the Duty ICU Consultant makes critical care treatment decisions.



Section 4.9 of the JFICMI National Standards for Adult Critical Care Services 2011 requires a critical care audit as follows: “quality of patient care and outcomes require support from a clinical audit and benchmarking process. It is the responsibility of the hospital, and the healthcare region which the Critical Care Unit serves, to invest in the appropriate hardware, software and staffing to support clinical audit” (JFICMI, 2011 p.8).

#### 4.1. Critical care performance measures

Performance measures are obtained from the National Critical Care Audit. For example, critical care activity is measured using the Critical Care Minimum Data Set

#### 4.2. Critical incident reporting

Where a critical incident occurs, a statutory reporting obligation arises using the HSE Safety Incident Management Policy 2014 (HSE, 2014) and/or the HSE Good Faith Reporting Policy 2011 (HSE, 2011b).

In addition, where a critical incident occurs, an open disclosure procedure arises according to the HSE and State Claims Agency Open Disclosure National Policy (HSE, 2013).

#### 4.3. Policies Procedures Protocols Guidelines (PPPGs)

Clinical guidelines on common conditions are already widely available and easily accessible. For most clinical conditions there seems to be no reason to duplicate these for Irish practice. The National Clinical Programme for Critical Care has taken the approach of endorsing the authoritative international Clinical Guidelines adopted by the Intensive Care Society of Ireland (ICSI) for most conditions, with the exception of certain situations where specific Irish guidelines may be appropriate.

Depending on individual patient requirements and local factors, clinical practice can vary between units and between clinicians. Sometimes it may be more appropriate for units to develop their own guidelines on specific topics of interest to themselves, thus giving them a sense of ownership of these guidelines in addition to reflecting their own practice.

The National Clinical Programme for Critical Care, in conjunction with the ICSI, provides website links to national and international guidelines and standards documents, and these serve as a useful resource for clinicians.

#### Guidelines are considered under three category headings:

- Guidelines on Administrative and Physical Structures e.g. minimum standards for Critical Care Units, the JFICMI guidelines, ESICM, ICS, ANZICS etc.
- Guidelines on common clinical conditions, which are widely available from authoritative sources and are frequently updated. Examples include: Management of Traumatic Brain Injury, Surviving Sepsis Guidelines, acute respiratory distress syndrome (ARDS) guidelines, management of liver failure, prevention of healthcare-associated infections (HCAIs), care bundles for central venous catheters etc.
- Guidelines developed by the ICSI for Ireland to fulfil a perceived need and to reflect practice, structures and legislation in Ireland on specific topics e.g. brain death, organ donor management etc.



#### 4.4. National Clinical Programme for Critical Care (NCPCC) guidelines implementation strategy proposal

Guideline implementation science shows that an active, multifaceted, educational, local approach works best (Prior, et al, 2008). The National Clinical Programme for Critical Care (NCPCC) proposes a PPPG implementation strategy that adopts professional body guidelines and complements professional body educational activities.

- Dissemination to HSE Divisions
- Adoption of existing Intensive Care Society of Ireland guidelines by the National Clinical Programme for Critical Care
- Distribution through the HSE National Clinical Programme for Critical Care Working Group Regional and local representatives
- Approval through National Clinical Effectiveness Committee, Department of Health
- Distribution to critical care stakeholders
- Wider dissemination to the Department of Health, wider healthcare system, and made available to the public
- Collaboratives including NCPCC Hospital Group multidisciplinary educational workshops
- Clinical information communication with communication tools e.g. situation, background, assessment, response (SBAR)
- Professional communication – intra-discipline, inter-discipline – via the NCPCC website where ICSI clinical guidelines and the JFICMI National Standards for Adult Critical Care Services 2011 are published. Multidisciplinary collaboratives disseminate improvement methodologies along with best evidence and best practice clinical practice guidelines. A “diktat” or “command-and-control” approach is avoided.
- Capacity information communication with the ICU Bed Information System (ICU-BIS) or Bed Bureau and with the National Clinical Programme for Critical Care annual census with existing bed stock and workforce estimates. Paediatric critical care capacity access communication is enabled by PICU, i.e. appropriate transfer of the critically ill child presenting to the adult hospital after initial resuscitation.

#### 4.5. Communications

Communication and engagement are vital to ensure safe, effective critical care.

The National Clinical Programme for Critical Care identifies communication requirements and engagement strategies in the following domains:

- Patient communication with family, next of kin, relations, loved ones, close friends. The communication expectation is set out in the Department of Health/HSE publication titled ‘You and Your Health Service’ (HSE, 2010).

## 5.0 MODEL OF CARE FOR ADULT CRITICAL CARE

### 5.1 Critical illness

Critical illness is a life-threatening condition that requires critical care intervention in order to ensure a patient's survival. A critically ill patient who may have multiple organ failures requires timely specialty intervention and multi-organ treatment and support.

### 5.2 Critical care

Critical care refers to two related processes. Firstly, 'critical' refers to discernment or recognition of a crucial and a decisive turning point, a potentially life-threatening deterioration of the patient's condition, followed, secondly, by 'care' i.e. intervention including resuscitation and transport to a critical care service. Critical care resuscitation and treatment interventions include a complex range of general and specialty procedures, supports and diagnostic procedures, which may succeed in helping the patient to survive.

### 5.3 Critical care in Ireland – current situation

Many world-class intensive care services have been developed by dedicated professionals, in university teaching hospitals and also in regional and sub-regional hospitals in Ireland.

Such development is due in no small measure to the modernisation initiatives undertaken by many hospitals, and in particular to the continuous modernisation of critical care services by Intensive Care Medicine Consultants.

In recent decades, the Irish Board of Intensive Care Medicine (IBICM) and the Joint Faculty of Intensive Care Medicine of Ireland have ensured the competency and expertise of the intensive care medical workforce. The excellent critical care professional education and training delivered by the IBICM and JFICMI, coupled with intensive care medical expertise, results in excellent outcomes and survival in the critically ill patient cohort in Ireland.

Consequently, at bedside in ICUs in Ireland today, a dedicated and expert professional workforce of medical, nursing and therapy professionals provide critical care treatments and supports with care and compassion to critically ill patients. In addition, multiple expert regional, supra-regional and national specialty interventions are available in many regional and supra-regional hospitals; these include medical, surgical, clinical microbiological specialties, as well as radiology, laboratory and blood transfusion specialties.

Accordingly, in many ICUs in Ireland today, evidence-based and expert critical care is delivered to the complex critically ill patient with multi-organ failure at the bedside; such care results in high-quality and excellent outcomes.

However, in some smaller hospitals, several very low-volume ICUs are provided. While smaller hospitals provide excellent general medical and general surgical services, they lack specialty services (such as nephrology and continuous dialysis) to support the complex needs of critically ill patients. The Critical Care 'hub-and-spoke' configuration serves to reform this fragmented hospital system legacy.

### 5.4 Future critical care in Ireland

Reforms of the health system are underway and are being driven by the Department of Health, the HSE, HIQA and the National Clinical Programmes. The objective of acute healthcare reform in Ireland is to centralise complexity and acuity in regional and supraregional hospital centres and to bring high-volume, low-complexity, low-acuity clinical work (i.e. treatments, procedures etc.) closer to the patient in local hospitals.

Thus, the goal is to achieve both central and local clinical excellence.

### 5.5 The Critical Care “hub-and-spoke” configuration

The National Clinical Programme for Critical Care describes the Critical Care ‘hub-and-spoke’ configuration as a service delivery reform. The Model of Care for Adult Critical Care is a ‘macro’ critical care healthcare system delivery model designed to enable adult critically ill patients gain timely access to Critical Care Services across the acute hospital system.

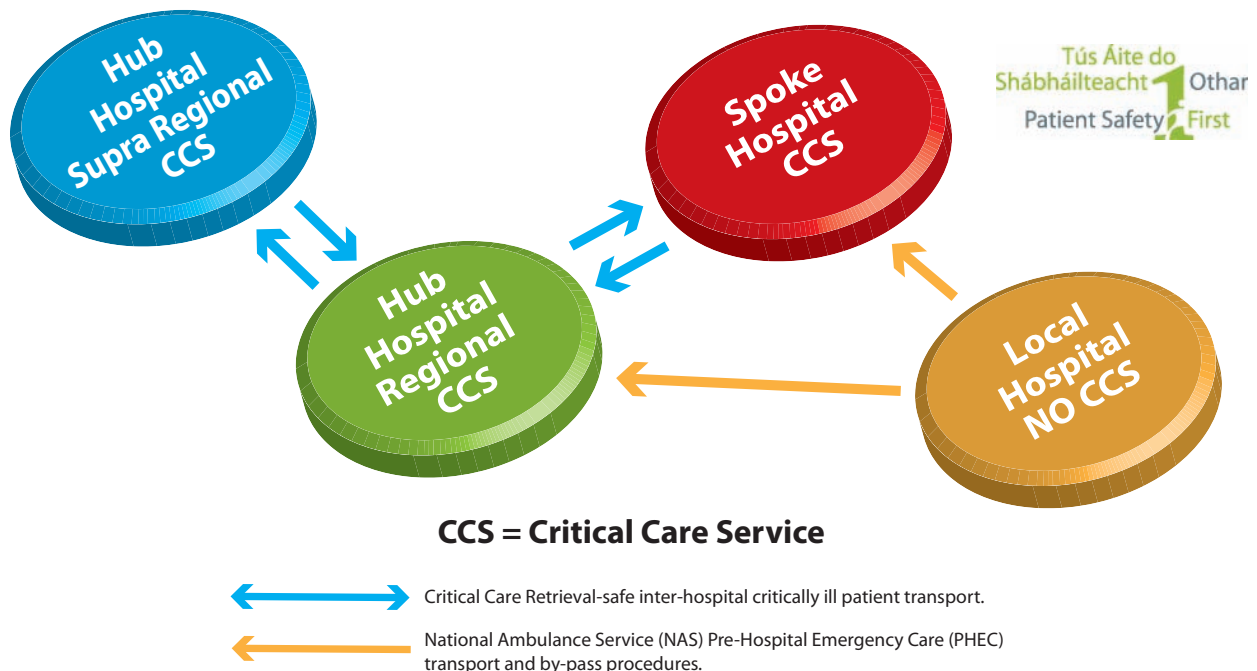
The Critical Care ‘hub-and-spoke’ configuration is illustrated in fig 2

1. Critical care services in regional/supra-regional ‘hub’ and sub-regional ‘spoke’ hospitals
2. No critical care service in local hospitals
3. Connections: Critical Care Retrieval, National Ambulance Service and National Transport Medicine Programme transport services.

The Model of Care for Adult Critical Care is the culmination of a collaboration from 2010 to 2013 with the many national and regional professional and administrative bodies that provide critical care, in addition to wider consultation with many critical care profession stakeholders and service users.

High-volume delivery models provide evidence of improved survival for many trauma, cancer and high-risk surgery patients. Kahn (2006) provides evidence of increased survival from a high-volume critical care delivery model. Accordingly, a ‘hub-and-spoke’ organisation model provides a care pathway by which critically ill patients gain timely access to safe and effective high-volume critical care services across the acute hospital system. Access delay or access failure to appropriate critical care for critically ill patients represents increased risk.

### CRITICAL CARE PROGRAMME CRITICAL CARE ‘HUB-AND-SPOKE’ MODEL



**FIGURE 2:**  
Critical Care ‘hub-and-spoke’ configuration, National Clinical Programme for Critical Care . (Prospectus, 2009)

As a result, critically ill patients with multi-organ failure should be transferred to acute regional or supra-regional 'hub' hospitals using timely transportation systems i.e. Critical Care Retrieval as part of the National Transport Medicine Programme.

A centralised organisational model was identified in the 2003 Report of the National Task Force on Medical Staffing, sometimes referred to as the 'Hanly Report' (National Task Force on Medical Staffing, 2003).

The report stated that there is convincing evidence that the best treatment results are achieved when patients are treated by staff working as part of a multidisciplinary specialist team, and that better clinical outcomes are achieved in units with appropriate numbers of specialist staff with relevant skills and experience, high volumes of activity and access to appropriate diagnostic and treatment facilities.

The 2009 HSE commissioned Prospectus Report, Towards Excellence in Critical Care, recommends a 'hub-and-spoke' configuration for critical care. 'Hub-and-spoke' is a term used to denote an organisation system that is integrated, connected, centralised and tiered.

### 5.6 Levels of critical care

The JFICMI was established in 2009 and developed the National Standards for Adult Critical Care Services 2011 for critical care medicine delivery. The JFICMI was founded by four bodies: the College of Anaesthetists of Ireland; the Intensive Care Society of Ireland; the Royal College of Physicians of Ireland, and the Royal College of Surgeons in Ireland.

The National Standards for Adult Critical Care Services provide a patient-based definition of critical illness where critical illness is defined by the patient's clinical condition and his/her level of need for critical care. Accordingly, critical care is not an institution-based or specialty-based definition.

A critically ill patient requiring critical care support for single organ failure normally receives 'Level 2' critical care. A critically ill patient requiring invasive ventilatory support or requiring multi-organ supports normally receives 'Level 3' critical care. A critically ill patient requiring specialty critical care normally receives 'Level 3(s)' specialty critical care e.g. Neurocritical Care, Cardiothoracic Critical Care (CCC), Extracorporeal Life Support (ECLS), Extra- corporeal Membrane Oxygenation (ECMO), Burns Critical Care, Solid Organ and Bone Marrow Transplantation Critical Care etc.

<b>Acute Care</b>	Level 0	Hospital ward clinical management
	Level 1	Higher level of observation eg. PACU
<b>Critical Care</b>	Level 2	Active management by critical care team to treat and support critically ill patients with primarily single organ failure
	Level 3	Active management by critical care team to treat and support critically ill patients with two or more organ failures
	Level 3s	Level 3 with regional/national service

**FIGURE 3:**

Levels of care, National Standards for Adult Critical Care Services 2011, Joint Faculty of Intensive Care Medicine of Ireland (p.4)

### 5.7 Critical care service

The JFICMI National Standards for Adult Critical Care Services 2011 defined a critical care service in an acute hospital where levels of critical care are delivered to critically ill patients as follows: A critical care service is appropriate for the care of patients requiring Level 2, Level 3, and Level 3(s) critical care, which is generally delivered within a high dependency (HDU) or intensive care unit (ICU). The term Critical Care Unit refers to a HDU or an ICU.

The JFICMI National Standards for Adult Critical Care Services also define minimum requirements for an ICU in terms of

resourcing, staffing, delivery and governance requirements. In addition, the National Standards also define facility requirements for critical care delivery.

The National Clinical Programme for Critical Care has adopted the Critical Care Service Minimum Requirements definition provided by the JFICMI National Standards (2011): Critical Care Service – minimum requirements • Critical Care bed capacity: ~200 admitted critically ill patients per year • 1:1 nurse/patient ratio for Level 3 ICU patients • On-site ICU Junior Doctor with critical care skills (including airway skills) 24/7/365

- Daily ICU Consultant sessions committed to ICU alone
- A minimum of two Consultants with ICU training and qualifications e.g. Fellowship of the Joint Faculty of Intensive Care Medicine in Ireland (JFICMI). The JFICMI National Standards state that it is desirable that Consultant sessions be provided by a specialist who is a Fellow of the Joint Faculty of Intensive Care Medicine of Ireland, or who is trained to a level that allows accreditation by JFICMI.
- Availability of direct access to continuous veno-venous haemofiltration (CVVH)
- Clinical Microbiology and Radiology Consultant support
- Audit and activity review processes
- Therapy professional support – eg Dietician, Pharmacist, Physiotherapist etc
- Radiography, laboratory, arterial blood gases and blood bank on call.

A Critical Care Service in a Model 4 regional or supra-regional hospital provides highvolume, multidisciplinary critical care to critically ill patients requiring multi-organ supports, multi-specialty supports and critical care specialty supports e.g. ECLS, neurocritical care, etc. There are additional requirements for regional and supra-regional critical care service delivery.

Model 4 Regional and Supra-regional Hospital Critical Care Services – additional requirements

- 1:1 nurse/patient ratio for Level 3 critically ill patients
- Roster of between six and seven ICU Consultants. The JFICMI National Standards state that it is desirable that Consultant sessions be provided by a specialist who is a Fellow of the Joint Faculty of Intensive Care Medicine of Ireland, or who is trained to a level that allows accreditation by the JFICMI.
- Availability of continuous renal replacement therapy
- Clinical Microbiology, Radiology, Consultant direct/sessional support
- National Critical Care Audit and activity review processes
- Therapy professionals direct sessional support – dietician, pharmacist, physiotherapist
- Multispecialty Consultant direct access and availability in hours and on call: Surgery, Medicine, Vascular, Urology, Radiology, Haematology, Gastroenterology etc.
- Radiography, laboratory, arterial blood gases and blood bank on call

According to the Hospital Groups report, Critical Care Services are provided only at Model 3 and Model 4 hospitals, and not at Model 2 hospitals (Department of Health, 2013).

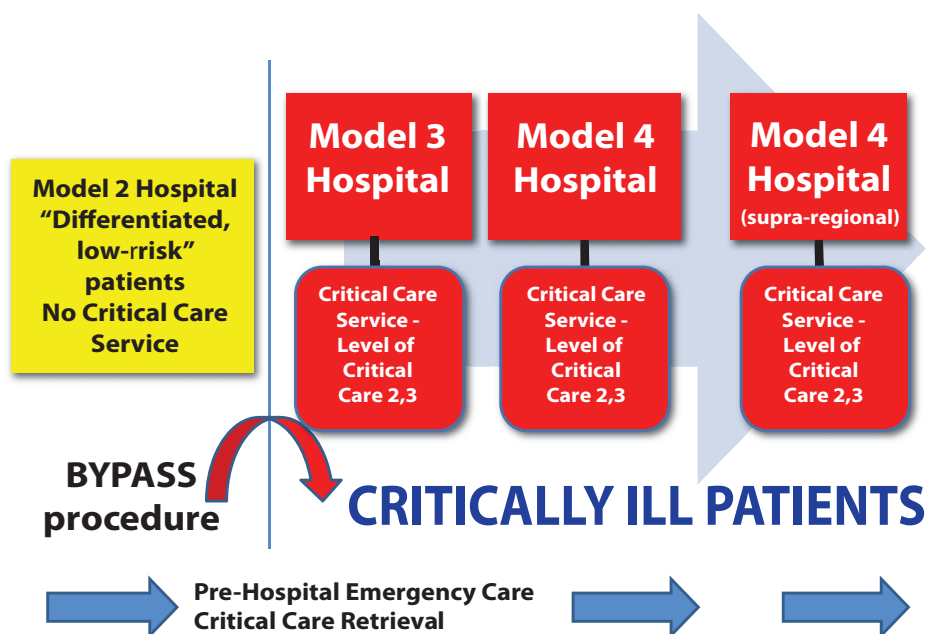
### 5.8 Alignment

This document aligns with the published DOH reports and the models of care of other National Clinical Programmes and specifically, the National Clinical Programmes for Acute Medicine, Acute Surgery and Emergency Medicine.

The Model of Care for Adult Critical Care also incorporates HIQA's requirements as set out in the 'Ennis', 'Mallow', 'Tallaght' and 'Galway' (HIQA, 2013) reports.

This alignment ensures that there is a safe and effective care pathway in place to meet the complex needs of the critically ill patient.

## ALIGNMENT WITH OTHER PUBLISHED DOCUMENTS



**FIGURE 4:**

Model of Care for Adult Critical Care alignment with other published documents.

## ALIGNMENT WITH THE ACUTE HOSPITAL MODELS

Acute Hospital Models	Levels of Critical Care National Standards JFICMI	Critical Care Service National Standards JFICMI	Medical, surgical multispecialty services	2003 Hanly Report	2009 HSE/ Prospectus Report Critical Care Model
Model 1 Hospital	Long-term care	No	No		
Model 2 Hospital	'Low-risk, differentiated' admissions	No	No	'Local' Hospital	'Local' Hospital
Smaller Hospital					
Emergency Medicine Programme (EMP) 'Local Injury Units'	Level 0,1				
Model 3 Hospital: ED, AMU, ASU	Level 0,1,2,3	Yes	No	'Major' Hospital	Spoke' Hospital
Model 4 Hospital (regional): ED, AMU, ASU	Level 0,1,2,3	Yes	Regional specialties	'University' Hospital	'Hub' Hospital
Model 4 Hospital (supra-regional): ED, AMU, ASU	Level 0,1,2,3,3S	Yes	Supra-regional/ National specialties	'University' Hospital	'Hub' Hospital

**FIGURE 5:**

Alignment with the Acute Hospital Models (Emergency Medicine Programme (EMP)), Emergency Department (ED), Acute Medical Unit (AMU), Acute Surgical Unit (ASU).

### Critical Care Model aligns with the National Clinical Programmes

Model of Care for Adult Critical Care aligns with the National Clinical Programmes and, specifically, with the following:

- Emergency Medicine Programme Emergency Care Networks
- Acute Medicine Hospitals Models
- Acute and Elective Surgery Models
- Anaesthesia Programme
- Asthma Programme

The National Clinical Programme for Emergency Medicine in its Care Model Report provides a tiered model of Emergency Medicine delivery (see <http://www.hse.ie/eng/about/clinicalprogrammes/emp/empreport2012.pdf>):

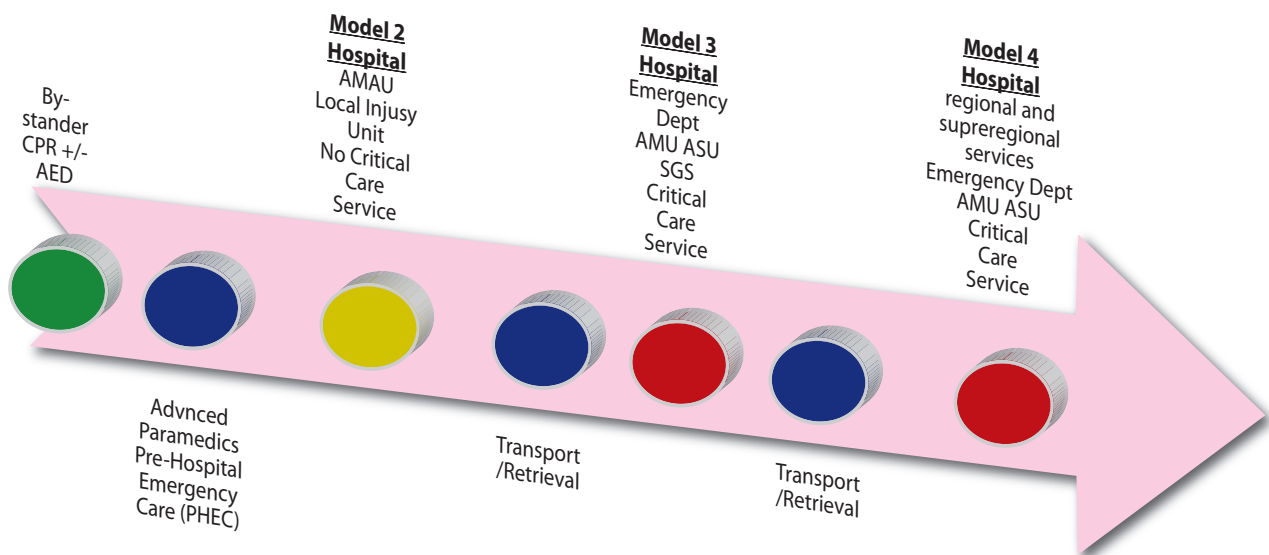
Model 2 Hospitals:	Local Injury Units
Model 3 Hospitals:	Emergency Department
Model 4 Hospital:	Emergency Department

The Critical Care 'hub-and-spoke' configuration aligns with the Emergency Medicine Care Model to provide a care pathway for critically ill patients across the acute hospital system.

### 5.9 Critical care pathway for the critically ill patient

The critical care pathway is a tiered and centralised service delivery construct designed to meet the complex needs of cohorts of critically ill patients in a timely, safe and effective manner.

## CRITICAL CARE PATHWAY



Critical Care Pathway- alignment of the Critical Care Model with Acute Hospital Models, Hospital Groups and National Clinical Programmes' provides a pathway to meet the needs of deteriorated acutely ill and critically ill patients across the health system.

**FIGURE 6:**  
Critical Care Pathway



### Critical Care Pathway: safety features

The safety features of the care pathway are as follows:

1. A Model 3 and a Model 4 Hospital both provide critical care services.
2. A Model 2 Hospital does not provide critical care services.
3. 'Bypass' procedures ensure that critically ill patients are transported to the appropriate type of hospital for their needs.
4. The National Adult Critical Care Retrieval Service provides safe, timely inter-hospital access for critically ill patients to specialty services/critical care.

### Critical care access times

Critically ill patients require timely access to critical care. For example, as Chalfin et al, (2007) demonstrated in the DELAY-ED study, there was a higher risk of mortality in critically ill patients who experienced a delay of more than six hours between their transfer from a hospital Emergency Department to an Intensive Care Unit (Chalfin, 2007). Accordingly, the National Clinical Programme for Critical Care stipulates the following time access goals to Hospital Group Critical Care Service providers.

1. Intra-hospital transfer: a critically ill patient presenting to an Emergency Department should access the Critical Care Service within 1-6 hours.
2. Inter-hospital transfer: a critically ill patient presenting to an Emergency Department should access an appropriate supra-regional/national Critical Care Service within less than 12 hours, as needed and as appropriate.

Alignment of the Critical Care Model with the Acute Hospital Models, Hospital Groups and National Clinical Programmes  
Alignment of this Model with the Acute Hospital Models, Hospital Groups and National Clinical Programmes serves the needs of the following patients:

1. Differentiated and undifferentiated patient presentations
2. Patients sustaining out-of-hospital cardiac arrest
3. Patients suitable for ambulance bypass protocols

### Differentiated and undifferentiated patient presentations

1. An acute patient may have a "differentiated, low-risk" condition i.e. may not be acutely ill and may be admitted to a Model 2 Hospital or Smaller Hospital, as outlined in the Department of Health publication *Securing the Future of Smaller Hospitals: A Framework for Development*. (Department of Health, 2013) However, the condition of a "differentiated" patient may deteriorate and may become acutely ill or critically ill, thus requiring resuscitation. The deterioration of such a patient's condition should be detected using the National Early Warning Score system (NEWS).

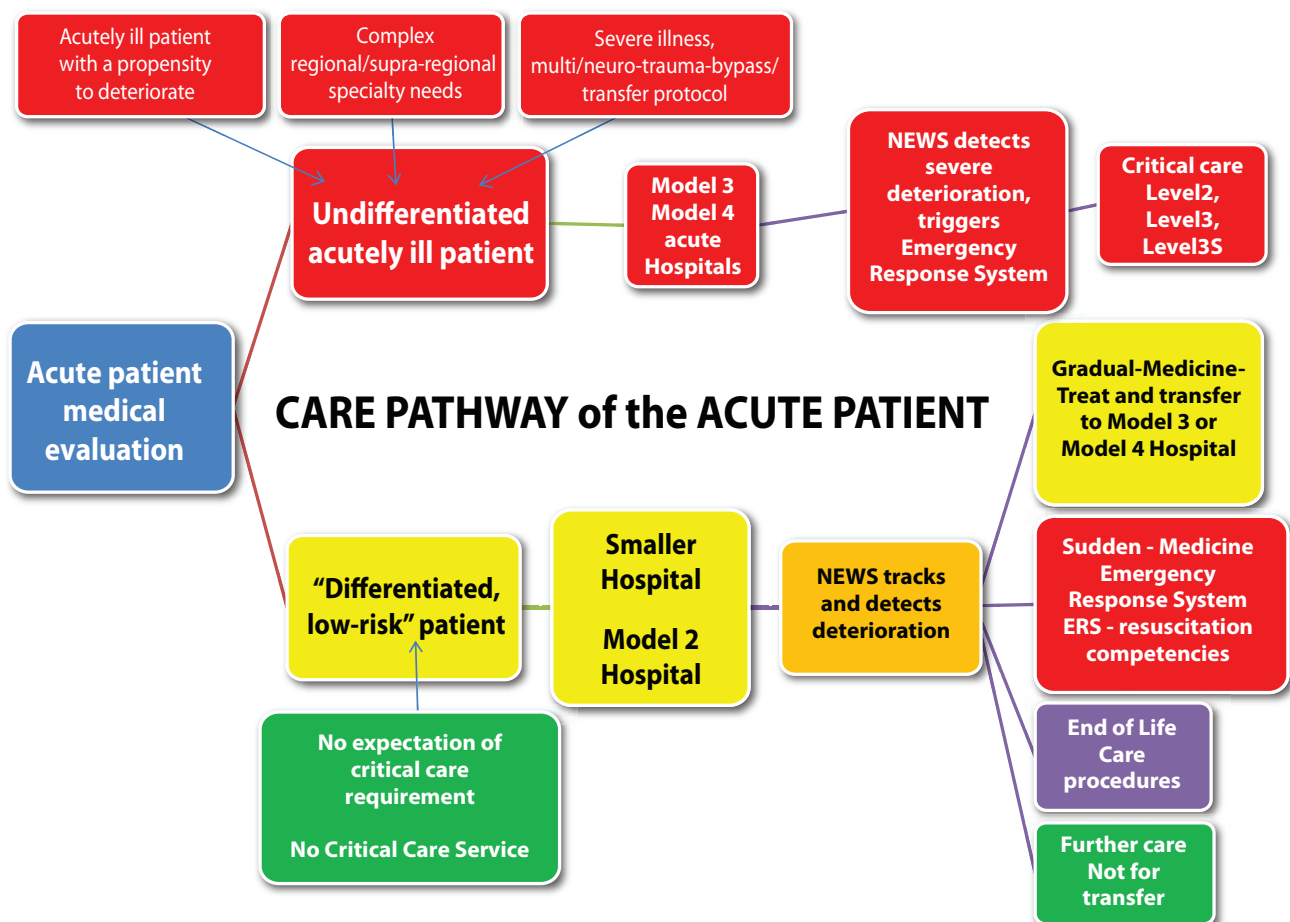
A high NEWS score activates the Emergency Response System appropriate to the Model 2 Hospital or Smaller Hospital. Following detection of their condition, the deteriorated acutely ill/critically ill patient is transferred to a Model 3 or Model 4 Hospital, as necessary/as appropriate, using an Intermediate Care Vehicle or Retrieval, as available.

On the other hand, an "undifferentiated" medical or surgical patient may, on clinical evaluation, be acutely ill and may require direct admission to a Model 3 Hospital or Model 4 Hospital. This acutely ill patient presents to the Emergency Department/Acute Medical Unit/Acute Surgical Unit of a Model 3 or a Model 4 Hospital. Following admission, acutely ill undifferentiated patients with certain conditions, presentations, co-morbidities and complexity have a propensity to deteriorate and become critically ill. Consequently, in line with the recommendations set out in HIQA Mallow SOC 1, the Model 3 Hospital and the Model 4



Hospital must have an on-site Anaesthetic Junior Doctor to provide an immediate competent response to a deteriorated patient as part of the Emergency Response System.

As stated above, deterioration in the condition of an acutely ill patient should be detected using NEWS; as part of this system, the Early Warning Score 'tracker' activates a 'trigger' component, the Emergency Response System (ERS), which in turn delivers an appropriate response.

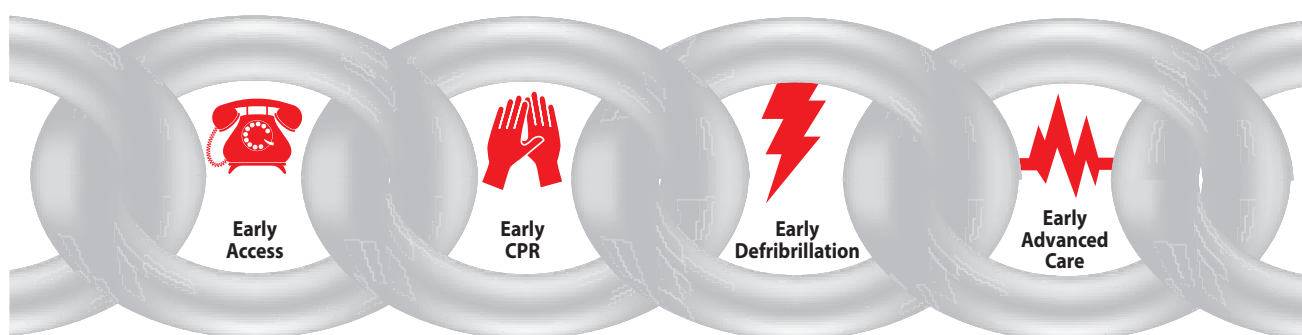


**FIGURE 7:**  
Care pathway of the "differentiated" or undifferentiated acutely ill deteriorated patient.

## 2. “Chain-of-Survival”: the critical care pathway for a patient sustaining an out-of-hospital cardiac arrest

The outcome for a patient sustaining an out-of-hospital cardiac arrest (OOHCA) is determined by access to a clinical care pathway, the “Chain-of-Survival”. Following resuscitation, including chest compressions and/or deployment of an automatic external defibrillator (AED), and following advanced paramedic treatment, resulting in the return of the patient’s spontaneous circulation (ROSC),

the critically ill patient is transported directly to a Model 4 Hospital, in order to access revascularisation therapy and critical care, including external cooling treatment. The patient’s journey may require ‘bypassing’ the local hospital to access the revascularisation and ICU cooling facilities in a Model 4 Hospital. Thus, the critically ill patient’s journey continues along the Acute Care Pathway until the patient’s needs are met.



**FIGURE 8:**  
Chain-of-survival for out-of-hospital cardiac arrest

### 3. ‘Bypass’ procedure

Following first-line treatment or resuscitation of a life-threatening condition by advanced paramedics as part of pre-hospital emergency care, the journey of the critically ill patient continues across the health system until the patient’s needs are met. Direct transport of a critically ill patient to a Model 3 Hospital, a Model 4 regional hospital or a Model 4 supraregional hospital may be required to gain timely access to specialty services. For this reason, a ‘bypass’ procedure i.e. direct transport of a critically ill patient to a further hospital centre may be required. ‘Bypass’ is required for patients who:

1. Have suffered severe trauma
2. Require acute myocardial infarction intervention
3. Are suffering from certain (defined) conditions

### 5.10 Critical care supra-regional and national critical care specialty capacity requirements

#### Regional critical care capacity

The Model 3 ‘spoke’ Hospital and the Model 4 ‘hub’ Hospital provide critical care to critically ill patients with multi-organ failure who require multi-specialty supports e.g. surgical and medical specialties as appropriate.

Supra-regional and national critical care capacity In addition to critically ill patients with regional critical care capacity requirements (Level 3 Critical Care needs), there are also critically ill patients with supra-regional or national critical care specialty requirements (Level 3(s) Critical Care needs) each with dedicated critical care specialty resource requirements:

1. Neurocritical care, including neurotrauma

2. Extra-corporeal life support (ECLS) with ECLS perfusion in hours and an on-call roster, as needed
3. Cardiothoracic critical care
4. Multi-trauma critical care
5. Solid organ and bone marrow transplantation critical care

### 5.10.1 Neurocritical care

Neurocritical care refers to Level 3(s) Critical Care i.e. the critical care of all patients with acute brain injury of any type – traumatic, haemorrhagic, ischaemic, CNS infection etc. All neurocritical patients with any type of acute brain injury (e.g. caused by trauma, intracranial haemorrhage, stroke) should access and benefit from neurocritical care and neurospecialist services in a supra-regional neuro-services centre; the services provided in such a centre include neurosurgery, neuro-interventional radiology etc. Critically ill patients requiring neurocritical care should access neurocritical care and neurospecialist services as part of the Critical Care Pathway.

Evidence presented by the UK Trauma Audit and Research Network (TARN) shows that treatment of patients with severe traumatic brain injury at neurosurgery centres is associated with a two-fold increased survival rate, when compared with patients who were not referred to neurosurgery centres.

	Neurosurgery	Non-neurosurgery
Injury severity score	25	26
Mortality	35%	61%

The UK National Confidential Enquiry into Patient Outcome and Death (NCEPOD) in its 2007 report Trauma: Who cares? recommended that all patients with severe head injury should be transferred to a neurosurgical/critical care centre irrespective of the requirement for surgical intervention (Findlay, 2007).

Similarly, the NHS National Institute for Health and Clinical Excellence Head Injury Clinical Guideline (CG56), published in 2007, recommends that transfer would benefit all patients with serious head injuries (GCS 8), irrespective of the need for neurosurgery (National Institute for Health and Clinical Excellence, 2007).

The Phillips Report: National Report on Traumatic Brain Injury in the Republic of Ireland 2008 published by the Traumatic Brain Injury Research Group provides the following recommendations for severe traumatic brain injury and neurocritical care: 'Neurosurgical management: Provision of sufficient neurocritical care facilities in Ireland, so that all patients with a severe TBI (GCS 3-8) can be treated in a neurosurgical unit in line with international best practice, irrespective of their need for operative intervention.' (Phillips, 2008 p.7).

Furthermore, in 2013, the UK NHS National Institute for Health Research (NIHR) Health Technology Assessment programme published a study entitled Risk Adjustment in Neurocritical care (RAIN), which concluded that the most robust evidence to date supporting the current National Institute of Clinical Excellence (UK) clinical guideline that all patients with severe Traumatic Brain Injury (GCS score of 3–8) would benefit from transfer to a neuroscience centre, regardless of their need for neurosurgery (Harrison, 2013).

Consequently, the National Clinical Programme for Critical Care recommends that all patients with acute severe traumatic brain injury should be immediately referred for Level 3(s) neurocritical care, as appropriate, or neurosurgery as appropriate, to a supra-regional or national neurotrauma centre. Currently, in Ireland, Beaumont Hospital and Cork University Hospital are both neurotrauma centres.

### 5.10.2 Extracorporeal life support (ECLS)

Extracorporeal life support (ECLS) provides advanced physiological support for patients with acute, severe and potentially reversible heart or lung failure that has continued to deteriorate despite optimal conventional support. During ECLS, deoxygenated venous blood is aspirated from the right side of the circulation, passed through an extracorporeal gas exchange device. Fully oxygenated blood is then pumped back to the right atrium in lung failure patients, or to the left side (aorta) in heart failure patients. ECLS is normally provided in a tertiary referral ICU while awaiting recovery of the patient's lung/heart function. In the absence of heart or lung recovery or heart or lung transplantation, the provision of prolonged mechanical circulatory support (e.g., Left Ventricular Assist Device) – may be considered in carefully selected patients.

In 2008, a national or supra-regional ECLS service for adult patients was established at the Mater Hospital ICU, which has expertise in caring for patients with severe heart failure or lung failure. The Mater ECLS programme is closely based on the education and training recommendations of the Extracorporeal Life Support Organization (ELSO), the world-wide organisation of extracorporeal support experts, based in Ann Arbor, Michigan (ELSO, 2010).

The ELSO compiles an annual registry of all ECLS patients from recognised ECLS centres around the world. The Mater ECLS programme contributes data twice yearly to the ELSO Registry.

To date, 30 Mater ICU nursing staff have been fully trained in the bedside management of ECLS patients; in addition, there is an ongoing active programme in place to maintain a high level of ECLS proficiency within the Mater Hospital team. Bedside ECLS care is also supported by the hospital's Critical Care Physicians, with technical support provided by the Mater Hospital Perfusion service. The Mater ECLS service has four ECLS machines on stand-by at all times, and

a fully prepared reserve machine needs to be immediately available whenever a patient is supported on ECLS. Normally, throughout the year, at any given time, the Mater has only one patient supported on ECLS; however, on occasions it has provided support for three ECLS patients simultaneously.

In patients with acute potentially reversible lung failure, indications for ECLS include severe hypoxaemia ( $P/F < 10$ ), severe respiratory acidosis ( $pH < 7.20$ ) or severely reduced compliance ( $< 20 \text{ ml/cmH}_2\text{O}$ ), despite optimal conventional mechanical ventilatory support.

Some patients referred for ECLS have deteriorated, despite trials of advanced support such as high-frequency oscillation and inhaled pulmonary vasodilators. Based on Australian and UK data, the estimated number of adult patients who require ECLS for acute lung failure is one/two per million population per year. In the ELSO Registry of Patients, 50-60% of adult patients with acute lung failure survive after receiving ECLS support.

In adult patients with acute heart failure, indications for ECLS include progressive cardiogenic shock, despite optimal intravascular volume loading, pacing, intra-aortic balloon counter-pulsation and vasopressor support. Although ECLS may be deployed in cardiogenic shock patients, the clinical stability afforded by ECLS allows careful patient assessment regarding the potential for native heart recovery or the use of longer-term support such as LVAD or heart transplantation. In the ELSO Registry, 30-40% of adult patients with acute heart failure survive after ECLS support.

Since 2008, the Mater ECLS service has supported 22 adult acute lung failure patients. Also since 2008, the service has had 13 survivors, in addition to six survivors among 11 adult acute heart failure patients (i.e. a total of 589 ECLS days). The median duration of support is 14 days for lung failure patients and four days for heart failure patients. These figures are comparable with the ELSO Registry data.

Patients are referred to the Mater ECLS service from ICUs around Ireland. Many of these patients are in an extremely unstable physical condition at the time of referral. In such circumstances, an ECLS Retrieval team is dispatched from the Mater Hospital with mobile ECLS equipment; in this way, ECLS can be deployed in the referral hospital, thus allowing the safe transfer of the patient to the Mater ICU.

Access to the Mater ECLS service is organised by the Duty Consultant Intensivist. Following consultation that is as timely and as broad as possible, the final decision to deploy ECLS is made by the most experienced ECLS clinicians available. Details of the indications and contraindications are summarised in the ECMO/ECLS section of Mater Hospital website: [www.mater.ie/health-professionals/referral-info](http://www.mater.ie/health-professionals/referral-info).

#### 5.10.3 Multi-trauma

Regionalised or centralised trauma service delivery and organisation achieves significantly increased survival rates for patients with severe multitrauma (Davenport, 2010). The Royal College of Surgeons in Ireland (RCSI) has proposed levels of trauma care consistent with the Hospital Models.

#### 5.10.4. Solid organ and bone marrow transplantation

Patients who receive solid organ or bone marrow transplants are immunosuppressed and, when critically ill, have specialty care requirements. Solid organ transplant patients include those who receive heart; lung; combined heart lung; kidney; kidney and pancreas, and liver transplants. These critically ill immunosuppressed solid organ or bone marrow transplant recipient patients should be transferred to appropriate supra-regional, multispecialty hospital centre ICUs for treatment.

#### 5.11 Vulnerable, critically ill patient groups

Critical illness is a life-threatening condition. In addition to the severity of a critical illness, a patient's survival is associated with 'host' factors. Certain cohorts of critically ill patients are vulnerable/at increased risk of mortality by

virtue of their surgery conditions, host physiology factors and socio-economic factors.

#### 5.12 Critically ill child presenting to the adult critical care Service: resuscitation and transfer

Where critically ill children present to the adult critical care service, the care principles are focused on resuscitation and transport/retrieval. The services currently provide resuscitation to the critically ill child, with a competency level equivalent to the modules in the skills course care of the critically ill child presenting to the adult Intensivist. Arrangements are made as soon as possible with the paediatric critical care network for the transfer/retrieval of the critically ill child.

#### 5.13 The critically ill pregnant woman

While critical illness in pregnancy is infrequent (approximately two/five cases per 1,000 pregnancies), such illness can result in a catastrophic outcome. Critical illness presentation in pregnancy may be subtle, with for example, pregnancy-related physiological changes masking or delaying recognition of critical illness.

In 2011, a joint committee of the UK Royal College of Obstetricians and Gynaecologists (RCOG) and the Royal College of Anaesthetists published a guideline titled Providing Equity of Critical and Maternity Care for the Critically Ill Pregnant or Recently Pregnant Woman.

The guideline's "driver" is that critically ill women should receive the same standard of care for both their pregnancy-related and critical care needs; such care should be delivered by professionals with the same level of competences, irrespective of whether these are provided in a maternity care setting or a critical care setting. This "driver" equity principle stipulates that the imperative is to devise a multidisciplinary care plan that gives equal consideration to the patient's pregnancy-related needs and critical illness needs. (RCOG, 2011).

The interrelated processes of recognition and intervention are the cornerstones of the care of the critically ill pregnant woman. The 2007 UK Confidential Enquiry into Maternal and Child Health (CEMACH) Report Saving Mothers' Lives stated that the detection of lifethreatening illness alone is of little value; rather, it is the subsequent management of such illness that alters the outcome. Thus, detection of the deteriorated health status of a pregnant woman who is critically ill activates prompt and appropriate intervention and treatment, which in turn leads to successful outcomes for both mother and baby. (Lewis (ed.), 2007).

The core principles of the care of a critically ill pregnant woman are 'ABCDE' e.g. as follows:

- A Airway
- B Breathing
- C Circulation
- D Delivery as needed
- E Early transfer

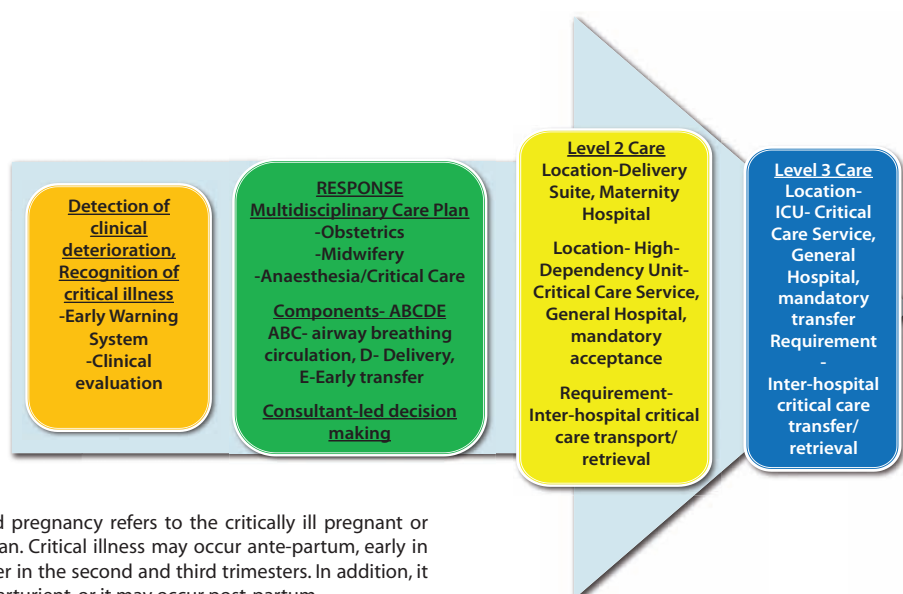
In line with these principles, the National Clinical Programmes for Critical Care, Obstetrics & Gynaecology and Anaesthesia have jointly agreed guidelines for the critically ill woman in obstetrics (Royal College of Physicians, 2014).

The components of the guidelines are:

- 1 Detection
- 2 Recognition
- 3 Intervention
- 4 Transfer

Detection uses the early warning system (I-MEWS). The sequence is as follows: Detection triggers clinical evaluation and recognition. Recognition triggers escalation with resuscitation by, and the formulation of, a multidisciplinary care plan (obstetrics, anaesthesia, midwifery, and critical care). Escalation triggers intervention. Intervention triggers critical care transfer. Thus, the care pathway for the critically ill pregnant woman is a process map or operational tool to improve survival of such patients.

## CARE PATHWAY FOR THE DETERIORATED CRITICALLY ILL PREGNANT WOMAN



Note: Critical illness and pregnancy refers to the critically ill pregnant or recently pregnant woman. Critical illness may occur ante-partum, early in the first trimester, or later in the second and third trimesters. In addition, it may be present in the parturient, or it may occur post-partum.

**FIGURE 9:**  
Care pathway for the critically ill pregnant woman.

### 5.14 Critically ill, high-risk surgery patients

Although the care of the high-risk surgery patient is an integral part of the provision of existing clinical services, including pre-operative assessment and clinical deterioration detection systems (NEWS), an explicit care pathway for the high-risk surgery patient is recommended.

The 2011 UK Royal College of Surgeons report titled *The Higher Risk General Surgical Patient* defines a care pathway for the high-risk or critically ill surgery patient (Royal College of Surgeons, 2011). The UK National Confidential Enquiry into Patient Outcome and Death (NCEPOD) report titled *Knowing the Risk: A Review of the Care of Perioperative of Surgical Patients* (Findlay et al., 2011) also defines the requirement for, and the components of, a high-risk surgery care pathway.

The National Clinical Programme for Critical Care advocates a care pathway for the high-risk surgery patient.

### 5.15 Critically ill elderly patients

Critical care is accessible for elderly patients on the basis of clinical need via a specialist geriatric service pathway or, directly, via the critical care pathway.

Age does not decrease the survival of critically ill elderly patients. However, against a background of frailty with multiple comorbidities, critical illness is associated with decreased survival in very elderly patients. Differences in care have been found for critically ill elderly patients (Nguyen, 2011). Nevertheless, as Nguyen states: '...the rationale for admitting an elderly patient to the ICU should not be restricted to short-term management of an acute disease but rather to allow the patient to recover from acute illness with a satisfactory quality of life.'

A review of outcomes of very elderly patients admitted to intensive care found an 80% rate of survival of such patients to hospital discharge stage (Bagshaw, 2009).

Significant increases in critical care service provision are required for the increasing elderly population, and this has been predicted by national population census projections and also by the National Clinical Programme for Older People.

Specifically, the Central Statistics Office 2013 publication *Population and Labour Force Projections, 2016-2046* states that by 2046 the older population (i.e. those aged 65 years and over) is projected to increase very significantly from its 2011 level of 532,000 to 1.4 million (Central Statistics Office, 2013).

The very old population (i.e. those aged 80 years of age and over) is set to rise at an even more dramatic rate (more than threefold), increasing from 128,000 in 2011 to 470,000 in 2046.

### 5.16 Critically ill patients with disabilities

Critically ill patients who also have disabilities receive equitable and individuated critical care on the basis of the critical illness of the disabled person, with equity of critical care access and delivery. A critically ill person's disability may or may not affect his/her critical illness prognosis.

### 5.17 Critically ill patients from socially disadvantaged groups

In Ireland, the rate of mortality among adult Travellers is 3.5 times greater than that among the general population. There is also a socio-economic gradient in critical care mortality, with lower socio-economic groups sustaining a higher mortality. These patients may have pre-existing conditions that can exacerbate the severity of their critical illness.

### 5.18 Critically ill patients from different racial and ethnic backgrounds

In Ireland, critically ill patients from different racial and ethnic backgrounds receive equity of access to and quality of critical care.

### **5.19 Irreversible critical illness and end-of-life care for the critically ill patient**

The majority of ICU patients recover from critical illness of which a proportion succumb and do not survive. For such patients, it is important to ensure that death, if inevitable, should be as comfortable and dignified as possible. End of life care is an inherent component of critical care clinical management and training. It is provided in accordance with Section 22 of the Guide to Professional Conduct and Ethics for Registered Medical Practitioners (2009) of the Medical Council of Ireland and where relevant, with the guidelines of professional bodies and any pertaining legislative framework.

Occasionally, an end-of-life care plan (e.g. Advance Healthcare Plan as per Medical Council) may be determined by the patient with full capacity but more frequently decisionmaking may be by the Critical Care consultant and admitting hospital medical consultants in conjunction with relevant multidisciplinary clinical input and with patient surrogates e.g. 'patient-designated healthcare representative'. The plan is normally based on the patient's medical condition(s) and the response to treatment, the patient's best interests (in terms of the individuated quality of life which may be anticipated) and the surrogate (family) opinion of the patient's wishes. Palliative Care consultation may be involved; rarely ethical or legal expertise may be contributory.

Approximately 10% of patients who die in Intensive Care do so as a result of brain death and their end-of-life is conducted in a patient-centred critical care manner. This may however entail the facilitation of organ donation, if this was the wish of the deceased, potential donor. (See Intensive Care Society of Ireland guideline on the Diagnosis of Brain Death and on Care of the Donor - 2010 ([www.icmed.ie](http://www.icmed.ie)))



## 6.0 NATIONAL CLINICAL PROGRAMME FOR CRITICAL CARE

- (i) Mission, vision, values
- (ii) Capability strengthening and performance improvement

### 6.1 Mission, vision and values

The National Clinical Programme for Critical Care is a key component of the Clinical Strategy and Programmes Division. The Critical Care Services of Acute Hospitals in Ireland provide critical care to all critically ill adult patients. The National Clinical Programme for Critical Care has the triple aim of a healthcare delivery system that combines quality and access with a system which ensures that the needs of critically ill patients are met in an effective, timely and cost-efficient manner.

Additionally, the Model of Care for Adult Critical Care provides implementable 'macro' critical care delivery system initiatives and structures that strengthen the performance capability of the critical care system.

#### Mission

The National Clinical Programme for Critical Care's mission is to provide the strategy to enhance performance and support to implementation within the acute hospital structure.

In its mission to support the strengthening of performance capability, the work of the National Clinical Programme for Critical Care is in line with the strategic framework of Future Health (Department of Health, 2012) and Department of Health/Health Service Special Delivery Unit (SDU) Unscheduled Care Strategic Plan (DOH, 2013c). These planning frameworks identify the following performance drivers:

- accurate information
- care pathways (process mapping)
- capacity planning
- communication
- governance

Thus, this document provides the model of care to support improvements in these performance driver areas.

The work of the National Clinical Programme for Critical Care follows the performance framework outlined in the Special Report (70) of the Comptroller and Auditor General Health Service Executive Emergency Departments (Comptroller and Auditor General, 2009), where quality, timeliness and cost are set out as components of a balanced measurement system.

#### Vision

The Commission on Patient Safety and Quality Assurance 2008 report titled Building a Culture of Patient Safety provided a vision for patient quality and safety in the acute healthcare services. (Commission on Patient Safety, 2008)

The Commission's stated vision was:

'Knowledgeable patients receiving safe and effective care from skilled professionals in appropriate environments with assessed outcomes' (p.187).

This model of care builds on this vision and indeed the Commission's vision is a key driver for the development of a critical care service delivery model for the critically ill patient.

A critically ill patient is vulnerable and incapacitated and consequently has, or can have, little or no knowledge of their critical illness and related conditions. Accordingly, by adapting the Commission's vision for critically ill patients, a critical care vision may be stated as follows:

The critical care's vision is that vulnerable, critically ill patients receive safe and effective critical care from competent professionals in appropriate environments with assessed outcomes in full communication with families and next of kin.

## Values

The National Clinical Programme for Critical Care's values are the themes of the HIQA National Standards for Safer Better Healthcare (HIQA, 2012). The eight NSSBHC themes are:

1. Safe Care and Support;
2. Better Health and Wellbeing;
3. Use of Information;
4. Use of Resources;
5. Workforce;
6. Leadership, Governance and Management;
7. Person-centred Care and Support;
8. Effective Care and Support. The model ensures that its initiatives and structures to drive performance conform to the regulatory themes or values.

## 6.2 National Clinical Programme for Critical Care: Capability strengthening and performance improvement

An objective of the National Clinical Programme for Critical Care is 'macro' performance improvement by strengthening critical care capabilities. These capabilities or domains are set out in the Special Delivery Unit Unscheduled Care Strategic Plan (Q1 2013) (DOH, 2013c); such capabilities include information, process mapping, capacity planning, communication/engagement and governance/leadership. Accordingly, in order to strengthen capability and improve performance, the National Clinical Programme for Critical Care has proposed critical care capacity requirements, critical care initiatives and structures that are secondary drivers of improved performance. Some of these requirements or projects are under consideration for resource allocation as part of the annual Estimates/HSE National Service Plan process; others are in development or are in operational implementation.

However, the 2013 HIQA 'Galway' report found a gap between the National Clinical Programmes strategy and operational resourcing and implementation. The 'Galway' report stated that HIQA was concerned that there was no clear pathway to provide assurance that the arrangements for programme implementation within the HSE were both developed and clear, and that this represented a significant missed opportunity to develop and embed best practice across a range of clinical services (HIQA, 2013).

The National Clinical Programme for Critical Care seeks to support the development of this implementation pathway, in order to support implementation of the critical care quality and safety strategic inputs provided. However, in many instances, adequate resources will be required to be provided via the National Service Plan process before such implementation can begin.

The 2009 Prospectus Report published a list of 43 recommendations aimed at strengthening the performance capability of critical care in the acute healthcare system. This Model of Care for Adult Critical Care builds on the recommendations in the Prospectus report to provide a programmatic or strategic framework to improve critical care for critically ill adult patients.

This section describes the National Clinical Programme for Critical Care's capability strengthening requirements and projects.

Capacity planning	<ul style="list-style-type: none"> <li>Capacity information: Annual National Clinical Programme for Critical Care Capacity Census</li> <li>Critical care activity, critical care surges, surge capacity</li> <li>Capacity requirements: commissioning regional and supraregional/ national critical care capacity</li> <li>Major surge capacity: Major Surge Committee</li> </ul>
Workforce planning	<ul style="list-style-type: none"> <li>Medical</li> <li>Nursing</li> <li>Health and Social Care Professionals including Pharmacy</li> </ul>
Access enablers	<ul style="list-style-type: none"> <li>Bed capacity information system: (Bed Bureau) project</li> <li>Critical Care Retrieval</li> </ul>
National Critical Care Audit	

#### Capacity information:

##### Annual National Clinical Programme for Critical Care Capacity Census

The Annual National Clinical Programme for Critical Care Capacity Census records adult critical care capacity i.e. the commissioned and actual critical care bed stock and critical care staff provided in critical care services in hospitals, and available to care for critically ill adult patients.

Each year, as part of the census process, all Directors of Critical Care Medicine, Clinical Directors, Clinical Nurse Managers, Directors of Nursing and Health and Social Care Professionals complete the required documentation, which is then co-signed by the Hospital General Manager or CEO.

The returns are collated and aggregated by the National Clinical Programme for Critical Care and the validated aggregate Census is then circulated to all Critical Care Services and stakeholders.

#### Critical care capacity losses

The years 2011 and 2013 show a 7.5% decrease in adult critical care bed stock or bed complement; half of this was in 'hub' ICUs. During 2011 and 2013, there was a concomitant 22% decrease in critical care nursing establishment or complement.

One of the direct effects of this capacity loss was an increased incidence of major surge episodes i.e. episodes of significantly increased critical care demand in hospitals. Major surges present increased hazards/risks for critically ill patients and hospitals alike. In 2013 there were several instances of major surges in hospitals in Ireland. These major surges were due to a capacity gap between increased demand and decreased supply. No special cause e.g. influenza A (H1N1) was evident. Rather, a common cause was identified i.e. variance in the volumes of critically ill patients presenting to the acute healthcare system and decreased critical care capacity. During these major surge episodes, demand far exceeded supply.

The implication of this significant decrease in critical care capacity for critically ill patients is that during surges/major surges, there is a significantly increased risk of access failure or access delay for critically ill patients to a critical care service, with a resultant direct increased complication and mortality risk for such patients.

In smaller hospitals, there has been planned closure of ICUs, with some resource redeployment to the central accepting hospitals. However, there has also been significant capacity loss in the central hospitals providing regional and supra-regional specialty and critical care services.

Decreased critical care capacity in central hospitals leads to inaccessible critical care services. This presents an increased risk for critically ill adults, in that insufficient critical care capacity causes critical care access delay or even access failure ('entry-block') for critically ill patients, with a resultant increased risk of mortality or complications occurring. Decreased critical care capacity also creates the 'knock-on' effect of premature discharge of other patients from critical care services.

Patients are infrequently transferred between hospitals, due to inadequate capacity in other hospitals. Such non-clinical transfer places an unnecessary burden and hazard on an already critically ill patient, and is an unacceptable critical care contingency model.

### ANNUAL CRITICAL CARE CENSUS 2014

Level 3/Level 3(s) ICU beds	Level 2 HDU beds	Critical Care bed capacity	Total Critical Care nursing establishment WTE	Year
178	55	233	1381.25	2014

Details of census reports 2014 are available on [www.hse.ie](http://www.hse.ie)

**FIGURE 10:**

National Critical Care Capacity and Critical Care Nursing Staff Establishment Provision 2014 Census.

#### • Critical Care Activity / Critical Care Surges / Surge Capacity

##### Critical care activity or volume

The volume of critically ill patients in Ireland was estimated in 2009 at approximately 15,000 critically ill patients per year. This was based on the actual number of critically ill patients admitted to 36 ICUs in Ireland over a 28-day period in 2008. (Prospectus, 2009).

In 2009, the Scottish Intensive Care Society Audit Group (SICSAG) estimated the volume of critically ill patients in Scotland at 20,000 in a population of 5 million (SICSAG, 2009). The number of critically ill patients in Ireland currently is estimated to be between 10,000 and 15,000 patients per year.

As a result of the National Critical Care Audit, accurate activity figures are now available from participating hospitals.

##### Critical care surges

In Ireland, variance in the numbers of critically ill patients occurs frequently, and all 'hub' Critical Care Services also frequently experience surge escalation. Surges occur year round, and thus the descriptor 'winter' in relation to surges or 'spikes' in critical care volume is both inaccurate and misleading. It is not unusual for many Critical Care Services to undergo surge escalation simultaneously. As a result, surge planning is a constant/core feature of, and a requirement for, critical care planning.

##### Critical care surge risks

Critical care presentation variances or 'surges' may be unsafe for a critically ill patient in cases where critical care access delay or failure occurs. An admission delay to a Critical Care Service for a critically ill patient that lasts longer than six hours is associated with threefold increased rate of mortality (Chalfin, 2007; Young, 2003).

### Surge capacity

Surge capacity is the provision of extra critical care bed capacity in a Critical Care Service for critically ill patients who present to a service where a certain fixed or commissioned critical care capacity is exceeded. Surge capacity is provided using either existing or additional staff resources.

An escalation plan provides sufficient contingency resource supply to meet demand i.e. the needs of the additional critically ill patients. Thus, met needs improve patient survival.

- a) Flexible surge capacity uses a critical care resource model e.g. roster model to deliver surge critical care within resources.
- b) Where flexible surge capacity is exhausted, additional surge capacity is activated i.e. extra resources are allocated to deliver critical care to a critically ill patient. The nursing resources are allocated locally by a named Nursing Manager, and funding is obtained from a central funding mechanism.

The surge capacity model (where critically ill patients undergo non-clinical transfer and transport to a distant Critical Care Service) presents an increased hazard and also perhaps a risk to a vulnerable, critically ill patient. Such a non-clinical transfer surge capacity model is therefore not recommended by the National Clinical Programme for Critical Care.

Rather, the National Clinical Programme for Critical Care follows the HIQA 'Mallow' recommendation (SOC 5) where a 'hub' hospital provides 'mandatory' surge capacity for critically ill patients referred appropriately (HIQA, 2009b). Critical care surge transfers also take place across Hospital Group 'boundaries', as needed.

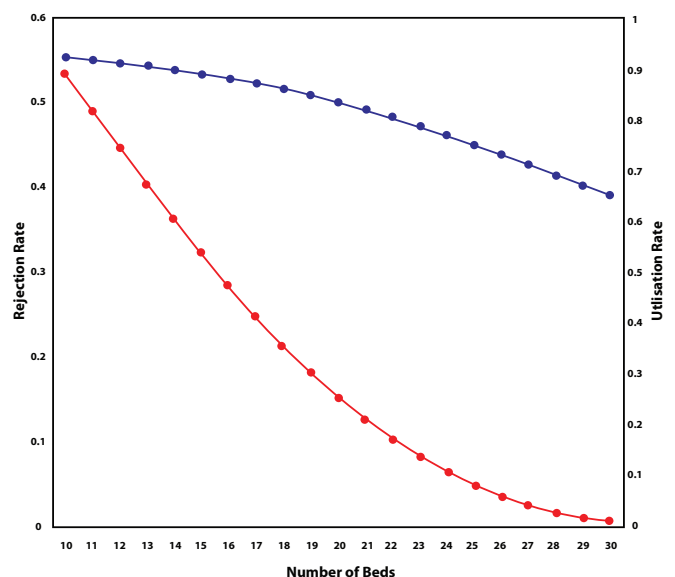
Such provision is contained in the HSE memo titled: Interregional transfer of critically ill patients following appropriate ICU Consultant to ICU Consultant referral and approval. [internal communication]

As described earlier in this document, critical care surges are continual year-round features of critical care activity.

### Surge capacity theory

Where critical care capacity is fixed i.e. inflexible, critical care access failure may occur during surges. McManus et al (2004) have modelled access failures of greater than 50% during surges where occupancy is greater than 90%. Consequently, where occupancy is 100% or exceeds 100%, the access failure rate increases, and is greater than 50%. For a critically ill adult patient who requires critical care admission, a delay is a direct result of access failure.

As highlighted earlier in this report, Chalfin (2007) has shown that where an admission delay to access dedicated critical care service facilities lasts longer than six hours, such delay is associated with increased mortality in critically ill patients. Consequently, during surges, access failure or entry block is associated with increased complications or mortality for the critically ill patient.



**FIGURE 11:**

Critical care access failure. Rejection increases (y-axis) with decreasing critical care bed capacity (x-axis). Alternatively, access improves with increased capacity. Access failure rates may fall to zero with increased (surge) capacity. McManus et al (2004).

### Surge capacity safety

During surges, ICUs function as high-reliability organisations. In a retrospective study of just over 200,000 patients in 108 ICUs, Iwashyna et al. (2009) found that ICUs are able to scale up their operations to meet the needs of a wide range of operating conditions while maintaining consistent patient mortality outcomes. Consequently, increased and adequately resourced ICU capacity during surges is not unsafe for patients.

### Surge capacity planning

Surges are a predictable feature of ICU operation. To maintain critical care access for critically ill patients during surges, hospitals should operate surge or escalation contingency

plans, in order to reliably provide critical care resource and thus meet demand in a timely manner.

- Critical care capacity requirements/critical care capacity commissioning

### Capacity requirements

Where activity exceeds capacity on a sustained basis, critical care capacity commissioning is required to provide capability with quality and safety.

In 2013, the National Clinical Programme for Critical Care facilitated the collation by Acute Hospitals Operations of the critical care capacity requirements for the 10 high-volume 'hub' Critical Care Services.

## CRITICAL CARE CAPACITY REQUIREMENTS

Hospital	Comment
AMNCH, Tallaght	New build requirement for a further nine beds.
Beaumont	New build requirement for a further six beds.
Cork University Hospital	Six beds funded by National Cancer Control Programme.
OLOL Drogheda	Existing new critical care facility.
UCH Galway	Physical capacity exists for up to 24 beds.
MWRH Limerick	New critical care facility open.
Mater University Hospital	New-build Critical Care Whitty Building staffing proposal needs additional 18 WTE nurses.
St James's Hospital	Funding required for seven additional beds.
St Vincents University Hospital	Loughlinstown became Model II hospital in 2013.
Waterford University Hospital	Critical care capacity planning under way.

**FIGURE 12:**  
Regional and supra-regional hospital Critical Care capacity requirements

### Critical Care capacity commissioning

The National Clinical Programme for Critical Care (NCPCC) recommends that critical care capacity should be resourced and commissioned, in order to maintain or expand, as needed, the capacity in regional or supra-regional hospitals. In addition, the NCPCC recommends maintenance of critical care capacity in the 'spoke' or sub-regional hospital Critical Care Services.

The NCPCC provides annual critical care capacity inputs to the service planning process. As outlined earlier, the HIQA 'Galway' report found an implementation gap between the National Clinical Programmes' strategic inputs and operations implementation. Capacity closure of this gap might be possible with adequate resource provided through the national service planning process.

### Critical Care Major Surge Planning Report 2012

The significant threat of influenza A (H1N1) in 2009 stimulated the formation of the H1N1 Pandemic Critical Care Strategy Group, which included representatives from the Intensive Care Society of Ireland (National and Critical Care Network Leads), Office of the Nursing & Midwifery Services Director, Health Protection Surveillance Centre, working with, and reporting to, the HSE National Crisis Management Team and the HSE Integrated Services Directorate. Similar concerns for 2010 were addressed by a continuum of this Strategy Group.

In 2011, the efficacy of this response and collaboration highlighted the need for a formal Critical Care Major Surge Planning Committee, using the established committee and reporting structure to assist with guidance and planning for other critical care major surge events. Such events may present further pandemic risks (i.e. national), or may involve a major incident for a region or particular catchment area.

### Definition of critical care major surge

A critical care major surge is defined as: An unusually high increase in demand that overwhelms the critical care resources of an individual hospital and/or region for an extended period of time.

### Guidance 2012

- A. Critical Care Major Surge Planning National Template was updated and circulated to all acute hospitals. This template provides guidance for local major surge capacity planning preparedness, leadership, surge levels, manpower (medical and nursing), and potential impact on elective services.
- B. Guidance framework for health service providers on education and training requirements for non-ICU nurses, to support the provision of intensive care in the event of a major surge in intensive care activity. This provides a framework for the Directors of Nursing of all acute hospitals to maintain the required

database of nursing staff with such training, and continued provision of education/training to support the nursing response to a major surge in critical care demand.

- C. Integration with major incident planning. The interdependency of major incident planning with critical care major surge planning is identified in correspondence (2012) to the health system highlighting the role of (A) and (B) above as a mandatory component of both major incident and critical care major surge capacity planning.
- D. Health Protection Surveillance Centre (HPSC): Ongoing collaboration with the HPSC, with particular reference to enhanced surveillance of severe acute respiratory infections.

### Workforce planning

The Model of Care for Adult Critical Care contains detailed recommendations on staffing levels for medical, nursing, pharmacy and health and social care professionals in critical care.

### Medical workforce planning

Intensive Care Medicine workforce planning identifies a need for approximately 82 Consultant Intensivists in Ireland (assuming 100% commitment to Intensive Care Medicine (ICM)). Currently, there is a shortfall of 46 Intensive Care Medicine Consultants nationally.

### Intensive Care Consultant manpower 2012: Adult Critical Care Services

Intensive Care Medicine is well suited to consultant team structures/governance. This allows for continuity of patient care, enhanced availability of senior decision-making and the creation of sustainable rotas. Onerous rotas (1:4 or more frequent) are not sustainable, and impact negatively on Intensive Care Medicine recruitment. In order to sustain rotas of 1:6, or less frequent, it is likely that most specialist intensive



care rotas will require input from other appropriately trained and accredited specialists who have “an interest” in intensive care medicine.

Both the JFICMI National Standards for Adult Critical Care Services 2011 and the ICSI emphasise the importance of continuity of patient care. Specifically, they state that although rotas may vary, depending on unit size, the number of consultants, the number of junior staff, length of shifts, and rotas of lead consultants should be organised so as to maximise continuity of patient care. It is desirable to provide for blocks of Critical Care Unit time for each consultant of at least three/four days at a time, rather than changing on a daily basis.

This is consistent with international recommendations. Current ICU/HDU national configuration, as defined in the Prospectus 2009 report, is used to describe national acute hospital configuration for this manpower report. This is further updated with bed stock analysis from the National Clinical Programme for Critical Care 2012.

Manpower planning also needs to take a number of variables into account:

- the effect of reconfiguration of acute hospital services
- development of Critical Care Transport/Retrieval teams
- complex nature of delivery of consultant hours to intensive care
- gap analysis in consultant intensive care manpower provision versus identifiable need
- the ability to bridge that gap through specialty recognition and development.

### Effect of reconfiguration

The indicative whole time equivalent (WTE) consultant manpower requirement is based on current configuration of services. Closure of any smaller ICU requires that the appropriate critical care bed capacity be transferred to the

new, receiving Critical Care Service; this is consistent with population catchment area and strategic requirements, including regional or national specialty services. Some efficiencies in consultant rotas may be achieved as a result of amalgamation with the larger Critical Care Services; such efficiencies may be realised once reconfiguration is more clearly identified.

### Transport/Retrieval

The issue of Critical Care Retrieval services, and the transport of the critically ill, features significantly in the proposed reconfiguration of acute hospitals. Such services may be provided by a supervised non-consultant hospital doctor (NCHD), usually in a specialty training position and advanced nurse practitioner model with consultant supervision from ICU; alternatively, such services may be Consultant led/delivered. The provision of either type of service requires appropriately trained and available staff, but without eroding available expertise within the base ICU.

### Complex nature of current delivery of Consultant hours to intensive care

Currently, Consultant expertise may be provided from a number of differing appointment strands. These may include:

- Consultant Anaesthetists with a number of hours or days committed to intensive care within a working week. In the main, these posts will have been a primary appointment to anaesthesia, with the dedicated hours to intensive care arising post-appointment, as a result of the hospital recognising a need for such dedicated hours.
- Consultant Anaesthetists with a Special Interest in Intensive Care Medicine. These consultants will have undergone dedicated specialty training and examination in Intensive Care Medicine, thus fulfilling specific job description appointment criteria. They will have been appointed with a specific requirement that they provide intensive care specialist services. During



recent years, this type of post was the most common Intensive Care appointment in situations where an intensive care practice was being developed. A significant number of such post holders were trained and accredited to the level of Consultant in Intensive Care Medicine.

- These consultants had undergone further dedicated specialty training and examination in Intensive Care Medicine to a level which, internationally, would be consistent with that of a mono-specialist in Intensive Care Medicine. There are relatively few of these posts in the system, and the consultants who are appointed generally have other (non-conflicting) duties within their hospitals (e.g. anaesthesia)

Complexities in current work patterns include:

There are virtually no full-time ICU doctors in Ireland. Such a phenomenon is unusual internationally.

When a Consultant is on leave, backfill is usually achieved through cross-cover with a conflicted Consultant hours arrangement (i.e. dual responsibility to two clinical areas such as Anaesthesia and Intensive Care), or, in some larger units, through a significant decrease in doctor-to-patient ratio (e.g. 1:18 may become 1:30).

A number of non-tertiary hospitals have conflicting hours, where an Intensive Care Medicine commitment may be paired with immediate availability to an obstetrics unit. The impact of such conflict would require a more in-depth analysis of case mix for that intensive care practice.

The models of work pattern are dependent on non-consultant doctors at the approved doctor-to-patient ratios, thus ensuring that Consultants are able to provide appropriate clinical commitment, guidance, and oversight; are able to liaise with next of kin, as well as fulfil the management roles

stipulated in their contracts and identified in the JFICMI/ICSI Intensive Care Standards report (JFICMI, 2011).

### Estimation of Consultant manpower and gap analysis

The current dedicated consultant hours in Table 6.2 are dedicated non-conflicting hours where the consultant has no other clinical commitment.

The models of work pattern (rota) are configured around three proposed ICU sizes i.e. those with less than 12 beds, those with between 12 and 24 beds, and those with between 24 and 36 beds. The WTE hours dedicated to ICM is a calculation based on 100% of WTE clinical hours being dedicated to ICM.

Each rota would need to extend over a number of weeks, so as to structure the average out-of-time commitment in such a way that an individual's work commitment would fulfil their contract of appointment, but would also be European Working Time Directive compliant.

For a larger intensive care practice, each module of 12 beds would need to be considered independently, and further interpreted with local case mix and established work patterns.

Although the numbers of WTE required could be considered to be indicative rather than absolute, it is noteworthy that the suggested requirement is very similar to that noted in the Hanly report (National Taskforce on Medical Staffing, 2003) and subsequent FÁS (2009) report.

## CONSULTANT WORK PATTERN CURRENT AND ROTA OPTIONS 1 AND 2

Hospital Prospectus identifier #	Critical Care beds 2009	Critical Care beds 2012	Dedicated ICM hours/ week 2012	Dedicated ICM hours converted to WTE	Minimum WTE required to service ICM clinical hours	
					Rota 1	Rota 2
HSE West						
2: Ballinasloe	4	4	0	0	2.36	3.3
35: University College Hospital Galway	19	19	45	1.8	4.3	6.6
12: Ennis	2	0	0	0	ICU CLOSED	
5: Castlebar	4	4	45	1.8	2.36	
21: Merlin Park	4	0	0	0	ICU CLOSED	
15: Limerick Regional	13	13	0	1.8	4.3	6.6
16: Limerick St John's	2	0	0	0		
14: Letterkenny	9	5	0	0	2.36	3.3
28: Roscommon	3	0	0	0	ICU CLOSED	
29: Sligo	5	5	20	0.8	2.36	3.3
26: Nenagh	3	0	0	0	ICU CLOSED	

Hospital Prospectus identifier #	Critical Care beds 2009	Critical Care beds 2012	Dedicated ICM hours/ week 2012	Dedicated ICM hours converted to WTE	Minimum WTE required to service ICM clinical hours	
					Rota 1	Rota 2
HSE South						
30: South Infirmary (Cork)	5	4	0	0	Post-anaesthesia Care Unit (PACU)	
33: Tralee	5	5	0	0	2.36	3.3
13: Kilkenny	4	7	0	0	2.36	3.3
7: Clonmel	4	8	45	1.8	2.36	3.3
3: Bantry	2	0	0	0	ICU CLOSED	
9: Cork University Hospital	13	15	50	1.96	4.3	6.6
36: Waterford	6	8	20	0.8	2.36	3.3
37: Wexford	5	5	9	0.35	2.36	3.3
20: Mercy Hospital (Cork)	6	5	45	1.8	2.36	3.3
18: Mallow	2	0	0	0	ICU CLOSED	

Hospital Prospectus identifier #	Critical Care beds 2009	Critical Care beds 2012	Dedicated ICM hours/ week 2012	Dedicated ICM hours converted to WTE	Minimum WTE required to service ICM clinical hours	
					Rota 1	Rota 2
HSE Dublin Mid-Leinster						
17: Loughlinstown	3	3	0	0	2.36	3.3
23: Mullingar	4	6	45	1.8	2.36	3.3
24: Naas	4	4	0	0	2.36	3.3
1: AMNCH (Tallaght)	11	12	50	1.96	2.36	3.3
27: Portlaoise	6	2	0	0	2.36	3.3
34: Tullamore	4	4	47.5	1.87	2.36	3.3
31: St James's Hospital	28	27	100	3.9	6.7	9.9
32: St Vincent's University Hospital	15	11	70	2.76	4.3	6.6

Hospital Prospectus identifier #	Critical Care beds 2009	Critical Care beds 2012	Dedicated ICM hours/ week 2012	Dedicated ICM hours converted to WTE	Minimum WTE required to service ICM clinical hours	
					Rota 1	Rota 2
HSE South						
10: Drogheda	6	7	40	1.6	2.36	3.3
11: Dundalk	2	0	0	0	ICU CLOSED	
6: Cavan	4	4	40	1.6	2.36	3.3
8: Connolly (Blanchardstown)	5	5	36	1.4	2.36	3.3
25: Navan	6	4	9	0.35	2.36	3.3
19: Mater	29	29	100	3.9	6.7	9.9
22: Monaghan	HDU	0	0	0	ICU CLOSED	
4: Beaumont	20	18	45	1.8	4.3	6.6
Totals committed			904 hours /week*			
Equivalent WTE				35.8*	82.1	118.8

\*Current service delivery for most centres relies on a cross-cover arrangement during any leave. It can be presumed therefore that for approximately 15% of hours, a cross-cover or reallocation of service commitment is required.

**FIGURE 12:**  
Consultant work pattern current and rota options 1 and 2

### Specialty development and NCHD - training and service positions

The JFICMI has made a submission to the HSE Medical Education and Training (MET) body with regard to the needs for structured training posts in Intensive Care Medicine to match the requirement for specialist consultant manpower.

This is a collaborative submission across the training bodies represented by the JFICMI. Specifically, it recommends a multidisciplinary access model to what has been termed 'supra-specialty' training in ICM, both during and following base specialty training. To date, ICM training posts have been largely supported by the College of Anaesthetists of Ireland's CST in Anaesthesia training scheme, and, at a more local level, from Internal Medicine, Emergency Medicine and Surgical rotation secondments for modular time periods. The need for a formal structured training scheme directed specifically to ICM specialty needs was previously submitted to the Post Graduate Medical and Dental Board, prior to its replacement by the HSE MET body.

The previous reliance on the completion of training in ICM being achieved abroad (typically in Australia, New Zealand, the UK, USA or Canada) is no longer sustainable. All of these countries have a significant demand for ICM specialists, and are now competing to retain those that they have trained.

Ireland has the specialist training qualities in place to enable it to be in a position to train ICM specialists to completion in a way that is commensurate with best international standards

Figure 12 above identifies an approximate need for 82 Consultants in Intensive Care Medicine, with a shortfall in 2012 of approximately 46 consultants. In collaboration with the College of Anaesthetists, workforce planning has utilised the following presumptions:

- identified manpower gap bridged over time
- presume a 30-year consultant career

- allow a 20% attrition rate from a training scheme (e.g. choose to work outside of Ireland)
- 20% allowance for flexible working time

In order to achieve a 100% work commitment to Intensive Care Medicine, 82 Consultant Intensivists would require 4.2 trainees per year to complete advanced higher specialty training.

It is likely that many of these posts would follow a current model of a commitment to both Anaesthesia and Intensive Care Medicine, in which case the number of Intensive Care Medicine trainees required would be greater, i.e. in inverse proportion to the amount of contractual time spent in Intensive Care Medicine.

The JFICMI is awaiting the agreement of the Irish Medical Council to formally accept a submission for specialty recognition of Intensive Care Medicine; such recognition would greatly facilitate the training and career structure for Intensive Care Medicine.

### Intensive Care Medicine: Education and Training

#### Intensive care medicine training in Ireland international context

Intensive Care Medicine specialised training in Ireland requires that the trainee undergo a period of specialty training in Intensive Care Medicine to a level of specialisation, examination, and experience equivalent to that demanded by other societies where Intensive Care Medicine is well developed. This is compatible with EU programmes as described in the ESICM overview and CoBaTRice competency-based programme, and is similar in structure to the Joint Faculty of Intensive Care Medicine United Kingdom and the College of Intensive Care Medicine of Australia and New Zealand programmes. The USA Critical Care Boards process is also similar.

The common strand in all these programmes is a period of base specialty training (usually Anaesthesia or Internal Medicine, but potentially Emergency Medicine or Surgery), with Intensive Care Medicine modular training within base specialty training, followed by a period of supra-specialty Intensive Care Medicine training which may be partly within or after completion of base specialist training.

There is some variation within these various programmes, but most require approximately two years of dedicated Intensive Care Medicine training and six months to one year of complementary training, with the components of that complementary training depending on base specialty. A trainee from an Anaesthesia base specialty may require complementary training in Internal Medicine, and a trainee from medicine may require complementary training in Anaesthesia. There are various other options as components of such complementary training.

### Training pathway in Ireland

Intensive Care Medicine workforce planning estimates that 4.2 trainees would need to complete specialist certification in a dedicated Intensive Care Medicine training programme in Ireland every year in order to maintain these 82 Consultant Intensivist positions. Specialty recognition by the Irish Medical Council for Intensive Care Medicine is a welcome development.

In Ireland, the training requirements are very similar to international comparators – two years training in Intensive Care Medicine in recognised training posts, including six months' complementary training, and success in the Fellowship of the Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) examination.

A lesser level of qualification of one year's training (Intensive Care and complementary) and JFICMI examination success defines eligibility for a specialist (e.g. anaesthetist) post with an "interest in intensive care medicine".

### Current issues pertaining to ICM training in Ireland

A particular difficulty for trainees in Ireland is a lack of dedicated Intensive Care Medicine training posts. Modular training may be achieved within some base specialty training programmes but training to a level of specialist in Intensive Care Medicine can only be achieved currently through one-years training within a base specialty (maximum allowable from base programme) and a further one year by competitive application to a one-year Fellow programme, for which there are limited posts. Currently, these are structured as Fellow posts, and thus they are not part of Specialist Registrar contractual structures. Completion of Intensive Care Medicine training abroad is therefore the most common scenario, with the Australian training scheme attracting the greatest number of trainees. While a smaller number train through the UK, US and Canada, gaining access to the North American training programmes is increasingly difficult at the higher specialist level.

Ireland has numerous centres of excellence in Intensive Care Medicine, such that completion of specialist training in this area should be as achievable in Ireland as it is in the UK, EU, USA and Australasia. What is lacking is access to defined modular training posts at a supra-specialty level i.e. after base specialty accreditation has been achieved. Training abroad should nonetheless continue to be encouraged, either as a recognised component (where appropriate) of specialist training, or, more importantly, as a way of achieving new experience in specific developments in Intensive Care Medicine, in order to advance the practice in Ireland.

The delivery of patient care in Intensive Care Medicine at consultant level in Ireland is through a combination of Consultants in Intensive Care Medicine and Consultant Anaesthetists with a Special Interest in Intensive Care Medicine (see Intensive Care Consultant Manpower section in this report). The analysis of current manpower as part of the HSE National Clinical Programme for Critical Care work identifies a significant Consultant deficit (see Intensive

Care Consultant Manpower section). In the absence of the development of a greater number of dedicated training posts this demand will not be met either at specialist level or through Consultants with an Interest in Intensive Care Medicine.

Due to increasing specialisation and demand on Intensive Care Services, the establishment of a dedicated training programme tailored to meet this demand is essential. Manpower planning considerations: consultant appointments Manpower planning is complex, and the Manpower Planning section within this Model of Care for Adult Critical Care contains a number of weaknesses, most particularly in the area of the complexity of rotas and ensuring European Working Time Directive (EWTD) compatibility. Consequently, the target quota of 82 Consultants involved full time in Intensive Care Medicine should be interpreted as the minimum number necessary to provide the requisite clinical hours, excluding rota and EWTD demands. This target quota also helps to identify the numbers of ICM specialists who need to graduate each year if a stable workforce is to be maintained.

### Recommendations:

- Intensive Care Medicine should be recognised as a specialty by the Irish Medical Council, in order to facilitate training and manpower planning.
- The Intensive Care Medicine training system in Ireland must ensure that graduate specialists in Intensive Care Medicine achieve a standard which is consistent with the standards demanded by equivalent developed health services, and that they deliver a standard of Intensive Care Medicine of the highest professional and practice standards.
- The Joint Faculty of Intensive Care Medicine of Ireland, through the constituent postgraduate training bodies of the College of Anaesthetists of Ireland, Royal College of Surgeons in Ireland and Royal College of Physicians of Ireland should establish a CST programme across all base specialties. The HSE-MET has engaged with the process, and proposals to progress this are under discussion.
- Improved availability of training in Intensive Care Medicine should achieve a number of outcomes – from Acute Medicine training and Critical Care Medicine training and experience at a non-specialist level for a broad number of postgraduate doctors to completion of training at specialist ICM level. For example, such training and experience may be particularly relevant to Acute Medicine Training, or may be considered to be a module of training for many medical and surgical acute disciplines.
- Training in Intensive Care Medicine should be competency based and should take place within the specified timeframe.
- Intensive Care Medicine training should comprise two years of dedicated Intensive Care Medicine training. At the end of one-year competency-based training, and following completion of base specialty CST, a doctor would be eligible to hold the post of Consultant with a Special Interest in Intensive Care Medicine. At the end of two years competency-based training, and following completion of base specialty CST, a doctor would be eligible to hold the post of Consultant in Intensive Care Medicine.
- Individual postgraduate training bodies are encouraged to examine the amount of training time allocated to Intensive Care Medicine within their specialty training programmes. The College of Anaesthetists of Ireland has established a one-year dedicated Intensive Care Medicine modular training option in defined centres approved by the Joint Faculty of Intensive Care Medicine of Ireland. The Royal College of Physicians of Ireland (RCPI) has expressed an interest in trying to develop a similar model.

- The complementary training structure within the current JFICMI Regulations will be revised in recognition of changes in medical training in recent years but will retain mandatory components of complementary training in order to complement trainees' base specialty training in the global context of competency-based Intensive Care Medicine training.
- Consideration needs to be given to the implementation of a diploma or certification level outcome for trainees who complete defined modular training and achieve basic competencies in Intensive Care Medicine which complement a non-Intensive Care Medicine specialist career structure (e.g. Acute Medicine, Anaesthesia, acute medical specialties, acute surgical specialties).

The 2006 medical workforce planning report titled Preparing Ireland's Doctors to meet the Health Needs of the 21st Century (the 'Buttimer' Report) provides a vision whereby: 'Ireland's postgraduate education and training environment will be attractive to all medical graduates, and deliver high-quality programmes that will result in a sufficient number of fully trained, highly competent doctors to deliver a patient-centred, high-performance health service for this country.' (Postgraduate Medical Education and Training Group, 2006)

The postgraduate education and training system and the clinical expertise arising from its training cycles is an important outcome determinant.

### Critical Care Nursing Workforce Planning

Nursing staff are vital members of Critical Care multidisciplinary teams. Within the Critical Care discipline, they also account for the greatest number of professionals working in this area. The role of the Critical Care Nurse is essential to the process of delivering evidenced based care to critically ill patients.

### Role and responsibilities of the critical care nurse

The role and responsibilities of the nurse providing person-centred care in the Critical Care environment is complex and varied, due to the continuous assimilation, interpretation and evaluation of specialised information, including subtle changes in technological and monitoring outputs and the patient's condition. A Critical Care Nurse is someone who has advanced-level knowledge, skills and competencies to deliver quality and safe holistic care to the critically ill patient. Future scope for the further expansion of competencies and the development of new roles should be an ongoing consideration for services.

Critical Care Nurses adhere to their code of professional conduct; develop their roles in line with the Scope of Practice Guidance Framework created by the NMBI to support the expansion and extension of roles within the critical care environment in a safe and effective manner. The Domains of Practice outlined by the NMBI to guide undergraduate nursing practice are adopted within Critical Care Nursing.

### Training

In Ireland, the educational and clinical preparation for nurses working in the Adult Critical Care environment is generally undertaken as a post-registration programme and includes the provision of higher/postgraduate diplomas and master's programmes. Foundation programmes are available for staff in some large acute teaching hospitals which have Critical Care units.

The 2009 Prospectus report proposed that all Critical Care Nursing education should be underpinned by a number of principles (including standardisation, fitness for purpose, service driven, equity of access, flexible modules). Education should be delivered in partnership with clinical services and Centers for Nurse & Midwifery Education and Higher Education Institutes. A guiding framework for the professional development of registered nurses working in

Adult Critical Care Units (Model 3 and Model 4 Hospitals) is currently in development, and will support the Prospectus report proposal.

### Nursing workforce

The complement of Critical Care Nurses necessary to meet the demands of critically ill patients presenting to regional and supra-regional acute hospitals must be maintained by comprehensive workforce planning within the current hospital networks/groups nationally.

This will ensure that sufficient numbers of appropriately qualified personnel are available in the right place and at the right time to meet the demands of Ireland's Critical Care Services.

Staff qualification and age profiling was completed by the National Clinical Programme for Critical Care in 2012 and will inform nursing workforce planning into the future. In an effort to meet current and future demands, together with occasional capacity escalations, the Model of Care for Adult

Critical Care advocates that a staff development plan be put in place in each unit/network i.e. a plan that can support the functioning of all commissioned Critical Care beds in a flexible manner.

### Quality requirements (nursing) for the delivery of quality safe Levels 2, 3 and 3(s) patient care

Intensive Care is synonymous with a 1:1 nurse-patient ratio, and the literature suggests certain quality requirements for the delivery of effective care. However, these requirements have to be applied contextually and realistically to each Level 2, 3 and 3S unit. Therefore, local discretion, together with decision-making and governance, applies.

The following factors should be taken into account when assessing appropriate staffing levels for each unit:

- patient throughput, case mix and dependency
- nursing staff skill mix, competence and experience
- medical staff skill and availability
- unit layout
- training requirements

## CRITICAL CARE QUALITY REQUIREMENTS – NURSING

Critical Care quality requirements – Nursing		JFICMI Level 2 Care	JFICMI Level 3 Care	JFICMI Level 3(s) Care
1	A registered nurse with specialist qualification in Intensive Care Nursing as well as skills and competencies in a clinical speciality must be rostered for every shift.			✓
1a	A registered nurse with a specialist qualification in Intensive Care Nursing must be rostered for every shift.		✓	
2	When a patient is present in a unit, there must be a minimum of two registered nurses present in the unit at all times. At least one nurse must hold specialist qualifications in Intensive Care Nursing as well as relevant skills and competencies for the clinical speciality of the unit.		✓	✓
3	Level 3 and Level 3(s) patients (clinically determined) require a minimum of one nurse to one patient.		✓	✓
4	Level 2 patients (clinically determined) require a minimum of one nurse to two patients	✓		
5	A designated nurse manager with a specialist qualification in Intensive Care Nursing, as well as relevant skills and competencies pertaining to the clinical speciality of the area, is required on site to manage the unit. This person is formally recognised as the overall unit nurse manager.		✓	✓



6	Every shift must have a designated team leader per 8-10 beds; this team leader is likely to be a Clinical Nurse Manager with a specialist qualification in intensive care as well as knowledge, skills and competencies in the speciality of the unit if it is a Level 3(s) unit. This nurse should be supernumerary for the entire shift. The primary role of the team leader is to oversee the clinical nursing management of patients, service provision and resource utilisation during a shift. Other aspects of the role include staff support and development, so as to ensure compliance with hospital policies and procedures; liaising with medical and allied staff; developing and implementing patient clinical management plans; assessing the appropriateness and effectiveness of clinical care; liaising with organ donation teams and ensuring that a safe working environment is maintained. A Clinical Nurse Manager of units with more than 10 beds may require additional assistance with this role.		✓	✓
7	ACCESS nurses are in addition to bedside nurses, unit managers, team leaders, clinical facilitators and non-nursing support staff. An ACCESS nurse provides 'on the floor' assistance, coordination, contingency, education, supervision and support. Ratio based on qualifications of current staff: < 50% qualified staff = 1 ACCESS nurse per 4 beds 50-75% qualified staff = 1 ACCESS nurse per 6 beds > 75% qualified staff = 1 access nurse per 8 beds			✓
7a	ACCESS nurse for single-room Level 3 units. Ratio 1:4 rooms		✓	
8	One Health Care Attendant with specific competencies per 6 beds per shift in an open-plan unit		✓	✓
9	For the purpose of continuous professional development, each unit should have a dedicated clinical facilitator/nurse educator. The recommended ratio is 1 WTE: 50 staff in Level 3(s) or Level 3 units. The role of the clinical facilitator/nurse educator is to lead staff and unit development activities only; the clinical facilitator/nurse educator must be unit based. Additional educators/coordinators are required to run and manage tertiary-based Critical Care Nursing courses.		✓	✓
10	At least one experienced member of a Level 3(s) and Level 3 unit must be assigned to an audit role, thus assisting delivery of the National Clinical Programme for Critical Care's objectives in relation to audit.		✓	✓
11	Critical Care units must be provided with administrative staff to support the effective running of the unit. In larger units, administrative staff may be required during out of hours and at weekends. Ratio 1 WTE per six-bed unit	✓	✓	✓
12	Flexible working patterns for nurses must be in place. This should be determined by skill mix, unit size, activity, case mix and surge needs, so as to ensure critically ill patient safety and quality critical care delivery.	✓	✓	✓
13	A minimum of 70% of staff should hold a specialist qualification in Intensive Care Nursing, with skills and competencies pertaining to the clinical speciality of the unit.			✓
13a	A minimum of 50% of staff should hold a specialist qualification in Intensive Care Nursing with general intensive care skills and competencies. In order to create an effective skills mix, the optimum percentage of such staff is 75%.		✓	
14	All staff should have access to competency-based education and training programmes – from induction through to postgraduate education and training in Intensive Care Nursing. Rotation of staff between Level 2, Level 3 and Level 3(s) is advocated, in order to develop a critical mass of specialist Critical Care Nurses.	✓	✓	✓
15	Regional and supra-regional centres should provide clinical placements for postgraduate programmes, if required.		✓	✓

Adapted from BACCN 2009, RCN 2003, NHS Wales 2006, ACCCN 2003 and ACHS 2012

**FIGURE 13:**  
Critical Care quality requirements – Nursing

#### Nurse staffing calculation to provide 1:1 direct nursing care for an ICS Level 3 patient.

Following the implementation of the Haddington Road Agreement in 2013, nurses' working hours increased to 39 per week.

- A. WTE for a RGN is 39 hours per week.  
365 days in year, divided by 7 = 52.14 weeks  
 $52.14 \times 39 = 2,033.46$  hours per year
- B. Leave deductions (20%) = 406.6  
(Leave includes annual leave, public holidays, study leave, maternity leave etc.)

- C. Work commitment (hours) A minus B = 1,626.86 hours/year
- D. Hours per year to be covered = 9,125 hours/year (365 days x 25 hours (allows 1 hour per 24 hours for shift handovers)
- E. Nurses required to provide direct 1:1 nursing care 24/7 = 5.6 WTEs  
(9,125 (D) ÷ 1,626.86 (C))

The same WTE allocation is required for any nursing staff member (e.g. Clinical Nurse Managers) who are required to provide 24/7 unit cover.

## Health and Social Care Professionals including Pharmacy

### Introduction

Health and Social Care Professionals including Pharmacists are vital for the delivery of Critical Care services. They provide their own unique clinical contribution to the overall multidisciplinary team caring for the critically ill patient. The early involvement of these professions in the management of the critically ill patient in the areas of nutrition support, prevention of contractures, rehabilitation, provision of counselling and support for patients and families, communication, and swallowing issues will support better patient outcomes.

This section outlines the role, recommended staffing levels and the education/training and competencies required by the HSCP's to work in the area of critical care.

### Role of the Dietitian in Critical Care

The Dietitian is central to the provision of nutrition support as well as nutritional screening and assessment (NICE, 2006). The presence of a dedicated Dietitian in the Intensive Care Unit (ICU) leads to better achievement of nutritional targets, better use of enteral feeding, earlier introduction of nutrition support and, possibly, better patient outcomes

(Heyland et al, 2003; Roberts et al, 2003; Soguel et al, 2012) Analysis of the data from a recent international multicentre prospective observational study (Cahill et al, 2010) showed that the presence or absence of an Intensive Care Dietitian had a significant effect on determining ICU nutritional performance (Heyland et al., 2010). The presence of a Dietitian was associated with top performance (Heyland et al., 2010), and enables adherence to internationally recognised nutrition support guidelines. (Heyland et al., 2010b; Cahill, NE et al., 2010b)

In 2011, a national deficit in dietetic staffing requirement of 11.1 WTE's was identified. Workforce planning guidelines for ICU/HDU dietetic staffing have been described elsewhere and (ERHA, 2004; Allied Health Professionals (AHP) and Healthcare Scientists (HCS) Advisory Group, 2002; National AHP and HCS Critical Care Advisory Group, 2003; Prospectus, 2009; Irish Nutrition and Dietetic Institute, 2008) are outlined below.

### Recommendations

- Current or planned ICU beds should be associated with dedicated dietitian staffing of 0.1 WTE post per Critical Care bed, at Clinical Specialist or Senior grade.
- Current or planned HDU beds should be associated with a dedicated 0.05 WTE post per HDU bed, at senior grade.

The WTE equivalents above represent contracted hours minus fixed and variable leave. For 52 week cover, 0.12 WTE per Level 3 bed or 0.06 WTE per Level 2 bed is needed (British Dietetic Association, 2004).

### Education/Training and Competencies

It is recommended that a Senior or Clinical Specialist Dietitian be identified to take a clinical lead role within critical care. This post requires at least three years' experience post qualification as a Dietitian.

**Competencies:** All Dietitians must maintain a core competency level, as outlined by the Irish Nutrition and Dietetic Institute (INDI) and the European Federation of the Associations of Dietitians (EFAD) Competencies and Performance Indicators (European Federation of the Associations of Dietitians, 2009). ICU-specific competencies for Dietitians should encompass strategic, clinical, education and research roles (Taylor et al., 2005).

**Education and training:** Continuous professional development standards as outlined by INDI and by the Statutory Registration Board (CORU) (HSCP, 2013) should be adhered to as a matter of course. Compliance with statutory registration criteria will become essential once they have been instituted fully for this profession.

Continued education, training and up-skilling is recommended for all Dietitians working in critical care (HSE, 2009). A clear education pathway should encompass ongoing training on the comprehensive nutritional assessment and management of critically ill patients, the recognition of patients with complex nutritional needs, and the promotion of appropriate nutritional care. The ICU Dietitian must attend and/or participate in a nutrition support continuing professional development (CPD) event annually, and must attend and/or present research at one of the larger multi-professional international nutrition support events every two to three years.

The ICU Dietitian is involved in providing training for other Dietitians. Dietitians who provide cover for ICU Dietitians should participate in:

- Education sessions with a Critical Care Dietitian, e.g. tutorials, case presentations, journal reviews.
- Shadowing a Critical Care Dietitian in seeing different patient types.
- Planning, implementing and revising nutrition care plans under the supervision of a Critical Care Dietitian.
- Demonstrating the ability to independently deliver a quality nutritional care service to Critical Care patients, as deemed by a Critical Care Dietitian.
- Continued self-directed learning in the area of nutrition and critical care.

### Role of the Pharmacist in Critical Care

The Clinical Pharmacist is uniquely qualified to offer specialist knowledge and experience on drug therapy, and is an essential member of the Critical Care team, ensuring that the patient receives safe and effective treatment (DH, 2005; SHPA, 2006; Moyen et al, 2008). Critical Care Pharmacists make significant contributions to critically ill patient care and outcomes (Allied Health Professionals (AHP) and Healthcare Scientists (HCS) Advisory Group, 2002; DH, 2005; SHPA, 2007; Moyen et al, 2006; Horn, E. et al, 2006.; Brilli, RJ et al., 2006; Rudis MI et al., 2000; Papadopoulos, J. et al., 2002; LeBlanc, JM et al., 2008; Montazeri, M. et al., 1994; Parshuram, CS, 2008; Leape, LL et al. 1999; Baldinger SL et al. 1997). Of note in the area of risk management and medication safety, Critical Care Pharmacists help to reduce patient mortality through reduction in prescribing errors, identification of adverse drug reactions and medication safety promotion (Horn E. et al. 2006; Montazeri, M. et al, 1994; Bond, CA et al. 2007). In addition, having a Clinical Pharmacist working in a Critical Care unit can have a positive pharmacoeconomic impact through direct cost savings on drugs and cost avoidance from a reduction in adverse drug events (Baldinger, SL et al, 1997; Miyagawa CI et al., 2008).

Workforce planning guidelines for Critical Care Pharmacy staff are highlighted below (Prospectus, 2009; Hospital Pharmacists Association of Ireland, 2008), and are based on international best practice (AHP-HCS, 2002; National AHP and HCS Critical Care Advisory Group, 2003; SHPA, 2007; Horn E. et al., 2006).

### 3.1 Recommendations

- 0.1 WTE post per Level 3 Critical Care bed, at Senior Pharmacist grade or higher.
- 0.05 WTE post per Level 2 Critical Care bed, at Senior Pharmacist grade.

### Education/Training and Competencies

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 2014 the new 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.

### Role of the Physiotherapist in Critical Care

Norrenberg and Vincent (2000) completed a profile of physiotherapy services in European Critical Care units and found a wide variation in the role and profile of physiotherapists across Europe. In an Irish context, (Irish Society of Chartered Physiotherapists, 2008) only 11.8% of Critical Care units have dedicated physiotherapy staff, thus limiting their capacity to act as senior clinical physiotherapy decision-makers.

Physiotherapy staff in hospitals with Critical Care units deliver physiotherapy services 24/7/365. Education and training demands require experienced senior or clinical specialist level physiotherapy staff. The rotation of junior staff through Critical Care achieves competency for out-of-hours service provision.

The UK Intensive Care Society Standards Committee (National AHP and HCS Critical Care Advisory Group, 2003) recommend a staffing ratio of 1.0 WTE physiotherapist to 4.8 Critical Care beds, assuming occupancy at 100%, a physiotherapy referral rate at 90%, and a single physiotherapy session of 30 minutes each day. This formula does not take account of skill mix or caseload complexity.

### 4.1 Recommendations

- 1 WTE dedicated physiotherapist to 4.8 Critical Care beds, or
- 0.2 dedicated physiotherapists per Critical Care bed.

### Education/Training and Competencies

**Undergraduate** - As well as general modules in anatomy, physiology and pathophysiology, the undergraduate physiotherapy curriculum comprises lectures and practical education in critical care-specific topics such as sepsis, multi-organ dysfunction, mechanical ventilation and physiotherapy techniques specific to this patient cohort. These techniques include manual hyperinflation, airway clearance and rehabilitation. All undergraduate students complete a clinical placement in cardiorespiratory care, and most will undertake a clinical placement in a Critical Care setting.

**Postgraduate** - There is limited availability of postgraduate education specific to Critical Care in Ireland. Most postgraduate education is undertaken as short courses at weekends and at the expense of the participants. These courses are not accredited, and content is not standardised. The HSE, through the ISCP (Irish Society of Chartered Physiotherapists), has funded an Advanced Physiotherapy Practice in cardiorespiratory care; Critical Care-specific modules included advanced airway management, Critical Care outreach and rehabilitation in Critical Care. This was once-off funding, and places were allocated after a national

competition; there was no undertaking for ongoing or repeat funding for future courses.

Core clinical competencies - Physiotherapy is the only allied health profession (AHP) that provides services 24/7, in line with best practice. The out-of-hours physiotherapy service in most locations requires all physiotherapy staff to maintain a core level of competence in the management of critically ill patients, irrespective of the clinical specialty that such staff pursue during their normal daily work; for example, physiotherapists providing the out-of-hours service are called on to deliver this service even if their normal duties are wholly in another area of clinical practice e.g. women's health or stroke rehabilitation. This situation requires considerable ongoing training and education to be provided by Critical Care staff, in addition to managing a clinically complex caseload and supervising junior staff who are on rotational assignments. No resources are allocated for the provision of such education.

The Dublin Academic Teaching Hospitals physiotherapy group have developed physiotherapy clinical competencies for Cardiorespiratory and Critical Care which form a framework for education for staff grade physiotherapists. A clinical competency framework for senior and clinical specialist grades is currently under development.

### **Role of Occupational Therapist in Critical Care**

Occupational Therapists enable patients who are or have been critically ill to maximise their ability to carry out every day activities and interact as fully as possible in society. This entails the prevention of complications and providing assistance to overcome and adjust to the physiological and psychological effects of having organ system failure (AHP-HCS Advisory Group, 2002).

Occupational Therapists adopt a patient-led approach which involves patients, relatives and carers in assessment,

setting goals to reflect future aspirations, helping all involved to make informed decisions about the future and also helping them to engage in the treatment plan (AHP-HCS Advisory Group, 2002). Occupational Therapist's training encompasses mental health and physical medicine. Occupational Therapist's work across primary, secondary and tertiary care settings.

Intervention by the occupational therapist in the critical care setting focuses on the customised fabrication of splints / orthosis for upper and or lower extremities, preventing the development of contractures, positioning, facilitation to enable function and improved range of motion. Occupational Therapists work with patients following medical or surgical intervention. Currently there is a marked shortage of occupational therapist working in critical care settings in Ireland. At present some units are covered by Occupational Therapists, according to speciality. The amount of time each week dedicated to seeing patients in critical care settings varies, depending on the facility, the number of patients referred, the condition of the patient, and the level of intervention needed. Dedicated Occupational therapy staffing is needed in all Intensive Care settings in Ireland in order to provide optimal care.

### **Recommendations**

There are clear recommendations that Occupational Therapists should be working in the intensive care setting (National AHP and HCS Critical Care Advisory Group, 2003). Such Occupational Therapists should be at senior grade level, and should be in compliance with the qualities and core competencies outlined in the guidelines developed by the Intensive Care Society Standards Committee, 2003 (National AHP and HCS Critical Care Advisory Group, 2003).

Workforce planning guidelines for Occupational Therapists in Intensive Care setting (Pashkow, P., 1995):

- 1 WTE senior therapist per 8 patients - Complex

Medical & Surgical 1:8

- 1 WTE senior therapist per 7 patients - Pulmonary/Ventilation Weaning 1:7.

### Education/Training and Competencies

- All Occupational Therapy staff working in Critical Care should comply with the Code of Ethics from the Association Occupational Therapists of Ireland, should adhere to professional competence standards and maintain professional development in order to provide an appropriate, safe and high-quality service.
- The Occupational Therapist taking a clinical lead for Critical Care should have knowledge and skills in (National AHP and HCS Critical Care Advisory Group, 2003):
  - The management of unconscious and/or acutely ill patients
  - The treatment of ongoing physiological and psychological problems following critical illness
  - Supporting people to adapt to their loss of role and function
  - Accessing services to enable people to gain rehabilitation following discharge
  - The provision of supervision and training
  - Communication with patients, carers, the team and others involved in the planning and provision of patient care
  - The review and development of services

### Effects of Occupational Therapy on outcome effects in Critical Care

A recent study (Schweickert, WD et al., 2009) recommends that occupational therapy is commenced as soon as possible with mechanically ventilated patients. A strategy for wholebody rehabilitation, consisting of interruption of sedation and physical and occupational therapy in the earliest days of critical illness, was safe and well tolerated. In addition, it resulted in better functional outcomes at

hospital discharge, a shorter duration of delirium and more ventilator-free days, when compared with standard care.

### Role of Speech and Language Therapist in Critical Care

The role of the Speech and Language Therapist (SLT) in Critical Care is to assess and manage oropharyngeal dysphagia and/or a communication disability in the critically ill patient. This role is best achieved as part of a multidisciplinary team (Dikeman, K.J. et al.2003; Royal College of speech and Language Therapists, 2013; Speech Pathology Australia, 2005)

This role includes diagnosis of eating, drinking and swallowing difficulties, including aspiration and the provision of appropriate therapy/intervention to minimise preventable respiratory and/or nutritional complications of swallowing difficulties. Management may include the use of objective assessments such as videofluoroscopy or FEES (fibreoptic endoscopic examination of swallow).

The SLT works within the multidisciplinary team to facilitate weaning and decannulation in patients with tracheostomy. Specialist weaning intervention may reduce the time taken to wean from ventilation/tracheostomy, length of stay in critical care and enable improved patient outcomes (Dikeman, K.J. et al. 2003; Royal College of Speech and Language Therapists, 2013; Speech Pathology Australia, 2005;Thompson-Ward, E et al.1999).

SLT management of communication difficulties (including the use of alternative and augmentative communication where appropriate) can help reduce negative emotional responses and improve the psychological well-being of the person, family and staff (Royal College of Speech and Language Therapists, 2013; Manzano,J.L. et al. 1993; Jordan, M et al.2009). Restoring or facilitating communication enables the patient

- i) to consent to treatment and

- ii) to participate in rehabilitation, by both engaging the patient in goal setting and establishing how best to provide valuable feedback on clinical issues, such as work of breathing. Increased participation enables improved outcomes and may shorten length of stay (Sprengli, M, 2005; Manzano, J.L. et al. 1993; Isaki, E, et al. 1997).

### Recommendations

Published guidelines are available from the UK Skills for Health Sector Skills Council. Based on this guidance, the following staffing level is recommended (Jordan, M, et al. 2009):

- 0.06 WTE Speech and Language Therapists per Critical Care bed, at Senior or higher grade.

### Education/ Training and Competencies

SLT staff providing these services should have specialised postgraduate training in the management of patients in critical care settings and ideally be at a senior grade level. The RCSLT Tracheostomy Competency Framework has a section specific to clinical / technical skill development in critical care and the document as a whole will be relevant to SLTs working with this caseload (Royal College of Speech and language Therapists, 2014).

General dysphagia and communication competencies are a prerequisite for working in critical care. It is the responsibility of the SLT with expertise in critical care to share knowledge and expertise with SLT colleagues within their service and throughout local/regional networks e.g. via IASLT, RCSLT, Special Interest Groups, Journal Clubs, AHP Networks, mentoring, critical care networks, clinical supervision, HSE and Clinical Care Programme advisors. An IASLT Position Paper on Tracheostomy Management for Speech and Language Therapists is due for publication in 2015 and will be of particular relevance for speech and language therapists working in critical care.

### Role of Social Work in Critical Care

The provision of psychosocial care and support should be an integral part of patient and family care in the Critical Care Unit (Allied Health Professionals (AHP) and Healthcare Scientists (HCS) Advisory Group, 2002; National AHP and HCS Critical Care Advisory Group, 2003). Social Workers are uniquely qualified to provide such counselling and support in Critical Care settings (Hartman-Shea, K. et al., 2011). Primary roles include psychosocial support and counselling, crisis intervention, psychosocial assessment, facilitating communication, end-of-life care, practical assistance, and assessment of family's perception of illness (Hartman-Shea, K. et al., 2011; Rose SL et al., 2006; Dowling, J. et al 2005; Delva, D. et al., 2002; McCormick, AJ et al., 2007). Access to a supportive counsellor during hospitalisation may reduce the incidence of post-traumatic stress symptoms for patients and families following an ICU admission (Davydow, DS et al., 2008).

Psychosocial counselling and support is not only the most frequent social work role, but is also found to have an impact on family satisfaction and the reduction of anxiety and stress (Rose SL et al., 2006; Delva, D. et al., 2002), and increase coping (McCormick, AJ et al., 2007). An early psychosocial assessment by the social worker, i.e. within 72 hours of admission, is recommended (Delva, D. et al., 2002). This assessment helps to provide important information on how the family communicates their understanding of the critical illness, practical concerns and any indication for ongoing counselling and support (Nelson, JE et al., 2006). By assessing and addressing complex psychosocial circumstances, misperceptions are clarified and communication within the family and with the team are enhanced (Rose SL et al., 2006).

Exact staffing requirements for Social Workers for acutely ill patients recovering from critical illness have not yet been clearly delineated by national or international guidelines. National and international guidelines do, however, recognise



their importance in the Critical Care setting. Practice experience would demonstrate that staff providing these services should have specialised training in the management of patients in Critical Care settings and, ideally, should be at a senior grade level.

## Conclusion

Health and Social Care Professionals significantly contribute to the care of the seriously ill patient and are an integral part of the critical care team. There is an abundance of literature which supports the role of HSCP's in the management and rehabilitation of critically ill patients. These professions are a distinct group of practitioners who apply their expertise to diagnosis, treatment and rehabilitation across health and social care including critical care, as well as participation in health education.

These professions referred to with the exception of Pharmacy will also be regulated in the near future under their own statutory regulator (CORU) and will be required to ensure that they maintain and update their knowledge and skills as part of their continuous professional development requirements for registration.

Pharmacy is not governed by the Health and Social Care Professionals Act 2012, as is the case with other mentioned professions. The regulatory body for pharmacy services is the Pharmaceutical Society of Ireland (PSI), which was established by the Pharmacy Act 2007. The PSI is responsible for registration, education and training of Pharmacists in Ireland, and in conjunction with the Pharmacy Legislation and Regulation Section Unit, Department of Health and Children (DOHC), it develops the professional role of Pharmacists and pharmacy services in Ireland.

Workforce planning is not part of the PSI's remit. The majority of Critical Care Pharmacists working in Irish hospitals are members of the Hospital Pharmacists Association of Ireland

(HPAI). This body 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 the specialist pharmacist posts required for the model of care for critical care, as recommended in the JFICMI National Standards for Adult Critical Care.

## Critical Care Access Enablers

### Bed Information System for ICU (ICU-BIS)

It is widely recognised that there is a shortage of Critical Care beds in Ireland. It is vital therefore that existing beds are utilised optimally. It is common for smaller hospitals to have to telephone a number of larger hospitals to find a bed when they need to transfer a patient. Larger hospitals commonly have to transfer patients elsewhere when their ICU beds are full. Time is often wasted contacting hospitals to confirm if they have an ICU bed available, in addition finding the right person to speak to in order to arrange a bed can be very time consuming. These issues are also relevant when a patient is being repatriated to a referring ICU.

The provision of Critical Care outside ICU/HDU is common due to the shortage of ICU beds. This is a major risk factor for patients and it may put additional pressure on ICU staff and other staff in the hospital. At present there is no systematic method of documenting this activity.

A Bed Information System (BIS) is proposed to address these issues.

### Aims of a bed information system:

- Provide live information on bed occupancy in all units to optimise the utilisation of Critical Care bed resources.
- Reduce the time delay currently experienced by clinicians who are referring a patient to an ICU in



a different hospital (including repatriations to a referring ICU).

- Provide data on ICU bed occupancy and on requirements for ICU bed capacity.
- Provide daily data on Critical Care provided outside ICU.
- Provide information about the Retrieval Service and contact details for the Retrieval Service Consultant on duty.

### Options available:

Discussions have been ongoing for some time about technical options to capture and make available the relevant information.

- Option 1 Automated process where the Clinical Information System (CIS) emails the relevant data to populate a website that can be accessed by referring hospitals.
- Option 2 (For hospitals that don't have a CIS, or if Option 1 is not technically feasible), units log on to SDU website to populate the ICU-BIS website manually.

This facility could also be used to provide the same data on patients under the care of the Critical Care team outside ICU.

### Components of bed information system (BIS-ICU):

1. The CIS formulates an email containing the following information:
  - Current Critical Care bed complement (as defined by the hospital)
  - No of beds occupied at present
  - Information on each of these occupied beds
    - Endotracheal Tube/tracheostomy Y/N ventilated Y/N
    - vaso-pressors Y/N
    - CVWH Y/N

- Phone number (i.e. direct line) for ICU
  - Phone number for ICU Consultant on call (if agreed by each ICU)
2. System emails this information to SDU server every hour.
  3. SDU server populates BIS-ICU website.
  4. Referring hospitals access BIS-ICU website, using password.
  5. SDU system will have potential ability to store data on bed occupancy. This would be useful in assessing the requirements for ICU capacity. However, there should be an agreement not to utilise this until:
    - (i) There has been sufficient time to check the accuracy of the data and
    - (ii) There is explicit agreement from the unit and the hospital CEO to do so.
  6. Collect data on website hits and the source of these.
  7. There is potential to include information on contact details for the Retrieval Service.

### Data on Critical Care provided outside ICU

Manual download will be required for the data on Critical Care provided outside ICU i.e. patients cared for by the ICU team who are waiting for an ICU bed. Data could be uploaded to the BIS website at 8.00am daily by a designated person. We suggest uploading the same dataset as listed above.

### Possible future developments

Links to a proposed 'dispatch system' for Ambulance Service/ Retrieval Service. Potential to develop into a formal 'Bed Bureau' if resources for personnel were available. Links to National Clinical Programme for Critical Care and ICU Audit Programme.

### Critical Care Retrieval

The HSE has provided resources to the National Transport Medicine Programme to develop the existing retrieval

service for critically ill adult patients currently provided by the MICAS service. The remit of the Service is 'Hospital to Hospital' transfer of critically ill patients. Prehospital care is not considered part of the remit of this Service. Critically ill patients have been defined in a previous document as Level 3 ICU patients (this usually means ventilated).

Those at risk of progression to this level of acuity during transfer would also be included. Three potential patient groups have been identified:

- Stabilisation and transfer of patients from smaller hospitals (Model 2 Hospitals) who need Level 3 ICU (i.e. usually includes intubation).
- Urgent transfer of critically ill patients to specialist centres for urgent clinical interventions e.g. extradural haematoma, ruptured AAA.
- Semi-elective transfer of critically ill patients from one ICU to another, i.e. on the same day.

Provision of an adult retrieval service 365 days a year will require considerable manpower input. Extra staffing resources provided in 2014 will permit commencement of daytime services in Dublin, Cork and Galway it is anticipated that a number of existing staff will also participate in the service. New staff appointed for retrieval would spend some of their time in the department of their base specialty to free up existing staff for retrieval. This will facilitate cover across weekends and holidays while ensuring new staff maintain their skills in their base specialty.

Safety during transfers requires a specific consultant to be clearly responsible for each transfer, either undertaking the transfer personally or overseeing the NCHD who is doing so. The Service should be coordinated each day by a specific Consultant with the skill-set to make clinical decisions about the appropriateness and safety of each transfer and who can prioritise transfers when there is more than one request.

Work remains to be done to define the skill set and competencies required of medical staff participating in the Service. In general terms, staff should be competent to care for critically ill patients (Level 3 ICU) as defined by appropriate training and by the ongoing maintenance of skills. Specific competencies and training requirements will be defined before the service commences, in consultation with the relevant Training Bodies.

### National ICU Audit Programme

A National Critical Care Audit is currently being implemented, with recruitment of audit staff and procurement of IT infrastructure already underway. The key aims are to measure the quality of critical care in Ireland and benchmark this locally and against international standards (ICNARC). Data gathered will inform future development, resource utilisation and will complement the existing HIPE (Hospital Inpatient Enquiry) system and potentially lead to research opportunities. The National Critical Care Audit provides critical care quality assurance.

## APPENDICES

1. Acknowledgements – Advisory Group and Working Group membership
2. Critical care nursing staffing commissioning ratios
3. Compliance with HIQA 'National Standards for Safer Better Healthcare'
4. ICM workforce plan
5. Critically ill patient scenarios using the Critical Care Model

## APPENDIX 1: ACKNOWLEDGEMENTS

On behalf of the National Clinical Programme for Critical Care, Dr Michael Power would like to personally acknowledge the many considerable contributions made, and thank Dr Áine Carroll, Dr Barry White, Dr Philip Crowley, HSE; Dr Rory Dwyer, Audit; Dr Bairbre Golden, Anaesthesia Programme; Mr Paul Rafferty, Ms Fiona Cahill, Mr Kieran Tangney, Ms Mary Godfrey, Ms Maeve Raeside, Ms Mary McCarthy, Ms Fionnuala Duffy, HSE; Ms Lis Nixon, Mr John Joyce, SDU, Department of Health; Dr Brian Marsh, Dr Dermot Phelan, JFICMI; Dr Patrick Seigne, Dr Brian O'Brien, ICSI; Dr Jeanne Moriarty, Dr Ellen O'Sullivan, CAI; Dr Rory Page, Dr Geraldine Moloney, AAGBI-ISC; Dr Karen Burns, Dr Fidelma Fitzpatrick, Dr Darina O'Flanagan, HCAI Programme, HPSC; Dr Una Geary, Dr Gerry McCarthy, Emergency Medicine Programme; Ms Marian Wyer, Ms Joan Gallagher, Dr Michael Shannon, ONMSD; Ms Ann Donovan, Ms Martha Hanlon, Ms Carmel O'Hanlon, Mr Damodar Solanki, Advisory Group; Dr Geoff King (RIP), Transport Medicine Programme, PHECC; Dr Kevin Clarkson, Dr Maria Donnelly, Dr Vida Hamilton, Dr Colman O'Loughlin, Dr Catherine Motherway, Dr John O'Dea, Dr Rob Plant, Dr Donal Ryan, Dr Andrew Westbrook, Dr Alan Woolhead; Ms Emma Benton, Ms Emma Gorman; the Clinical Leads of the National Clinical Programmes; Dr Brendan O'Hare, Dr Dermot Doherty, IPCCN; Dr Garry Courtney, Acute Medicine Programme, Professor Frank Keane, Mr Ken Mealy, Acute and Elective Surgery Programmes, Ms Sharon Murray, Ms Una Quill, Acting Programme Manager, among many contributors.

In particular, the National Clinical Programme for Critical Care would like to thank:

Ms Linda Dillon, Patient representative.

Dr Rory Dwyer, National Critical Care Audit, National Critical Care Retrieval Service, Intensive Care Unit Bed Information System (ICU-BIS), Neurocritical care

Dr Brian Marsh, Intensive Care Medicine Medical Workforce Planning, Intensive Care Medicine Education and Training

Dr Ed Carton, National Extra Corporeal Life Support Service (ECLS) at the Mater Misericordiae University Hospital

Ms Marian Wyer, Nursing Workforce Planning, Intensive Care Nursing Workforce Planning

### Advisory Group

Dr Michael Power, Clinical Lead, Chairperson

Dr Rory Dwyer, National Critical Care Audit

Dr Fidelma Fitzpatrick, Dr Karen Burns, HCAI Programme

Dr Bairbre Golden, Director, National Clinical Programme in Anaesthesia

Mr Fintan Foy, CEO, CAI

Dr Cathy McMahon, Paediatric Critical Care

Dr Michael Scully, NCPCC Advisory Group Liaison, JFICMI/ICSI

Mr Damodar Solanki, Clinical Pharmacist, PSI, HPAI

Ms Ann Donovan, DONRG/IADNM

Ms Carmel O'Hanlon, Clinical Specialist Dietician, Therapy Professionals

## Working Group

Dr Michael Power, Clinical Lead

Dr Pat Neligan, ICU Director, University Hospital Galway, Galway Roscommon Hospital Group/West North West Hospital Group

Dr Gerry Fitzpatrick, ICU Director, AMNCH, Dublin Midland Hospital Group

Dr Rory Dwyer, Clinical Lead, National Critical Care Audit, National Critical Care Retrieval Service Interim Clinical Lead

Dr David Honan, ICU Director, Wexford

Dr Vida Hamilton, ICU Director, Waterford

Dr Geoff King (RIP), Transport Medicine Programme Clinical Lead

Dr Jeanne Moriarty, Immediate Past President, CAI, Clinical Director, St James's Hospital

Dr John O'Dea, ICU Director, MWRH Limerick, Mid-West Hospital Group

Dr Paul O'Connor, Letterkenny General Hospital

Dr Fidelma Fitzpatrick, Dr Karen Burns, HCAI Programme

Ms Carmel O'Hanlon, Clinical Specialist Dietician, Therapy Professionals

Dr Cathy McMahon, Paediatric Critical Care

Dr Rob Plant, ICU Director, Cork University Hospital, South/South West Hospital Group

Dr Danny Collins, ICU Director, St James's Hospital, Dublin Midland Hospital Group

Mr Damodar Solanki, Clinical Pharmacist, PSI, HPAI

Dr Andrew Westbrook, ICU Director St Vincent's University Hospital, Dublin East Hospital Group

Dr Colman O'Loughlin, ICU Director, Mater Misericordiae University Hospital, Dublin East Hospital Group

Dr James O'Rourke, ICU Director, Dublin North East Hospital Group

Dr Alan Woolhead, Dr Rosemary Moriarty, ICU Director, OLOLH, Drogheda, Dublin North East Hospital Group

Ms Marian Wyer, Nursing and Midwifery Planning and Development Officer

Ms Maureen Kennedy, Nursing

Ms Una Quill, Acting Programme Manager, NCPCC

## APPENDIX 2

### Critical care nursing staffing commissioning ratios

As outlined in the requirements section above, a minimum ratio of one nurse to one patient is required in order to provide direct, safe, effective quality nursing care for Level 3 patients, with Level 3(s) patients often requiring a higher nurse-to-patient ratio e.g. 1.2:1. A minimum ratio of one nurse to two patients is required in order to deliver Level 2 patient care.

In addition to nurses providing direct care, senior nurses providing leadership, management and co-ordination functions are required, in order to deliver critical nursing care.

Calculation of nursing requirements by individual units should include the following components for consideration according to local decision-making and governance:

- 1) Nursing complement required to provide 1:1 nursing for each patient (the minimum nurse-to-patient requirement for Level 3 care)
- 2) Leadership and management staff for every shift plus a designated CNM3 who is formally recognised as unit manager.
- 3) Extra staffing for patients in single rooms
- 4) Increased staffing for complex cases
- 5) Clinical Facilitator
- 6) Health Care Assistant

The workload in a critical care service is often complex and variable. Providing the right nursing care for critically ill patients is not simply a matter of applying standard nurse-to-patient ratios. Other factors that influence managers in determining nursing requirements include the skill of the nurse, the complexity of the patient's needs and the physical environment.

Note: No additional cost allowance has been included in the above calculations for leave other than annual leave

(i.e. sick leave, maternity leave, adoptive leave, carer's leave, parental leave, compassionate leave or force majeure leave).

### Guidance on calculation for other WTE requirements within the unit, based on local discretion and governance

- ii) WTE requirement for other shift-based staff:
 

Clinical Nurse Manager (per 10-12 beds)	5.54 WTE
Access nurse (per 4 single rooms)	5.54
WTE HCA (per 10 beds)	5.54
- iii) WTE requirements for unit-based staff
  - o Designated nurse manager 1 WTE per 10 beds
  - o Clinical Facilitator/educator 1:50 Level 3(s)/Level 3 staff
  - o Administration support 1 WTE per 10 beds.

Note: In the above calculations no additional cost allowance has been included for leave other than annual leave (i.e. sick leave, maternity leave, adoptive leave, carer's leave, parental leave, compassionate leave or force majeure leave).

## APPENDIX 3

### Compliance with HIQA National Standards for Safer Better Healthcare

To improve the overall performance of the health system, HIQA has provided the National Standards for Safer Better Healthcare (HIQA, 2012). The National Clinical Programme for Critical Care (NCPCC) adopts the NSSBHC Themes as its

NCPCC Values ('value set').

The NCPCC seeks to identify practices and interventions that improve performance of the critical care system in any or all of the Themes or performance domains.

HIQA National Standards for Safer Better Healthcare (NSSBHC) 2012 Critical care performance evaluation framework domains		
HIQA quality and safety "Themes" or domains	Critical care goal/objective	Critical care performance measure or indication
Patient-centred care and family support	Timely access Communication, discussion	ICU-Bed Information System capacity, occupancy Family communication record
Effective care and support	Survival Quality of life	National ICU Audit Committee quality and safety indications
Safe care and support	1. Infectious complications 2. Non-infectious complications/critical incidents	HCAI rates: BSI, CRI, VAP Hygiene surveys Patient safety critical incident 'track-and-trigger'
Better health and wellbeing	Critical illness prevention, secondary prevention	Discharge planning Re-admission rates Adverse events after discharge
Leadership, governance and management	Clear accountability, responsibility structure	Effective Hospital Group and Critical Care Service Governance Committee structures
Workforce	Capacity (bed stock) Workforce establishment Competencies Practice arrangements	Census Medical, nursing, therapy profession accreditation rates Satisfactory practice arrangements
Use of resources	The needs of the critically ill patient population are met during variances and major surges without capacity redundancy	Audit activity Surge activity, Major Surge activity Retrieval activity Deployment of resource to meet surges
Use of information	Critical care quality and activity knowledge leads to delivery changes as needed	National Critical Care Audit, NOCA Website communication/dissemination

## APPENDIX 4

### ICM Workforce Plan:

Work pattern models to define rota requirement:

A 37-hour Consultant contract\* comprises 30 clinical hours + 7 hours teaching, management, administration etc. = 1,320 clinical contact hours annually per Consultant.

(30 hours x 44 weeks {6 weeks annual leave + 2 weeks CME activity})

Rota 1: Consultant work pattern 10 hours Monday to Friday; five hours Saturday and Sunday

Rota 2: Consultant work pattern 12 hours Monday to Sunday Minimum Consultant WTE required as a function of clinical hours:

	Rota 1 (above)	Rota 2 (above)
ICU/HDU < 12 beds	2.36	3.3
ICU/HDU > 12 and < 24	4.3	6.6
ICU/HDU > 24 and < 36	6.7	9.9

\* Public Service Stability Agreement 2013-2016 (Haddington Road Agreement)



## APPENDIX 5

### Critically ill patient scenarios using the Critical Care Model

The journeys of critically ill patients across the health system may be described using three putative critically ill patient scenarios. These scenarios indicate an increasing profile of severity and complexity that is best served by a Critical Care 'hub-and-spoke' configuration.

1. 70-year-old woman with an acute infective exacerbation of COPD: Model 3 Hospital Critical Care Service
2. 35-year-old woman with multi-trauma following a road traffic accident: Model 4 Regional Hospital Critical Care Service
3. 55-year-old dialysis-dependent man with diabetes and coronary artery stents on clopidogrel, who has suffered an acute severe traumatic brain injury and an acute extradural haematoma and requires craniotomy and evacuation following a fall: Model 4 Supra-regional Hospital Critical Care Service

#### 1. Model 3 Hospital Critical Care Service

A 70-year-old woman with a life-time history of cigarette smoking was admitted to a Model 3 Hospital via the Emergency Department (ED), where she had been directly referred by her GP. She had been transported to the ED by a paramedic ambulance. In the ED a diagnosis of an acute infective exacerbation of COPD was made. At the same time, she received nebulised bronchodilator treatments, intravenous steroids and IV antibiotics. Moderate respiratory distress was noted, and following admission to the Acute Medicine Unit (AMU), non-invasive ventilatory support was commenced by the Acute Medicine Team with a continuous positive airway pressure (CPAP) of 5 cmH<sub>2</sub>O with 40% inspired oxygen concentration. Arterial blood analysis showed a PaO<sub>2</sub> of 6kPa and a PCO<sub>2</sub> of 8 kPa. The patient's respiratory condition and distress deteriorated despite adequate non-invasive ventilatory support. The Critical Care

Service was consulted. In light of imminent respiratory arrest, a decision was made by the Critical Care Service team to intervene. An emergency endotracheal intubation procedure took place in the AMU without adverse event. Oxygenation and ventilation returned to normal. The patient received sedation and neuromuscular blockade and was transported to the ICU where a surge ICU bed was ready. The patient had a single organ failure/respiratory failure. No shock or renal failure was evident.

As the patient had a good functional status with no prior critical care interventions, the Critical Care Service decided that she should remain in the Model 3 Hospital for treatment with invasive ventilatory support, in the expectation that after a few days of ventilatory support, extubation and liberation from ventilatory support would be successful. The patient's treatment of an acute infective exacerbation of COPD continued with IV antibiotics, steroids and nebulised bronchodilators in line with ventilatory support. The Acute Medicine Service and the patient's family were in agreement with the treatment plan. On the fourth day of the patient's hospital stay, her condition had improved, and consequently, following gradual withdrawal of ventilatory support, liberation from ventilatory support was successful.

On the fifth day, the patient was discharged from ICU to the AMU and, following further recovery, she was discharged to her home and to the care of her GP.

#### 2. Model 4 Regional Hospital Critical Care Service

A 35-year-old pregnant woman sustained multiple trauma in a road traffic accident. She was a passenger in a car that went off the road at speed. An Advanced Paramedic was dispatched to the scene in a Rapid Response Vehicle with a following ambulance and Paramedic. At the scene, after the Fire Service had extricated the patient from the wreckage, she was managed using spinal precautions and placed on a spinal board in left lateral tilt position. The patient was

responsive, moving all four limbs, and had trunk and limb injuries. On evaluation by the Advanced Paramedic, the patient was noted to be pale with a tachycardia, appeared to have chest and abdominal tenderness, and had an obvious left femoral fracture. The Advanced Paramedic gave oxygen via facemask and 2L normal saline via an IV cannula. Using a hospital bypass standard operating procedure as part of Pre-Hospital Emergency Care, the patient was transported 60 miles to the nearest regional multi-specialty hospital. On arrival in the ED of the regional hospital, the patient was noted to be alert, in pain and in respiratory distress, pale with tachycardia and hypotension. Using a trauma evaluation procedure, the patient was found to have haemorrhagic shock with free intraperitoneal blood on portable ultrasound.

The patient was resuscitated with crystalloids and blood products in left lateral tilt. A chest drain was placed with relief of a haemothorax and respiratory distress. Anaesthesia and Critical Care Services attended in the ED. On the basis of the trauma evaluation, a ruptured viscus was diagnosed and the Surgery decision was to proceed directly to emergency laparotomy. The Obstetrics service evaluated the foetus and confirmed that the foetal heartbeat was present in a 10-week pregnancy. The left lower extremity was placed in a Thomas splint by the Orthopaedic service with IV analgesia.

With continuing crystalloid and blood product resuscitation, the patient proceeded to emergency laparotomy. After uneventful induction of general anaesthesia, at laparotomy, a ruptured spleen was found. Splenectomy was completed. No other injuries were noted. The Obstetrics service inspected the pelvis at laparotomy: a gravid uterus was noted, with no pelvic visceral injury. Haemostasis and intravascular volume resuscitation were successful. The patient received six units of red cell concentrate and a platelet transfusion from the Blood Bank.

The patient was transported to ICU where invasive ventilatory support continued overnight with sedation. The foetal heart was monitored. The following day the patient's condition remained stable and on return to OT, the Orthopaedic service proceeded to uneventful, intramedullary nail fixation of the femoral fracture. The patient returned to ICU for continued ventilatory support. The moderate lung injury noted was attributed to trauma and transfusion. The Obstetrics service noted that foetal heartbeat was absent, and a spontaneous miscarriage ensued. The Obstetrics service continued monitoring. Antimicrobial therapy was continued in consultation with Clinical Microbiology.

On the fifth day, following improvement in oxygenation, sedation was discontinued and the patient was gradually liberated from invasive ventilatory support. On the sixth day, the chest tube was removed. On the seventh day, the patient was discharged to the Observation Area of the Trauma Ward with supplemental oxygen and noninvasive haemodynamic monitoring under the care of Surgery and the Orthopaedic service, with follow-up consultation by the Obstetrics service.

### 3. Model 4 Supra-regional Hospital Critical Care Service

A 55-year-old man with multiple chronic medical conditions sustained a fall down a stairs at home during the evening. The patient was dialysis-dependent, suffered from diabetes, had coronary artery stents in place and was on clopidogrel and insulin. It was immediately noted by his family that he was poorly responsive. An Advanced Paramedic and an ambulance were dispatched, arriving in less than 30 minutes. The patient's Glasgow Coma Scale was 10. The Advanced Paramedic evaluation was that it was a likely acute severe traumatic brain injury, possibly with an acute intracranial haemorrhage and possibly requiring craniotomy and evacuation.

After O<sub>2</sub> supplementation and IV fluid resuscitation, the patient was transported by road to a Model 3 Hospital within 30 minutes. On arrival, the patient's GCS had deteriorated to 7. An intracranial haemorrhage was suspected by the ED Consultant. The patient underwent endotracheal intubation by the Anaesthesia team, and, within an hour, was transported in house for a CT scan, where an extradural haematoma with cerebral contusion was obvious.

Consultation by the ED Consultant with the Neurosurgery team at Cork University Hospital included electronic transmission of the CT images. The Neurosurgery team deemed transfer of the patient appropriate. The Anaesthesia team activated the Region Critical Care Retrieval, which was dispatched and departed within 30 minutes, arriving one hour later. After a 30-minute hand-over and one-hour road journey, the patient arrived at Cork University Hospital within six hours of sustaining his fall. Following evaluation by the Neurosurgery and Anaesthesia teams, the patient was transported directly to OT for craniotomy and evacuation of the intracranial haematoma.

The patient had a Tenckhoff catheter in situ for peritoneal dialysis. The patient did not require emergency dialysis pre-operation. He received two donor pools platelet transfusion as he had taken clopidogrel in the previous 12 hours. The patient also received glucose supplementation for low glucose, as he had self-administered longacting insulin earlier. A craniotomy haematoma evacuation was successful with adequate haemostasis. The patient was transported to ICU for neurocritical care, including continued invasive ventilatory support and treatment of acute severe traumatic brain injury as well as intracranial pressure monitoring. The patient received continuous renal replacement therapy via a dialysis catheter in consultation with Nephrology. In consultation with Cardiology, clopidogrel was withheld and aspirin was substituted after one week.

After an episode of ventilator-associated pneumonia, the patient was liberated from invasive ventilatory support after one week. Following 10 days with an improved level of consciousness, the patient was discharged to the Level 1 Observation Unit in the Neurosurgery Ward. The patient continued to improve with Neurocognitive Therapy, Physiotherapy, Occupational Therapy and Speech and Language Therapy inputs available to the Neurosurgery service. After three weeks, the patient was discharged to a nursing home, short-term care environment. Following further Physiotherapy, the patient returned home six weeks after sustaining his injury.

## REFERENCES

- Allied Health Professionals (AHP) and Healthcare Scientists (HCS) Advisory Group, 2002. *The Role of Healthcare Professionals within Critical Care Services*. London: NHS Modernisation Agency. Available at <http://icupsychois.org.uk/documentation/025.pdf>. [Accessed 11 September 2014]
- National AHP and HCS Critical Care Advisory Group, 2003. *Allied Health Professionals (AHP) and Healthcare Scientists (HCS) critical care staffing guidelines*. London: Critical Care Programme Modernisation Agency. Available at <http://www.ukcpa.org.uk/ukcpadocuments/2.pdf>. [Accessed 11 September 2014]
- Association of Anaesthetists of Great Britain and Ireland, 2010. *Workload for Consultant Anaesthetists in Ireland. Guidance on the 2008 (Connaughton) Contract and Job Planning for Consultant Anaesthetists in Ireland*. Association of Anaesthetists of Great Britain and Ireland.
- Australian College of Critical Care Nurses, 2003. *ACCCN ICU staffing position statement on intensive care nursing staffing*. Available at <http://www.acccn.com.au/documents/item/20>. [Accessed 10 September 2014]
- Australian Council on Healthcare Standards (ACHS), 2012. *Clinical indicator user manual 2012*. Carlton: ACHS. Available at [http://www.anzics.com.au/downloads/doc\\_download/663-achs-intensive-care-clinicalindicators-2012](http://www.anzics.com.au/downloads/doc_download/663-achs-intensive-care-clinicalindicators-2012). [Accessed 10 September 2012]
- Bagshaw, S, 2009. Very old patients admitted to intensive care in Australia and New Zealand: a multi-centre cohort analysis. *Critical Care* 13 (2) R45.
- Baldinger, SL et al, 1997. Cost savings from having a clinical pharmacist work part-time in a medical intensive care unit. *American Journal of Health System Pharmacy* 54 (24) 2811-4.
- Barnato, AE et al., 2007. Prioritizing the organization and management of intensive care services in the United States: the ProMIS Conference. *Critical Care Medicine* 35 (4) 1003-1011.
- Behan, Jasmina et al., 2009. *A quantitative tool for workforce planning in healthcare: example simulations: report by the Skills and Labour Market Research Unit, FAS on behalf of the Expert Group on Future Skills Needs*. Dublin: FAS. Available at [http://www.fas.ie/nr/rdonlyres/9abc5ee1-cf20-4aa5-aca4-c5b81dd9fe5e/792/slmru\\_fas\\_egfsn\\_final\\_version\\_report\\_aquantitative.pdf](http://www.fas.ie/nr/rdonlyres/9abc5ee1-cf20-4aa5-aca4-c5b81dd9fe5e/792/slmru_fas_egfsn_final_version_report_aquantitative.pdf). [Accessed 9th September 2014]
- Berwick, D, 2008. The Triple Aim: Care, Health and Cost. *Health Affairs* 27: 759-69.
- Bond, CA et al. Clinical pharmacy services, pharmacy staffing, and hospital mortality rates. *Pharmacotherapy* 27 (4) 481-93.
- Brilli, RJ et al., 2006. American College of Critical Care Medicine Task Force on Models of Critical Care Delivery. Critical care delivery in the intensive care unit: defining clinical roles and the best practice model. *Critical Care Medicine* 29 (10) 2007-19.
- British Association of Critical Care Nurses (BACCN), 2009. *BACCN standards for nurse staffing in critical care*. Newcastle-Upon-Tyne; BACCN. Available at [http://www.baccn.org.uk/about/downloads/BACCN\\_Staffing\\_Standards.pdf](http://www.baccn.org.uk/about/downloads/BACCN_Staffing_Standards.pdf). [Accessed 10th September 2009].
- British Dietetic Association, 2004. *The workload management toolkit: a professional guidance document*. Birmingham: BDA.
- Cahill, NE et al., 2010. Nutrition therapy in the critical care setting: what is "best achievable" practice? An international multicenter observational study. *Critical Care Medicine* 38: 395-401.
- Cahill, NE et al., 2010b. Understanding adherence to guidelines in the intensive care unit: Development of a comprehensive framework. *Journal of Parenteral and Enteral Nutrition* 34 (6) 616-623.
- Central Statistics Office, 2013. *Population and labour force projections 2016-2046*. Dublin: CSO. Available at [http://www.cso.ie/en/media/csoie/releasespublications/documents/population/2013/poplabfor\\_2016\\_2046.pdf](http://www.cso.ie/en/media/csoie/releasespublications/documents/population/2013/poplabfor_2016_2046.pdf). Accessed 9th September 2014]
- Chalfin, DB., 2007. Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit. *Critical Care Medicine* 35(6) 1477-1483.
- College of Intensive Care Medicine of Australia and New Zealand. *Intensive care specialist practice in hospitals accredited for training in intensive care medicine*. Prahran: College of Intensive Care Medicine of Australia and New Zealand. Available at [http://www.cicm.org.au/cms\\_files/IC-2%20Intensive%20Care%20Specialist%20Practice%20in%20Hospitals%20Accredited%20for%20Training%20in%20Intensive%20Care%20Medicine%20Current%20September%202011.pdf](http://www.cicm.org.au/cms_files/IC-2%20Intensive%20Care%20Specialist%20Practice%20in%20Hospitals%20Accredited%20for%20Training%20in%20Intensive%20Care%20Medicine%20Current%20September%202011.pdf). [Accessed 10 September 2014]

Commission on Patient Safety and Quality Assurance, 2008. *Building a culture of patient safety: report of the Commission on Patient Safety and Quality Assurance*. Dublin: Stationery Office. Available at <http://www.lenus.ie/hse/handle/10147/65918>. [Accessed 9th September 2014].

Comptroller and Auditor General, 2009. *Health Service Executive Departments*. Dublin: Comptroller and Auditor General. Available at [http://www.audgen.gov.ie/documents/vfmreports/70\\_Emergency\\_Departments.pdf](http://www.audgen.gov.ie/documents/vfmreports/70_Emergency_Departments.pdf). [Accessed 9th September 2014].

Critical Care Information Advisory Group, 2013. *Critical care minimum data set*. Health and Social Care Information Centre. Available from [http://www.datadictionary.nhs.uk/data\\_dictionary/messages/supporting\\_data\\_sets/data\\_sets/critical\\_care\\_minimum\\_data\\_set\\_fr.asp?shownav=1](http://www.datadictionary.nhs.uk/data_dictionary/messages/supporting_data_sets/data_sets/critical_care_minimum_data_set_fr.asp?shownav=1). [Accessed 9 August 2014].

Davenport, RA., 2010. A major trauma centre is a specialty hospital not a hospital of specialties. *British Journal of Surgery* 97(1): 109-117.

Davydow, DS et al., 2008 Posttraumatic stress disorder in general intensive care unit survivors: A systematic review. *General Hospital Psychiatry*, 30 (5) 421-434

Dellinger RP et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. *Critical Care Medicine*, 41 (2), pp 580-637.

Delva, D. et al., 2002. Needs and feelings of anxiety of relatives of patients hospitalized in intensive care units. Implications for social work. *Social Work in Health Care* 35 (4) 21-40

Department of Health and Children, Commission on Patient Safety and Quality Assurance, 2008. *Building a culture of patient safety: report of the Commission on Patient Safety and Quality Assurance*. Dublin, Stationery Office. Available at <http://www.lenus.ie/hse/bitstream/10147/65918/1/DOHCpatientsafety.pdf>. [Accessed 8th September 2014]

Department of Health, 2012. *Future health: a strategic framework for reform of the health service 2012 – 2015*. Dublin, Department of Health. Available at: <http://health.gov.ie/blog/publications/future-health-a-strategic-framework-for-reform-of-the-health-service-2012-2015/> [Accessed 8th September 2014]

Department of Health, 2013. *The establishment of hospital groups as a transition to independent hospital trusts*. Dublin,

Department of Health. Available at: <http://health.gov.ie/blog/publications/the-establishment-of-hospital-groups-as-a-transition-to-independent-hospital-trusts/>. [Accessed 8th September 2014]

Department of Health, 2013b. *Securing the future of smaller hospitals: a framework for development*. Dublin, Department of Health. Available at <http://health.gov.ie/wpcontent/uploads/2014/03/SecuringSmallerHospitals.pdf>. [Accessed 8th September 2014]

Department of Health, Special Delivery Unit, 2013c. *Unscheduled care strategic plan (Quarter 1, 2013)*. Dublin: Department of Health. Available at <http://www.lenus.ie/hse/bitstream/10147/305965/1/SDUUCSPirish.pdf>. [Accessed 8th September 2014]

Department of Health [UK], 2005. *Adult critical care: specialist pharmacy practice*. London: DH. Available at [http://webarchive.nationalarchives.gov.uk/20130107105354/http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@en/documents/digitalasset/dh\\_4114093.pdf](http://webarchive.nationalarchives.gov.uk/20130107105354/http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4114093.pdf). [Accessed 11 September 2014]

Dikeman, KJ et al., 2003. *Communication and swallowing management of tracheostomised and ventilator-dependent adults*. San Diego: Singular Publishing Group.

Dowling J. et al., 2005. Impact on family satisfaction: the critical care family assistance program. *Chest* 128 (3) 765-805

Eastern Regional Health Authority, 2004. *Review of critical care services in the Eastern region*. Dublin: ERHA.

Extracorporeal Life Support Organization (ELSO), 2010. *ELSO guidelines for training and continuing education of ECMO specialists*. Ann Arbor: ELSO. Available at <http://elsonet.org/resources/guidelines>. [Accessed 9th September 2014]

Expert Advisory Group on Cancer, 1995. *A policy framework for commissioning cancer services: a report by the Expert Advisory Group on cancer to the Chief Medical Officers of England and Wales*. London, Department of Health. Available at [http://www.dhcarenetworks.org.uk/\\_library/Resources/ICN/Policy\\_documents/Calman\\_Hine.pdf](http://www.dhcarenetworks.org.uk/_library/Resources/ICN/Policy_documents/Calman_Hine.pdf). [Accessed 8th September 2014]

European Association of the Associations of Dietitians and and Thematic Network Dietitians Improving Education and Training Standards in Europe (DIETS), 2009. *European dietetic competences and their performance indicators attained at the*



point of qualification and entry to the profession of dietetics. Copenhagen: EFAD. Available at <http://www.efad.org/downloadattachment/1653/European%20Dietetic%20Competences%20and%20Performance%20Indicators%20-%20English.pdf>. [Accessed 11 September 2011]

Fernande, P, 1997. Recommendations on minimal requirements for Intensive Care Departments. Members of the Task Force of the European Society of Intensive Care Medicine.. *Intensive Care Medicine* 23;226-232

Findlay, G et al, 2007. *Trauma: who cares? A report of the National Confidential Enquiry into Patient Outcome and Death*. London: National Confidential Enquiry into Patient Outcome and Death (NCEPOD). Available at [http://www.ncepod.org.uk/2007report2/Downloads/SIP\\_report.pdf](http://www.ncepod.org.uk/2007report2/Downloads/SIP_report.pdf). [Accessed 9th September 2014].

Findlay, GP et al., 2011. *Knowing the risk: a review of the peri-operative care of surgical patients*. London: NCEPOD. Available at [http://www.ncepod.org.uk/2011report2/downloads/POC\\_fullreport.pdf](http://www.ncepod.org.uk/2011report2/downloads/POC_fullreport.pdf). [Accessed 9th September 2014].

Gunning, K and Gillbe, C, 2006.. *Standards for consultant staffing of intensive care units*. Intensive Care Society and Intercollegiate Board for Training in Intensive Care Medicine. Available at <http://www.ics.ac.uk/EasysiteWeb/getresource.axd?AssetID=455&type=full&servicetype=Attachment>. [Accessed 10 September 2014]

Harrison, DA et al, 2013. *Risk Adjustment In Neurocritical Care (RAIN) – prospective validation of risk prediction models for adult patients with acute traumatic brain injury to use to evaluate the optimum location and comparative costs of neurocritical care: a cohort study*. London: NIHR. Available at: [http://www.journalslibrary.nihr.ac.uk/data/assets/pdf\\_file/0004/73849/ExecutiveSummaryhta17230.pdf](http://www.journalslibrary.nihr.ac.uk/data/assets/pdf_file/0004/73849/ExecutiveSummaryhta17230.pdf). [Accessed 9th September 2014]

Hartman-Shea, K. et al., 2011. The Role of the Social Worker in the Adult Critical Care Unit: A Systematic Review of the Literature. *Social Work in Health Care* 50 (2) 143-157

Health and Social Care Professionals Council, 2013. *Framework for registration boards continuing professional development standard and requirements*. Dublin: CORU. Available at [http://www.coru.ie/uploads/documents/CPD\\_framework\\_document.pdf](http://www.coru.ie/uploads/documents/CPD_framework_document.pdf). [Accessed 11 September 2014]

Health Information and Quality Authority, 2009. *Report of the investigation into the quality and safety of services*

and supporting arrangements provided by the Health Service Executive at the Mid-Western Regional Hospital Ennis. Dublin, HIQA. Available at <http://www.lenus.ie/hse/handle/10147/71314>. [Accessed 8th September 2014]

Health Information and Quality Authority, 2009b. *Report of the investigation into the quality and safety of services and supporting arrangements provided by the Health Service Executive at Mallow General Hospital*. Dublin, HIQA. Available at <http://www.lenus.ie/hse/handle/10147/128590>. [Accessed 8th September 2014]

Health Information and Quality Authority, 2012. *National standards for safer better healthcare*. Dublin, HIQA. Available at <http://www.hiqa.ie/standards/health/safer-betterhealthcare>. [Accessed 8th September 2014]

Health Information and Quality Authority, 2012b. *Report of the investigation into the quality, safety and governance of the care provided by the Adelaide and Meath Hospital, Dublin incorporating the National Children's Hospital (AMNCH) for patients who require acute admission*. Dublin, HIQA. Available at <http://www.hiqa.ie/publications/report-investigationquality-safety-and-governance-care-provided-adelaide-and-meath-hos>. [Accessed 8th September 2014]

Health Information and Quality Authority, 2013. *Investigation into the safety, quality and standards of services provided by the Health Service Executive to patients, including pregnant women, at risk of clinical deterioration, including those provided in University Hospital Galway, and as reflected in the care and treatment provided to Savita Halappanavar*. Dublin: HIQA. Available at <http://hse.openrepository.com/hse/bitstream/10147/303157/1/PatientSafetyInvestigationUHG.pdf>. [Accessed 9th September 2014]

Health Service Executive, 2009. *The education and development of health and social care professionals in the health services 2009 -2014*. Dublin: HSE. Available at: <http://www.lenus.ie/hse/bitstream/10147/83537/1/EdandDvlpmtofHealthSocialCareProfs09-2014.pdf>. [Accessed 11 September 2011].

Health Service Executive, 2010. *You and your health service*. Dublin, Health Service Executive. Available at <http://www.hse.ie/eng/services/yourhealthservice/Documentation/YouYourHealthService.pdf>. [Accessed 9th September 2014].

Health Service Executive, 2011. *Code of governance: framework for the corporate and financial governance of the Health Service Executive*. Dublin, Health Service Executive. Available

at <http://www.hse.ie/eng/about/Who/directoratemembers/codeofgovernance/hsecodeofgov.pdf>. [Accessed 8th September 2014].

Health Service Executive, 2011b. *Good faith reporting policy*. Dublin, Health Service Executive. Available at [http://www.hse.ie/eng/staff/Resources/hrppg/Good\\_Faith\\_Reporting\\_Policy\\_2011.pdf](http://www.hse.ie/eng/staff/Resources/hrppg/Good_Faith_Reporting_Policy_2011.pdf). [Accessed 9th September 2014]

Health Service Executive, 2013. *Open disclosure: national policy*. Dublin, Health Service Executive. Available at [http://www.hse.ie/eng/about/Who/qualityandpatientsafety/nau/Open\\_Disclosure/opendiscFiles/opendiscpolicyoct13.pdf](http://www.hse.ie/eng/about/Who/qualityandpatientsafety/nau/Open_Disclosure/opendiscFiles/opendiscpolicyoct13.pdf). [Accessed 9th September 2014]

Health Service Executive, 2014. *Safety incident management policy*. Dublin, Health Service Executive. Available at <http://www.hse.ie/eng/about/Who/qualityandpatientsafety/incidentrisk/Riskmanagement/SafetyIncidentMgtPolicy2014.pdf>. [Accessed 9th September 2014].

Heyland, D et al., 2003. Nutrition support in the critical care setting: Current practice in Canadian ICUs – opportunities for improvement. *Journal of Parenteral and Enteral Nutrition* 27:74-83

Heyland, DK et al., 2010. Creating a culture of clinical excellence in critical care nutrition: The 2008 “best of the best” award. *Journal of Parenteral and Enteral Nutrition* 34 (6) 707-715.

Heyland, DK et al., 2010b. Lost in (knowledge) translation. *Journal of Parenteral and Enteral Nutrition* 34 (6) 610-615.

Hospital Pharmacists Association of Ireland, 2008. *Submission to the Prospectus review of adult critical care services in the Republic of Ireland*. Dublin: HPAI.

Horn E. et al, 2006. The critical care clinical pharmacist: evolution of an essential team member. *Critical Care Medicine* 34 Suppl 3 S46-51.

Hutchings, A., 2009. Evaluation of modernisation of adult critical care services in England: time series and cost effectiveness analysis. *BMJ* 339: b4353.

Irish Nutrition and Dietetic Institute, 2008. *Nutrition and dietetic report for Prospectus review of critical care services in Ireland (for HSE)*. Dublin: Irish Nutrition and Dietetic Institute.

Irish Society of Chartered Physiotherapists, 2008. *Information*

*paper for submission to Prospectus for National Review of Adult Critical Care Services*. Available at URL: <http://iscp.ie>

Isaki, E. et al., 1997. Ventilator Supported communication: a survey of Speech-Language Pathologists. *Journal of Medical Speech-Language Pathology* 5 (4) 263–273

Iwashyna TJ et al., 2009. Intensive care unit occupancy and patient outcomes. *Critical Care Medicine*, 37 (5) 1545-1557.

Joint Faculty of Intensive Care Medicine of Ireland, 2011. *National standards for adult critical care services*. Dublin: JFICMI. Available at [https://www.anaesthesia.ie/attachments/article/57/JFICMI\\_Minimum\\_Standards%20Rev-01.pdf](https://www.anaesthesia.ie/attachments/article/57/JFICMI_Minimum_Standards%20Rev-01.pdf). Accessed 10th September 2014].

Jordan, M. and Glennon, J. (2009) *Critical Care. A Vision for Post Graduate Critical Care Education and Training in Cheshire and Mersey: Designed by Professionals for Professionals*. Skills for Health. Cheshire and Merseyside Critical Care Network.

Kahn, JM, 2006. Hospital volume and the outcomes of mechanical ventilation. *New England Journal of Medicine* 355(1):41-50.

Kerr, D. J., 1996. Delivering cancer care: a model from the West Midlands. *British Journal of Cancer* 74, pp. 667–669.

Kim, MM, 2010. The effect of multidisciplinary care teams on intensive care unit mortality. *Archives of Internal Medicine* 170(4): 369-376.

Leape, LL et al., 1999. Pharmacist participation on physician rounds and adverse drug events in the intensive care unit. *JAMA*. 1999; 282(3):267-70

LeBlanc JM et al., 2008. International critical care hospital pharmacist activities. *Intensive Care Medicine* 34 (3) 538-42

Lewis, G (ed.), 2007. *Saving mothers' lives: reviewing maternal deaths to make motherhood safer, 2003-2005*. London: Confidential Enquiry into Maternal and Child Health. Available at [http://www.mdeireland.com/pub/SML07\\_Report.pdf](http://www.mdeireland.com/pub/SML07_Report.pdf). [Accessed 9th September 2014].

Maas, A, 2008. Moderate and severe traumatic brain injury in adults. *The Lancet Neurology* 7: 728-41.

McCormick, A.J., Engelberg, R., and Curtis, J.R. (2007). Social Workers in palliative Care: Assessing activities and barriers in the intensive care unit. *Journal of Palliative Medicine*, 10(4), 929-937

- McManus, M, 2004. Queuing theory accurately models the need for critical care resources. *Anaesthesiology* 100: 1271.
- Manzano, JL et al., 1993. Verbal Communication with ventilator dependent people. *Critical Care Medicine* 21 (4) 512-517.
- Miyagawa, CI et al., 2008. Effect of pharmacist interventions on drug therapy costs in a surgical intensive care unit. *American Journal of Hospital Pharmacy* 1986;43 3008-13
- Montazeri, M. et al., 1994. Impact of a clinical pharmacist in a multidisciplinary intensive care unit. *Critical Care Medicine* 1994 22 (6) 1044-8
- Moyen E et al., 2008. Clinical review: medication errors in critical care. *Critical Care* 12 (2) 208.
- National Clinical Programmes, 2011b. *National Clinical Programmes: checklist for clinical governance (national)*. Dublin: Health Service Executive. Available at [http://www.hse.ie/eng/about/Who/qualityandpatientsafety/resourcesintelligence/Quality\\_and\\_Patient\\_Safety\\_Documents/checklist.pdf](http://www.hse.ie/eng/about/Who/qualityandpatientsafety/resourcesintelligence/Quality_and_Patient_Safety_Documents/checklist.pdf). [Accessed 8th September 2014].
- National Health Service Wales, 2006. *Designed for life: quality requirements for adult critical care in Wales*. Cardiff: Welsh Assembly Government. Available from <http://www.wales.nhs.uk/sites3/documents/768/quality%20requirements%20for%20critical%20care.pdf>. [Accessed 10 September 2014].
- National Institute for Health and Clinical Excellence (NICE), 2007. *Head injury: Triage, assessment, investigation and early management of head injury in infants, children and adults*. London: NICE. Available at <http://www.nice.org.uk/guidance/cg56/resources/guidance-head-injury-triage-assessment-investigation-and-early-management-of-head-injury-in-infants-children-and-adults-pdf>. [Accessed 9th September 2014]
- National Institute for Health and Clinical Excellence (NICE), 2006. *Nutrition support in adults: oral nutrition support, enteral tube feeding and parenteral nutrition*. Royal College of Surgeons of England, London, 2006, Available at <http://www.nice.org.uk/guidance/cg32/resources/cg32-nutrition-support-in-adults-fullguideline2>. [Accessed 11 September 2014]
- National Task Force on Medical Staffing, 2003. *Report of the National Task Force on Medical Staffing* ('Hanly report'). Dublin: Department of Health. Available at <http://hse.openrepository.com/hse/bitstream/10147/46569/1/1680.pdf>. [Accessed 9th September 2014]
- Nelson, JE et al., 2006. Improving comfort and communication in the ICU: A practical new tool for palliative care performance and feedback. *Quality and Safety in Health Care* 15 (4) 264-271
- Norrenberg M. et al., 2000 A profile of European intensive care unit physiotherapists. *Intensive Care Medicine* 26 988-94.
- Nguyen, Y-L, 2011. The challenge of admitting the very elderly to intensive care. *Annals of Intensive Care* 1:29.
- Papadopoulos, J. at al., 2002. The critical care pharmacist: An essential intensive care practitioner. *Pharmacotherapy* 22 (11) 1484-1488.
- Phillips, Jack, 2008. *Phillips report: national report on traumatic brain injury in the Republic of Ireland 2008*. Dublin: Traumatic Brain Injury Research Group. Available at [http://www.headway.ie/download/pdf/phillips\\_report.pdf](http://www.headway.ie/download/pdf/phillips_report.pdf). [Accessed 9th September 2014]
- Prior, Mathew, Guerin, Michelle, Grimmer-Somers, Karen, 2008. The effectiveness of clinical guideline implementation strategies – a synthesis of systematic review findings. *Journal of Evaluation in Clinical Practice* 14 (5) 888-897
- PA Consulting Group, 2007. *Health Service Executive acute hospital bed capacity review: a preferred health system in Ireland to 2020*. London: PA Consulting Group. Available at <http://hse.openrepository.com/hse/bitstream/10147/45900/1/9561.pdf>. [Accessed 9 September 2007]
- Parshuram, CS, 2008. Pharmacotherapeutic friendly fire in the intensive care unit: high stakes seeking high calibre. *Critical Care* 12 (2) 137.
- Pashkow, P., 1995. Case Management for Subacute Programs. In *Handbook of subacute care*, ASPEN Publishers; Frederick, MD.
- Prospectus Strategy Consultants, 2009. *Towards excellence in critical care: review of adult critical care services in the Republic of Ireland*. Dublin: Prospectus. Available at <http://www.hse.ie/eng/about/Who/clinical/natclinprog/criticalcareprogramme/critcarrep09.pdf>. [Accessed 8th September 2014]



Roberts, SR et al., 2003. Nutrition support in the intensive care unit. Adequacy, timelines, and outcomes. *Critical Care Nurse*. 23:49-57

Rose, SL et al., 2006. The role of social work in the ICU: reducing family distress and facilitating end-of-life decision making, *Journal of Social Work in End-of-Life and Palliative Care* 2 (2) 3-23

Royal College of Nursing(RCN), 2003. Guidance for nurse staffing in critical care. London: Royal College of Nursing. Available at [http://www.rcn.org.uk/\\_\\_data/assets/pdf\\_file/0008/78560/001976.pdf](http://www.rcn.org.uk/__data/assets/pdf_file/0008/78560/001976.pdf). [Accessed 10 September 2014].

Royal College of Obstetricians and Gynaecologists (RCOG), 2011. *Providing equity of critical and maternity care for the critically ill pregnant or recently pregnant woman*. London: RCOG. Available at [http://www.rcog.org.uk/files/rcogcorp/Prov\\_Eq\\_MatandCritCare.pdf](http://www.rcog.org.uk/files/rcogcorp/Prov_Eq_MatandCritCare.pdf). [Accessed 9th September 2014]

Royal College of Physicians of Ireland, Health Service Executive, 2014. *Clinical practice guideline: the Irish Maternity Early Warning System (IMEWS)*. Available at <http://www.hse.ie/eng/about/Who/clinical/natclinprog/obsandgynaeprogramme/imews/guideline.PDF>. [Accessed 9th September 2014]

Royal College of Physicians of Ireland, Royal College of Surgeons Ireland and Intensive Care Society of Ireland (2011): Joint Faculty of Intensive Care Medicine of Ireland: National Standards for Adult Critical Care Services, available at [www.coa.ie/attachments/article/57](http://www.coa.ie/attachments/article/57)

Royal College of Speech and Language Therapists, 2013. *Speech and Language Therapy in Critical Care*. Position Paper.

Royal College of Speech and Language Therapists, 2014. *Tracheostomy CompetencyFramework*.

Royal College of Surgeons, 2011. *The higher risk general surgical patient: towards improved care for a forgotten group*. London: Royal College of Surgeons. Available at <https://www.rcseng.ac.uk/publications/docs/higher-risk-surgical-patient/>. [Accessed 9th September 2014]

Rudis, MI et al. Society of Critical Care Medicine and American College of Clinical Pharmacy Task Force on Critical Care Pharmacy Services. Position paper on critical care pharmacy services. *Critical Care Medicine* 28 (11) 3746-50.

Schweickert, WD et al., 2009. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. *Lancet* 373 (9678) 1874-82.

Scottish Executive, 2005. *Building a health service fit for the future: a national framework for service change in the NHS in Scotland*. Edinburgh, Scottish Executive. Available at <http://www.scotland.gov.uk/Resource/Doc/924/0012113.pdf>. [Accessed 8th September 2014].

Scottish Intensive Care Society Audit Group (SICSAG), 2009. *Audit of critical care in Scotland 2009: reporting on 2008*. Edinburgh: ISD Scotland publications. Available at [http://www.sicsag.scot.nhs.uk/docs/SICSAG\\_Report2009.pdf](http://www.sicsag.scot.nhs.uk/docs/SICSAG_Report2009.pdf). [Accessed 9th September 2014]

Society of Hospital Pharmacists of Australia Committee of Specialty Practice in Critical Care, 2007. SHPA standards of practice for critical care pharmacy practice. Collingwood: SHPA. Available at [http://www.shpa.org.au/lib/pdf/practice\\_standards/critical\\_care\\_ro.pdf](http://www.shpa.org.au/lib/pdf/practice_standards/critical_care_ro.pdf). [Accessed 11 September 2011]

Soguel, L. et al., 2012. Energy deficit and length of hospital stay can be reduced by a twostep quality improvement of nutrition therapy: the intensive care unit dietitian can make the difference. *Critical Care Medicine*. 40 (2) 412-419.

Speech Pathology Australia, (2005). *Tracheostomy Management*. Position Paper.

Spremulli, M (2005) Restoring speech and swallow control. *Advance for Speech and Language Pathologists and Audiologists*.

Thompson-Ward E. et al., 1999. Evaluating Suitability for Tracheostomy Decannulation: A Critical Evaluation of Two Management Protocols. *Journal of Medical Speech Language Pathology* 7 (4) 273-281.

Young, MP et al., 2003. Inpatient transfers to the intensive care unit: delays are associated with increased mortality and morbidity. *Journal of Internal Medicine* 18 (2) 77-83.







Feidhmeannacht na Seirbhíse Sláinte  
Health Service Executive

"Right Care, Right Now"

[www.hse.ie/criticalcare](http://www.hse.ie/criticalcare)