

Towards Excellence in Critical Care

REVIEW OF ADULT CRITICAL CARE SERVICES IN THE REPUBLIC OF IRELAND

FINAL REPORT

Submitted to the Health Service Executive September 2009

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**Executive
Summary**

1. Introduction

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. 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. In addition, while capacity is recognised as a significant issue, particularly in the larger acute teaching hospitals, critical care beds are not always being deployed exclusively for patients needing critical care. Instead they are too often occupied by patients who should be cared for at ward level, resulting in an inappropriate use of the current capacity available.

Critical care is a key component of the acute hospital system. It is also the most resource intensive of services provided by any acute hospital. It is therefore important that this service is effectively planned and the appropriate capacity, infrastructure and staffing are provided. This Review provides the opportunity to work towards achieving this ambition.

For the first time in Ireland a comprehensive audit has taken place across every public unit in the country. Together with this data, best practice research and the guidance of international advisors this report has identified forty-three recommendations for the future development of critical care. They will guarantee that Ireland moves towards excellence in critical care and that our patients receive the best quality service that is both safe and accessible.

Specifically, the principal objective of the Review was to advise on:

- The future model of critical care provision
- The appropriate number and configuration of critical care beds
- The governance of critical care, including the role of the intensivist
- Current work practices, including policies and procedures
- Critical care staffing, training and education requirements
- Transport arrangements for critical care patients
- Appropriate audit systems, and
- Facilities and infrastructure for critical care.

In developing our recommendations, there was a requirement to establish and analyse a national critical care dataset, to undertake an extensive review of international trends and practice, and to take into consideration the various health reform initiatives currently underway in the Republic of Ireland.

Our brief was to assess the current provision of adult critical care services in the public health system and identify the future requirements up to the year 2020. It should be noted that the Review was limited to adult critical care services including national specialist services and did not include neonatal/paediatric requirements. In addition, coronary care was not within its remit, except for where it overlapped with critical care and coronary care and critical care patients are treated in the same unit.

2. Overview of Approach to the Review

A Project Team was established for the Review made up of critical care stakeholders from the Department of Health and Children (DoHC), the Health Service Executive (HSE), the Intensive Care Society of Ireland (ICSI), the Irish Association of Critical Care Nurses (IACCN), the Ambulance Services, the Royal College of Physicians in Ireland (RCPI), and the Royal College of Surgeons in Ireland (RCSI). The Review was carried out by Prospectus Strategy Consultants. Prospectus have extensive experience working across the Irish health system, advising government bodies and acute hospitals, on major policy, strategic and service issues. The Prospectus Team included four international advisors:

- Professor Monty Mythen, Professor of Anaesthesia and Critical Care, UCLH;
- Dr. Andrew Webb, Medical Director, UCL Hospitals and Chair of the Welsh Assembly Critical Care Advisory Group;
- Ms. Sheila Adam, Chair of the Nursing and AHP Committee of the European Society of Intensive Care Medicine; and
- Dr. Kathy Rowan, Director of the Intensive Care National Audit & Research Centre.

In addition, the Intensive Care Society of Ireland nominated two critical care experts to the Review: Professor Armand Girbes and Dr. Gavin Lavery.

The involvement of individuals with a clinical critical care background was prioritised to guarantee a thorough understanding of the service.

The process for the Review was highly consultative, drawing on both qualitative and quantitative information. 52 critical care units across 37 hospitals were visited. This was considered vital to develop an in-depth understanding of the range of issues faced across the country, by larger and smaller hospitals, and those with a regional and national remit.

The Review involved the following activities over a five month period:

- Hospital visits, including at least a half day at each hospital, visiting the facilities, and speaking with critical care and other staff.
- Data gathering, including a one month audit of critical care activity, an overview questionnaire which was completed by each critical care unit, and where available, critical care activity information which was gathered from hospitals, units and the Health Service Executive.
- Stakeholder consultation, including one to one interviews; submissions; focus group sessions; and a qualitative web-based consultation tool.
- Review of international best practice gathered from a literature review; international societies; critical care standards; and international and local experts.
- Data analysis and modelling, including a detailed modelling exercise carried out by Prospectus and ICNARC (the Intensive Care National Audit and Research Centre), in the UK, to estimate the bed requirements for 2020 based on the data collected during the one month activity audit. (Please see Chapter 2, Data Modelling Methodology for Future Bed Requirements, for a more detailed description of the methodology and the assumptions, and Appendix L for a detailed breakdown of bed projections)
- Developing recommendations including proposing a model of care along with supporting recommendations and implementation planning.

3. Explanation of Levels of Critical Care used during the Review

Leading international experts on critical care no longer use the terms Intensive Care Unit (ICU) or High Dependency Unit (HDU) beds to describe critical care services. Instead, to more comprehensively and accurately analyse critical care activity, to assess the type of patient care delivered within different units, and to describe future capacity requirements, the term “Levels of Care” is used. For the purposes of this Review, our international advisors along with the ICSI agreed three Levels of Care - Level 3, Level 2 and Level 1/0 - would be used. These were applied based on the daily recording of organ monitoring/support as defined in the UK’s Critical Care Minimum Data Set (CCMDS; UK Department of Health). Level 3, Level 2 and Level 1/0 are defined below. It is important to note that Level 3 and Level 2 encompass critical care, whereas Level 1/0 is care that should be available on a general ward, and ideally not within a critical care unit.

- Level 3 was defined as advanced respiratory support/mechanical ventilation or monitoring/support of two or more organ systems (excluding gastrointestinal support and the combination of basic respiratory support and basic cardiovascular support)
- Level 2 was defined as monitoring/support of one organ system (excluding gastrointestinal support), or the combination of basic respiratory support/mechanical ventilation and basic cardiovascular support.
- Level 1/0 was defined as no organ monitoring/support or gastrointestinal support only. This level of care is not typically defined as part of the remit of critical care, and is care that should be available on a general ward.

During the Review, these three Levels of Care were used to analyse current critical care activity, and to project the critical care capacity requirements and reconfiguration proposals for the future. As a result, the recommendations in this Review for the future bed requirements are described as the number of Level 3 beds and Level 2 beds required. In other words, the number of beds required to deliver Level 3 care, and the number of beds required to deliver Level 2 care (as opposed to the number of ICU and HDU beds required). This approach reflects best practice in critical care service planning.

4. Data Modelling – Outline of Approach for Activity Analysis and Bed Number Projections

An overview of the steps taken by ICNARC in carrying out the data analysis and modelling for the future bed requirements is presented below. (Please see Chapter 2, Data Modelling Methodology for Future Bed Requirements, for a more detailed description of the methodology and the assumptions). This section is followed by a description of the Findings from the Review. The methodology was interrogated by the Project Team and Steering Group during the Review. This ensured the most appropriate approach was used, and all local nuances were taken into consideration in the analysis, thus striking a successful balance between best practice modelling (from ICNARC in the UK) and local expert knowledge of critical care delivery in Ireland.

The methodology used was based on the view that the most appropriate approach was to use real activity data, captured for the first time from the Irish system, to develop a baseline from which reasonable projections of required capacity could be derived. Although there are limitations to this approach, it is the view of the Review team, including ICNARC, our clinical advisors and the ICSI

representatives, that such an approach is superior to any alternative available and forms a solid base for our capacity calculations and other analysis. That said, we have also made explicit recommendations in relation to the requirements for ongoing data collection and the need to review and revise capacity estimates, particularly in the medium to long term.

The objective of the analysis was to identify the appropriate number and configuration of critical care beds in Ireland to 2020, by estimating the projected bed-days by specialty and level of care, both overall and by region. The results are presented by reason for admission (e.g. general, neurosciences, cardiothoracic etc.) and not specialty of unit. This approach acknowledges that not all specialist critical care is currently delivered within a specialist unit. Thus, reasons for admissions were categorized by the following specialties:

- General
- Neurosciences
- Cardiothoracic
- Liver
- Burns

Projections have been broken down into the four HSE regions – HSE Dublin Mid-Leinster, HSE Dublin North-East, HSE South and HSE West. The regional breakdown has only been provided for general critical care admissions as the “region” for analysis purposes has been based on the location of the hospitals, and not the origin of the patient. Results for specialties would therefore be skewed toward the locations of the few specialist units and would be representative of current provision rather than anticipated demand.

From the data collected during the one month audit, projected demand and bed requirements were calculated using the following steps:

- Bed-days of care delivered in June 2008 were calculated and broken down as Level 3, Level 2 and Level 1/0
- Bed-days of unmet need for admitted patients in June 2008 estimated.
- Bed-days of care delivered and unmet need for admitted patients extrapolated to totals for 2008 using weights estimated from the UK Case Mix Programme Database
- Bed-days of Level 2 and Level 3 care in 2008 inflated to allow for unmet need from patients not admitted to critical care
- Projected demand calculated as bed-days of Level 2 and Level 3 care plus bed-days of unmet need for admitted patients and unmet need for patients not admitted to critical care
- 2008 figures projected to 2020 based on population projections from the Central Statistics Office and the Economic & Social Research Institute

The future bed requirements are presented as the projected demand for critical care bed-days (at Level 2 and Level 3) by specialty of critical care required in each calendar year from 2008 to 2020. Activity categorized as Level 1/0 has not been included in the bed projections.

5. Findings from the Review

Adult critical care services are currently provided in 37 hospitals (52 units) across the country. The structure of critical care services varies greatly, ranging from units with a small number of beds (providing a combination of intensive care, high dependency care and coronary care) to large intensive care units providing the highest levels of complex critical care to the most seriously ill patients.

The overwhelming strength of the critical care service is its staff. Critical care staff around the country are highly motivated and highly skilled, and work together to provide an excellent standard of patient care, despite the issues that they are faced with.

Drawing on the activity data analysis, and qualitative information gathered through the visits to the 52 units, consultations and questionnaires, a number of key challenges for critical care in Ireland were identified during the Review. They are presented in the Tables below:

Key Challenges

Many critical care units are providing a large proportion of Level 1/0 care, suggesting that valuable resources and skills are not being efficiently or appropriately used.

All critical care units (with one exception) delivered Level 1/0 care. One unit delivered 100% of their care at Level 1/0, and the average unit delivered approx 35% of their care at Level 1/0. Critical care experts agree that Level 1/0 care should not be delivered in a critical care unit. (See also Chapter 2 Section entitled “Inappropriate use of existing capacity”)

A significant number of units provide very low levels of mechanical ventilation.

43% of all critical care units provided advanced respiratory support (mechanical ventilation) less than 30% of the time. In 12 hospitals the number of patients ventilated during the data collection period (30 days) was five or fewer. These statistics prompt questions as to whether the staff competency to provide advanced respiratory support can be sustained, and whether patients are being placed at risk.

The lack of isolation rooms available when required presents significant infection control risks.

Nationally isolation facilities are poor or non-existent (with a small number of exceptions) presenting significant infection control risks. Only 12 (of 52) units always had an isolation room available when required. The remaining units reported that they had an isolation room available on average 30%-40% of the time when it was required.

Key Challenges (cont.)

Average length of stay in critical care units was lower than international norms.

The length of stay (LOS) in critical care units varied between 1.1 and 4.9 days with an average length of stay (ALOS) of 2.8 days. Compared to international norms (average LOS 6.4 days¹), the average LOS in Ireland is low. A number of factors may contribute to this and could include: high demand for beds in critical care leading to early discharges, and/or a high proportion of patients in the critical care unit receiving Level 1/0 care (leading to a short length of stay).

Majority of units are discharging critical care patients early.

Most units (78%) indicated that some patients were discharged early (in the view of the treating clinicians/nursing staff). This ranged from 2% of patients in some units to 30% in others. Contributing factors include lack of capacity and increased pressure on units to facilitate emergency admissions.

Medical and nursing staff structures are inadequate.

Critically ill patients do not have equal access to high quality care. Specialists in intensive care medicine are not available in all hospitals and critical care nursing courses at induction and/or foundation level are not uniform in terms of content and availability. Data collected shows that:

- Dedicated 24/7 consultant anaesthetist/intensivist cover was available in only 17% of all critical care units
- Nursing staff are under significant pressure:
 - An average of 123 hours leave per unit per week was recorded. This included sick leave, maternity leave and parental leave
 - There was widespread non-replacement of staff on statutory and non-statutory leave
 - There was a lack of dedicated secretarial support, leaving highly trained critical care nurses carrying out large amounts of administrative work (only 15% of units stated that they had dedicated secretarial support)
 - There were rostering difficulties as a result of the introduction of the 37.5 hour week.
- Allied Health Professionals voice concerns that their support to critical care patients is often at a 'general' or 'high' level - if more dedicated time was allowed for, AHP staff could work closely with the medical and nursing staff and provide a more in-depth service to the unit and its patients.

Key Challenges (cont.)

The transfer of critical care patients poses major challenges.

In most cases staff undertake lengthy communications and negotiations to find a critical care bed, and then must travel with the patient leaving their own unit understaffed. The resources (human and otherwise) for such transfers varies greatly from hospital to hospital.

- MICAS, the single critical care transport system currently in place, only operates from 9am-5pm, five days a week.
- '999'/emergency calls receive priority over critical care transfers regardless of acuity

Taken together, the messages from our analysis paint a picture of a critical care system with wide variations in practice, inherent inefficiencies due to fragmentation of resources and patient safety issues, compounded by infrastructural deficiencies. **Above all there is a lack of capacity, however the evident inappropriate use of available beds and the current configuration of the critical care units add to the capacity problem and further reduces patient access to critical care beds across the country.** There are currently 52 units all providing critical care, some which are refusing complex patients, and others where the throughput is not sufficient to maintain staff competencies. As a result we believe patients may be put at risk. **These two key findings are explored further below:**

Capacity

In considering the current capacity of critical care in Ireland, it is vital that the number of patients and beds are considered in conjunction with other factors. These include for example, the availability of high observation or step-down care, the availability of outreach services, or the option for transferring patients back to their referring hospital once their complex critical care episode is complete. Considering the information presented above, in addition to information gathered and observations made on hospital visits, it is clear that capacity and patient flow difficulties are a common occurrence.

- Over the 28 day period, there were 278 **admission refusals** (for non-clinical reasons) to critical care suggesting a lack of appropriate available beds. This figure refers to the number of times that a request was made to a critical care unit for a bed, and was refused. It is recognised that this may include multiple bed requests for the same patient. But it is also expected that there may be many critical care bed requirements that were not recorded due to physicians and surgeons working around the capacity issue, and not making a request. While acknowledging that this figure is not scientific and has its limitations, site visits and qualitative information gathering confirmed it as a relevant indicator of access to critical care beds, and with the advice of our critical care advisors it was factored into future bed projections (See also Chapter 2 for a more detailed description of the methodology)

- A significant number of critical care **beds were used inappropriately** during the data collection period, suggesting a difficulty in accessing the correct level of critical care bed for the patient's need as well as a difficulty in accessing general ward beds for discharge from critical care. A number of hospitals which recorded refusals, also recorded Level 1/0 activity. The units where this occurred were sense-checked, as part of the quality assurance process for the Review. In considering the impact of this on future bed projections, it must be recognised that, pending radical reconfiguration of the existing general acute hospital capacity and work practices in Ireland, it is likely hospitals will continue to provide a proportion of Level 1/0 care delivered in critical care units. Therefore, the refusals in hospitals where Level 1/0 care was also taking place should not be discounted from projected requirements.
- Over the data collection period 5% of **internal ward transfers** from critical care occurred between the hours of 10pm and 4am, suggesting that critical care beds were not available for emergency admissions, with early discharge of patients to create space for another admission.

Configuration of critical care units

It is widely accepted by critical care clinicians that intensive care units require a throughput of 200 level 3 patients per annum in order to maintain staff competencies and skill in the care of the complex critical care patient. Using this as a benchmark for the data collected, the following deductions can be made.

- Of the 37 hospitals providing critical care across the country, 10 do not have the throughput of critical care activity required to maintain staff competencies.
- 9 hospitals across the four HSE areas are providing the vast proportion of all critical care (in terms of volume and acuity) and are under significant pressure, requiring additional capacity to meet demands, especially step-down capacity.
- The remaining 18 hospitals are providing a range of critical care services and, although capacity is an issue and specific difficulties exist for certain services, the need is not as acute as in the larger hospitals.

Critical care isolation facilities are another important benchmark. International guidelines¹ state that at least one cubicle is required for every six beds, and bed spaces should be 20 m²

- Nationally isolation facilities are poor or non-existent (with few exceptions) presenting significant infection control risks.

Chapter 4 presents the Findings of the Review in depth, including quantitative and qualitative data analysis, under seven key areas: configuration, governance, work practices, staffing, transport, audit and accreditation, and infrastructure. In addition Chapter 2 presents a detailed description of the Methodology used to arrive at the future bed requirements, with the results of the modelling for each step provided. Appendix L also provides a detailed breakdown of the bed projections.

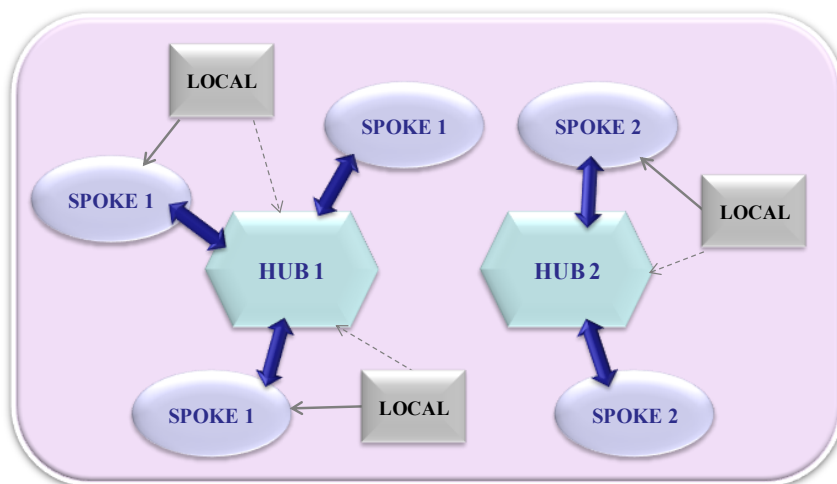
The recommended model for critical care in the Republic of Ireland

The evidence from the audit and the qualitative information gathered confirms the need for the development of critical care services to be prioritised without delay. The model of care and its supporting recommendations within this Review will guarantee that Ireland moves towards excellence providing a high quality service based on international best practice standards.

The model and recommendations have been developed with the advice and support of the international expert advisors to the Review, drawing on the large amount of information gathered and international best practice evidence.

The recommended model for the delivery of adult critical care is underpinned by a **network approach**, whereby ‘hub’, ‘spoke’, and ‘local’ hospitals will work together to provide the patient with safe and high quality critical care, in a timely manner. Each network will comprise a number of groups of ‘hub’, ‘spoke’ and ‘local’ hospitals, as shown in the diagram below. Each network’s geographical setup should be based on a combination of ensuring an appropriate number of patients to achieve critical mass, while balancing such issues as travelling distances and fitting with existing HSE organisational boundaries.

For example, a critical care network made up of two ‘hub’ hospitals, five ‘spoke’ hospitals and three ‘local’ hospitals.



Each critical care network will:

- Be fully **self sufficient**, having the appropriate bed numbers and mix of facilities to provide the full range of critical care services (with a small number of exceptions in the case of national specialty units (E.g. Neurosciences) which have a limited number of centres).
- Have access to a dedicated resource to support all **inter-hospital critical care transfers**.
- Have a **Critical Care Network Group** to drive both strategic and day-to-day issues within the network.

It is our view that the geographical boundary of the current HSE administrative areas would serve as suitable Critical Care Networks. However, it is important that these are validated against other ongoing health service developments, for example: the exact configuration of adult acute services, including major trauma, the future of A&E services in smaller hospitals, and the evolving HSE administrative area boundaries.

Clearly it is not possible at this stage to dictate the exact configuration (i.e. number of critical care units and number of beds per unit) and the network structure due to these unknowns. It is outside the scope of this Review and, above all, the configuration of critical care services is driven by the structure of acute hospital services. Given these are still in evolution, it would be unwise to state a firm recommendation in this regard.

The roles of Hub, Spoke and Local hospitals in delivering critical care

All hospitals with critical care units will work together within a network approach. The co-ordination of critical care services between hospitals in the network is key to the successful implementation of this model. The role of the 'hub' and 'spoke' hospitals in the delivery of critical care is to provide the highest level of critical care to the patient in the most appropriate environment which will provide the best possible patient outcomes. The table overleaf provides an overview of the role of the 'hub', 'spoke' and 'local' hospitals within the critical care network approach.

Overview table defining the critical care provided at different hospitals

Type of Hospital	Critical Care provided	Transfer / transport
<p>‘Local’ Hospital</p> <p>Services provided</p> <ul style="list-style-type: none"> • Ambulatory and/or non-acute inpatient services • Minor injury clinic • No Critical Care Unit 	<p>No critical care unit</p> <p>General ward care. If a patient’s condition deteriorates and requires critical care the patient will be transferred to the nearest ‘spoke’ or ‘hub’ A&E department:</p> <p>In the intervening time, before the transfer, the local hospital staff will treat the patient as required. Care may include:</p> <ul style="list-style-type: none"> • Airway management • Intravenous peripheral line access • Maintenance of patient safety 	<p>Ambulance</p> <p>Local ambulance service, supported by Advanced Paramedics will stabilise the patient (if required) and transfer for critical care services to either a ‘hub’ or ‘spoke’ hospital depending on acuity.</p> <p>Communication regarding the severity of illness will be between the ‘local’ hospital Consultant and the Intensive Care Consultant at the ‘hub’ or ‘spoke’ hospital.</p>
<p>‘Spoke’ Hospital</p> <p>Service provided</p> <ul style="list-style-type: none"> • 24/7 Accident and Emergency Service • Acute medical and surgical inpatient services • Trauma – with the exception of major trauma involving major organ failure or multiple fractures (for which bypass policies are in place to divert to a ‘hub’ hospital.) • Critical Care Unit 	<p>Critical care unit</p> <p>Patients who require critical care (but not long term complex multi-organ support or sub-specialist care, e.g. neurosurgical, cardiothoracic) including the following:</p> <ul style="list-style-type: none"> • Patients needing short term multi-organ system monitoring and support • Patients needing advanced respiratory support in the form of short term ventilation or longer term uncomplicated ventilation (<i>specific limits must be defined as part of national standards to be developed (See Recommendation 1)</i>) • Patients needing pre-operative optimisation • Patients needing extended post operative care • Patients moving to step-down care (e.g. no longer needing level 3 care) • Patients with major uncorrected physiological abnormalities 	<p>Critical care retrieval</p> <p>Unit to unit transfer will be available throughout each Network to transport the patient to the most appropriate ‘hub’ hospital and return the patient to the ‘spoke’ hospital, if required, when the acute episode of care is completed</p> <p>Communication between the units will be between the Intensive Care Consultants in the ‘hub’ and ‘spoke’ hospitals.</p>
<p>‘Hub’ Hospital</p> <p>Service provided</p> <ul style="list-style-type: none"> • 24/7 Accident and Emergency Service • Full range of acute medical and surgical inpatient services with tertiary referral role and subspecialist care • Major teaching hospital • Major trauma centre (including receiving major trauma via bypass policies) • Critical Care Unit 	<p>Critical care unit</p> <p>As per ‘spoke’ hospital above and also includes all complex support for multi-organ failure including the following:</p> <ul style="list-style-type: none"> • Patients needing prolonged advanced respiratory support • Patients needing prolonged monitoring and support for two or more organ systems • Patients needing sub-specialist critical care (e.g. neurosurgical, cardiothoracic, liver failure or burns) 	<p>Critical care retrieval</p> <p>Unit to unit transfer will be available throughout each Network to transport the patient between the appropriate ‘hub’ and ‘spoke’ hospitals.</p> <p>Communication between the units will be between the Intensive Care Consultants in the ‘hub’ and ‘spoke’ hospitals.</p>

6. Recommendations

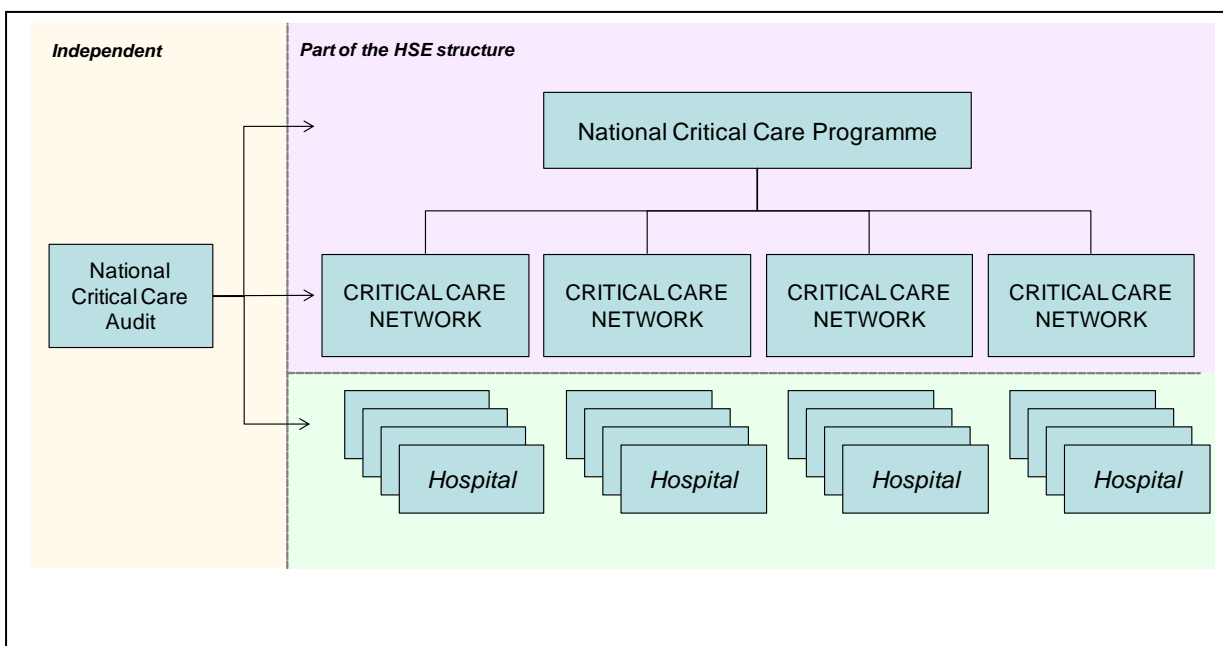
Research points to the **organisation of critical care delivery** as the most important determinant of patient outcome^{1,2,3}. Most recently the Madden Report (*Building a Culture of Patient Safety – Report of the Commission on Patient Safety and Quality Assurance*) also highlighted the clear link between quality and effective governance structures. Our recommendations are hinged on this principle – it is essential to provide a co-ordinated national approach to critical care. It is a high cost environment that needs a control structure to ensure optimum use of resources both nationally and regionally, using evidence based practice to inform national standards. Critical care networks must have in place a framework for dealing with clinical governance issues. It is also essential to ensure critical care development is aligned with other major service developments nationally. The implementation of strong and well-defined leadership of critical care, at a national and network level, will support the ongoing development of critical care as a key component of the acute hospital system.

The recommendations of the review include **two overarching recommendations** which reflect the principle of quality and governance being inextricably linked. They must be fulfilled to ensure that critical care is standardised across the country and has a framework on which to be implemented and further developed.

The first recommendation (**R1**) is to **Establish and implement comprehensive critical care standards for the Republic of Ireland**. The standards should first and foremost ensure that patient safety and quality of care is in line with best international practice. They should address all aspects of critical care delivery including clinical practice, infrastructure, policies and procedures, governance and staffing.

The second recommendation (**R2**) defines the governance structures required to oversee the development of critical care and the implementation of the recommendations of this Review. **Firstly to Establish a National Critical Care Programme within the HSE to drive the development of critical care and the implementation of the standards, and secondly to Establish a Critical Care Network Group to drive both the strategic and day-to-day issues within the network, under the guidance of the National Programme**. Governance structures for critical care at hospital level are described in detail in Chapter 8.

Overview of Critical Care National and Network governance structures



The full list of Recommendations is provided in the following Table, and described in detail in Chapter 8.

Summary of Recommendations

Overarching Recommendations

- R1 Establish and implement comprehensive critical care standards for the Republic of Ireland.
- R2 Implement National and Network level critical care governance structures.

Number and Configuration of Beds

- R3 The number of critical care beds should be increased by 45% from 289 to 418 beds. This will need to increase sequentially to 579 over the period 2010 to 2020.
- R4 The potential role of cross border relationships should be reviewed further to determine where synergies may be exploited.
- R5 All critical care units should work towards a minimum capacity of eight beds.
- R6 Coronary Care beds should not be located within a critical care environment.

Governance of Critical Care at Hospital Level

- R7 A multidisciplinary 'Critical Care Delivery Group' should be established in every hospital with critical care services.
- R8 Every critical care unit should be led by a dedicated intensivist and have a dedicated senior nurse manager.
- R9 In the case of a hospital which has multiple critical care units (non specialist), the same dedicated intensivist and senior nurse manager should lead all units.

Work Practices

- R10 24 hour patient care should be led by intensive care consultants and delivered in an integrated manner by a multidisciplinary team with an emphasis on effective communication.
- R11 National critical care standards, including critical care specific policies and procedures, should be localised and implemented in all critical care units.
- R12 A model for critical care outreach including the use of early warning systems should be developed and implemented with the relevant staffing provision.
- R13 The National Major Incident Plan should be reviewed in light of the updated structures for critical care.

Staffing, Education and Training

- R14 Recruitment and retention programmes aimed at all critical care staff should be developed and implemented.
- R15 Every critical care unit should have 24/7 cover by a dedicated consultant with an agreed minimum level of intensive care training and accreditation.
- R16 Medical staffing levels should be appropriate for the number and level of beds within a unit.
- R17 Out of hours medical staffing of a critical care unit must be provided, at a minimum, by an appropriately experienced Registrar appointed to the critical care team.
- R18 Every critical care unit must have on-site access to a consultant microbiologist.
- R19 In all critical care units, the consultant in charge should not change on a daily or sessional basis.
- R20 The establishment of a Faculty of Intensive Care Medicine of Ireland should be finalised.
- R21 Intensive care medicine should be recognised as a specialty division on the Register of Medical Specialists and as a division on the Medical Council's Register.
- R22 A recognised standalone SpR intensive care programme should be introduced.
- R23 An appropriate continuing medical education programme/structure should be established to maintain clinical competencies in line with the national critical care standards.
- R24 The HSE should undertake a review of nursing work practices to develop an appropriate staffing skill mix for Critical Care Units.
- R25 Nurse:patient ratios reflecting the clinical need and complexity of the patients should be implemented and supported with a flexible approach to the workforce.
- R26 The HSE should review all critical care educational programmes to ensure a standardised approach to the acquisition of appropriate specialised clinical skills and competencies for critical care.
- R27 A National 'Introduction to Critical Care' Module should be developed and completed by all nursing staff in Critical Care.
- R28 Every critical care service should have a dedicated Nursing Clinical Facilitator.
- R29 As an outcome of the review of nursing work practices and skill mix (R24) the role of the health care assistant in critical care should be further developed.
- R30 A Health Care Assistant module, appropriate to critical care unit needs, should be established, working with SKILLS Project.
- R31 Appropriate non-clinical support staff to support administrative, cleaning, portering, housekeeping and audit-related duties in the critical care environment, should be put in place.
- R32 Appropriate critical care specific training for non-clinical support staff should be implemented.

R33 Appropriately trained and experienced Allied Health Professionals should be available as a dedicated resource to critical care with staffing levels in line with best practice and standards.

R34 Dedicated, ward-based pharmacists in all critical care units should be put in place.

Transport and Transfers

R35 A dedicated, specialist critical care retrieval service should be implemented.

R36 The potential benefits of using air-transport should be periodically re-evaluated.

Audit and Accreditation

R37 The collection of a national, standard clinical dataset on the case mix, outcome and activity of adult critical care on all admissions to all adult critical care units should be developed and implemented.

R38 A national audit system to foster improvements in the organisation and practice of critical care, through national benchmarking, reviewing trends and continuous comparative audit, should be implemented.

R39 The National Critical Care Programme should work with HIQA to implement a system for critical care unit licensing based on the national standards.

Physical Infrastructure and Facilities

R40 All new-build critical care units should adhere to facility specifications as set out in the national standards for critical care.

R41 Interim infrastructure and facility standards should be developed for existing critical care units and plans should be put in place to prioritise the upgrade.

R42 All critical care units should meet national infection control policies and guidelines in accordance with guidance from HIQA and the HSE.

R43 All critical care units should have access to modern, fit for purpose, equipment for the delivery of critical care, and should have access to the full range of diagnostics, consistent with the new national standards for critical care.

7. Conclusion

Our Review identified the need to radically reconfigure existing critical care services and to address a significant under-provision of core critical care capacity in the system as a whole. This lack of core critical care capacity is made worse by a pattern of inappropriate use of the existing beds available. These instances of inappropriate use of current capacity need to be addressed, but doing so will not avoid the need to reconfigure the service or to provide additional core capacity. The audit carried out by us as part of our Review also pointed to a significant degree of unmet need for critical care services, as evidenced by early discharges, patient refusals, and delayed discharges.

Based on our activity modelling, a 45% increase in critical care capacity is required to rectify this situation. This has been estimated by stripping out the Level 1/0 care delivered, factoring in the unmet need, and projecting the number of beds required to deliver Level 3 and Level 2 care, using live activity data as the basis for the projections. It is worth noting that this increase, when fully delivered, will result in Ireland having a ratio of 12.6 beds per 100,000 population, which would currently put our country in the mid-range when comparing ICU beds against population in developed countries, and at much the same position as France, Netherlands and Spain.

In addition to increasing capacity and, equally importantly, the configuration of existing critical care, we must prioritise patient safety, ensuring that critical care units have the appropriate throughput of the different levels of care to maintain staff competencies. A reconfiguration of the service, moving away from the large number of small critical care units to build a network approach, should be underpinned by effective national and regional governance structures. The system as a whole then has to be subject to rigorous and sustained evaluation based on national standards.

The recommended model of care and recommendations are key to the future success of critical care services in this country. As the health service drives to ensure that patients are treated in the right location at the right time a modern acute hospital system is in many ways defined by the quality and capability of its critical care component. We consider that a lack of strategic planning and investment over the years has led to a critical care service in which some patients may be at risk. It is important therefore that these recommendations are met with the same degree of commitment as shown during this Review by all its stakeholders. The National Programme should be established immediately to progress their implementation.

CHAPTER 1
Introduction

8. Introduction

- 1.1 Scope of the Review
- 1.2 Review Approach
- 1.3 Review Process Limitations
- 1.4 Conclusion

1.1 Scope of the Review

Critical care is a key component of the acute hospital system and supports the sickest of patients with acute conditions requiring the most complex care. To date, adult critical care services, like many other hospital services, have evolved in a relatively unstructured and unplanned manner. The effective configuration of acute hospitals is a priority within the HSE Transformation Programme, and as a result, this Review of adult critical care services nationally was commissioned in order to inform their further development.

Within the Review and throughout the report, 'critical care' refers to adult critical care within the Republic of Ireland, unless otherwise stated. It should be noted that 'critical care' embraces what is generally known as intensive care and high dependency care and does not include coronary care. This review encompassed adult critical care services including national specialist services, but excluded paediatric and neonatal critical care requirements.

The objective was to review the current provision of adult critical care services and assess the future requirements up to the year 2020, enabling the HSE to plan for a future model of critical care based on evidence.

Specifically the principal objective of the Review was to advise on:

- The future model of critical care provision
- The appropriate number and configuration of critical care beds
- The governance of critical care, including the role of the intensivist
- Current work practices, including policies and procedures
- Critical care staffing, and training and education requirements
- Transport arrangements for critical care patients
- Appropriate audit systems
- Facilities and infrastructure for critical care.

In developing views on the above, our work involved developing and analysing a national critical care dataset, undertaking an extensive review of international trends and practice, and taking into consideration the various health reform initiatives currently underway in the Republic of Ireland.

1.2 Approach to the Review

1.2.1 The Project Team

The Review was carried out by Prospectus Strategy Consultants. Prospectus have extensive experience working across the Irish health system, including advising government bodies and acute hospitals on major policy, strategic and service issues. The Prospectus team included a number of international expert critical care advisors. They were:

- Professor Monty Mythen, Professor of Anaesthesia and Critical Care, UCLH;
- Dr. Andrew Webb, Medical Director, UCL Hospitals and Chair of the Welsh Assembly Critical Care Advisory Group;
- Ms. Sheila Adam, Chair of the Nursing and AHP Committee of the European Society of Intensive Care Medicine; and
- Dr. Kathy Rowan, Director of the Intensive Care National Audit & Research Centre.

The advisors brought international critical care expertise as well as experience in carrying out similar reviews in England and in Wales. The Prospectus team worked with a larger Project Team assembled by the HSE. This Team included membership from the Department of Health and Children, the HSE, the Intensive Care Society of Ireland (ISCI), the Irish Association of Critical Care Nurses, the Ambulance Services, the Royal College of Physicians in Ireland (RCPI) and the Royal College of Surgeons in Ireland (RCSI). In addition, the Intensive Care Society of Ireland nominated two critical care experts to the Review, Professor Armand Girbes and Dr. Gavin Lavery.

1.2.2 Workstreams

The Review focused on gathering a mix of qualitative and quantitative information to inform the development of recommendations for the future of adult critical care services. Visiting all hospitals with critical care services was considered an important element in order to develop an in-depth understanding of the range of issues faced nationally, to develop relationships with staff and to encourage full participation and engagement with the Review. The involvement of individuals with clinical backgrounds was also prioritised throughout the process to ensure a detailed understanding of the environment and the issues.

The key activities undertaken were as follows:

Hospital visits

Prospectus visited all 37 hospitals which currently provide critical care services. Information was gathered through observation of the facilities, viewing of policies and procedures in the critical care units and discussions with a broad range of staff, including those involved in the delivery of critical care (for example, consultant anaesthetists and intensivists, intensive care and high dependency unit nurses, allied health professionals, etc.) and those who work with or 'use' the critical care services (for example, consultant surgeons and physicians, A&E, administration, bed managers, etc).

Data gathering

Developing a strong baseline of data was a key requirement of the Review. A number of methods were employed to gather a great deal of information about the status of the critical care units across the country.

- *One month activity data collection:* This exercise was carried out by all 52 critical care units in the country for a 28 day period in the month of June 2008. The data collected centred on the episode of care for each patient, collecting detailed information on their access to the unit, status at admission, care received during their stay, their exit from the unit and status at discharge. These data were then collated and analysed. Seasonal variation (specifically the fact that June was recognised as a quiet month for intensive care, and in many areas elective surgery activity was much reduced) was taken into account. (See also Chapter 2 Data Modelling Methodology for Future Bed Requirements, and Appendix L for a detailed breakdown of future bed projections)
- *Overview questionnaire:* Each critical care unit completed a detailed questionnaire in order to establish the current situation of their unit, including bed numbers and configuration (i.e. number of ICU, HDU and CCU beds), staffing, access to supporting services, etc.
- *Statistical data from units and the HSE:* Where possible, activity information was gathered from hospitals, critical care units and the HSE on bed configuration and critical care patient activity.

Stakeholder consultation

An extensive stakeholder consultation phase was undertaken to ensure an in-depth understanding of the range of views on critical care services and to explore the interdependencies between critical care and other areas of the health service. The consultation phase was advertised through the HSE website and the Medical Times, inviting input from interested parties. The consultation comprised one to one interviews, group discussions, written submissions and included a range of stakeholders (e.g. Health Service Executive, Department of Health and Children, nursing and medical staff, professional bodies, international experts. See Appendices F and G for a list of those consulted). In addition, a qualitative internet based questionnaire was made available to all who had an interest in critical care and focused on issues such as key areas of strength and weakness, and service priorities for the future. (See Appendix I for results)

International Best Practice

International Best Practice was central to the development of the model for the delivery of critical care in the Republic of Ireland, particularly in informing the data modelling methodology used. Information was gathered through a number of channels:

- Literature Review
- International societies and critical care standards
- International expert advisers
- Experts in critical care in Ireland and Project Team members

Prospectus developed a detailed research output document which was distributed to the Project Team during the course of the Review, and was subsequently used as a basis for developing the model and the recommendations. (See Chapter 5 for Research and Best Practice).

Data analysis and modelling

In order to develop the model of service delivery along with supporting recommendations, the projected demand for critical care services in the Republic of Ireland through to 2020 needed to be established. A detailed modelling exercise was undertaken to develop these projections starting from activity data gathered from all critical care units in Ireland over the 28-day period in June 2008. The 12-month (2008) profile was developed by weighting the June activity using comparable activity data from England, Wales and Northern Ireland (via the UK's case mix programme database as validated by the Intensive Care National Audit & Research Centre - ICNARC), taking into account bed days of care delivered, unmet need for admitted patients and unmet need for patients not admitted. In order to project demand for critical care services up to 2020 Irish population projections from the Economic and Social Research Institute (ESRI) and Central Statistics Office (CSO) were utilised. For the purposes of this projection to 2020, a constant rate of use of critical care is assumed in each specialty by age-group and gender. (See Chapter 2 for a detailed explanation of the modelling process and its assumptions).

Developing recommendations

Using all of the information gathered from hospital visits, data collection, research, data analysis and modelling, with advice and input from our international experts, a proposed model for the delivery of critical care services was identified. This model was developed for the specific situation and challenges in Ireland with the overriding purpose of providing the highest quality patient care. The model is defined and explained, and the key recommendations for moving forward set out in full in Chapters 7 and 8.

Implementation

Having set out the model and recommendations for the future of critical care services, prioritisation, interdependencies and implementation were considered. The practical implementation, aligning new systems and structures with other ongoing initiatives and moving in a realistic and achievable manner towards the defined model was the focus. Our process addressed the implementation of key recommendations in the short, medium and long term. (See Chapter 10 on Implementation)

1.3 Review Process Limitations

There are a number of factors which presented challenges for the review process, all were managed and minimised, but should be noted for completeness.

- The short timeframe available for the Review resulted in hospital visits being completed before the unit information had been collected.
- The data modelling was based on only one month of activity data. This was due to a lack of comprehensive critical care data available in a standard, consistent format at both hospital and national level.
- The activity data collection occurred during June which was thought to be a quieter time for many critical care services.
- The unforeseeable and unusual decrease in critical care activity in certain units during the review period (e.g. closing of the Letterkenny critical care unit for refurbishment and the cancellation of elective surgery in some hospitals)
- The fact that although Coronary Care was outside the remit of this Review, many units included CCU beds, resulting in a challenge in separating the critical care staffing and work practices from those relevant to coronary care.
- The difficulty in aligning ESRI/CSO population projections with the HSE area structure.
- The need to take account of regional restructuring currently being undertaken by the HSE (e.g. transformation of hospital services in the North East Region).
- The fact that policy in adult acute services is still evolving and major components which impact directly on critical care have not been agreed, for example configuration of A&E services and trauma services.

1.4 Disclaimer

This report contains sensitive information on clinical services at some hospitals and is produced for the purposes of the National Director, and other designated HSE officers, of the National Hospitals Office of the Health Service Executive. The report, its analysis and recommendations contained herewith, are provided in good faith, and no liability or responsibility is given to any director, member or officer in their individual capacity, or to any third party.

1.5 Conclusion

- We are confident that our recommendations reflect the learnings from international best practice in the organisation and delivery of critical care services.
- We believe that, when implemented, these recommendations will support the development of a safe and high quality critical care service, configured to meet the evolving needs of the Republic of Ireland in the next decade.
- We would like to thank all those who worked with us on this Review, including the Project Team and our advisors. In particular though, we would like to say a special thanks to the staff of the critical care units without whom we would not have been able to complete the Review.

CHAPTER 2
**Data Modelling Methodology
for Future Bed Requirements**

2. Data Modelling Methodology for Future Bed Requirements

- 2.1 Methodology Rationale and Insights**
- 2.2 Outline of Methods and Definitions**
- 2.3 Detailed Description of Methodology and Results of Data Analysis**

2.1 Methodology Rationale and Insights

2.1.1 Introduction to our Methodology

As in any modelling exercise, there are a number of ways in which forecast requirements could be derived. Our methodology, as agreed with the Steering Group, was based on the view that the most appropriate approach was to use real activity data from the Irish system to establish a baseline from which reasonable projections of required capacity could be developed.

In this regard, there was a clear understanding that there is a lack of Irish comparable national information available in relation to critical care activity. Because of this it was important, despite the short time frame assigned for the Review, to undertake the comprehensive month-long activity gathering and analysis of the current situation in terms of actual critical care usage and availability.

There are some limitations to this approach and these are clearly set out as caveats in the Review. However it is the firm view of the Prospectus team, including ICNARC, our clinical advisors and the ICSI representatives, that such an approach is superior to any alternative available and forms a solid analytical base for our capacity calculations and other analysis.

We also have made very explicit recommendations in relation to the requirement for ongoing data collection and the need to review and revise capacity estimates, particularly in the medium to long term.

2.1.2 Estimating bed requirements – using an activity based approach versus a top-down approach.

In relation to the possible use of a ‘top-down’ approach (looking at numbers of critical care beds per head of population in other developed countries), it was made clear that there is no international formula available which makes this reliable or reasonable as a means of meeting the objectives of the Review.

Confounding factors include such fundamental issues as differences in definition as to what constitutes an acute general bed or critical care activity, the number of critical care units, differences in hospital services, population structures, alternatives to hospital care and resourcing mechanisms.

A review of trends in recent planning studies shows that internationally all planners calculate on the basis of existing style practice within their countries and that innovative planners apply an “appropriateness of ICU-use” approach. Equally, the literature indicates that, for planning and evaluating ICU services, target values or structural data such as percentage of acute care beds or number of beds per 100,000 population lose their relevance and are mostly used for checking plausibility.

By way of illustration of the impracticality of relying on this approach as the principal basis for estimating required capacity, it should be noted that the extremes in figures using the comparator of adult ICU beds per 100,000 population are striking. For example, there is a five-fold variation between the UK and Germany by this measure on one analysis.

At present in Ireland there are approximately 8.71 adult critical care beds per 100,000 for the population aged 16 years and over. By increasing the bed count to 418 as recommended in this Review, this would translate into a ratio of 12.60 per 100,000.

It is worth noting, by way of the plausibility test aspect, that moving to the estimated requirement in our Review would put Ireland in the mid-range of a table showing comparison of ICU beds against population in developed countries, at much the same position as France, Netherlands and Spain using latest data.

The table below provides an overview of the number of adult Intensive care beds per 100,000 population¹.

Country	Number of Adult ICU Beds per 100,000 population
Germany	29.52
Belgium	26.68
United States	25.77
Canada	13.24
France	12.06
Netherlands	10.04
Spain	9.49
United Kingdom	8.88
Ireland	8.71

¹ Based on the population aged 16 years and over. The rate utilised for the United States relates to the population aged 18 years and over.

As stated, an examination of methods and approaches to evaluating and planning critical care requirements within a given region or population, highlighted that innovative planners apply an “appropriateness of ICU-use” approach when analysing the actual utilisation of service provision². This is typically achieved through the application and analysis of patient score techniques including TISS, SOFA and APACHE. Each approach has certain strengths and limitations. The Prospectus/ICNARC team utilised a SOFA score approach for the purposes of this review.

Taking into consideration the fact that projections included within this review are primarily based on a single month’s data, Prospectus and ICNARC strongly recommend that the projection exercise be repeated upon the successful introduction of a national critical care dataset.

2.1.3 Capacity calculations

Our calculations estimate that there is a requirement to increase existing critical care beds from 289 at present to 418, an increase of 45%. In the longer term we also estimate there will be a total requirement for 579 beds by 2020.

This estimate

- Is based on an audit of actual activity, by patient, in the hospital system and reflects existing practices and casemix during the audit period
- Excludes Level 1/0 work currently being carried out in designated critical care facilities
- Discounts delayed discharges
- Assumes 80% occupancy for critical care units
 - Where available, local activity data suggests that occupancy rates within critical care units in Ireland frequently exceed a 100% occupancy rate at specific times during the calendar year. Typical recommendations are that average occupancy should be around 80% to allow for peaks in demand.
 - A brief overview of available activity data highlights the following:
 - St James’s Hospital (2006 activity overview report): Average occupancy rate of 107/108%
 - Mayo General Hospital: Average annual occupancy rate ranged between 105% and 110% during the period 2004 to 2007
 - University Hospital Galway (2005 activity overview report): Average occupancy rate of 96%
 - Mater Misericordiae Hospital: Average annual occupancy rate within the ICU ranged between 97% and 121% during the period 2001 to 2006
 - 2002 ICSI Study³: ICU occupancy average of 97% within adult ERHA hospitals and 98% in hospitals outside the ERHA
- Includes an estimated requirement for ‘refusals’ identified in audit

² Wild, C., Narath, M. (2005) Evaluating and planning ICUs: methods and approaches to differentiate between need and demand. Elsevier: Health Policy 71 (2005) 289 - 301

³ Intensive Care Society of Ireland (2002) Accessibility of Intensive Care Facilities in Ireland to Critically Ill Patients. Irish Medical Journal, March 2002, Volume 95, No. 3

- It is projected that 418 critical care beds are required to operate the proposed model effectively in 2009 at an occupancy rate of 80%. Of this bed total, 17% is necessary to meet the estimated unmet need (refusals / cancellations) as calculated based on the June '08 audit.
- Takes account of projected shifts in Irish demographic structure, using CSO/ESRI data on same

2.1.4 Difficulties with access and use of refusals rate as a measure of demand

Refusal rates as a measure of demand is not put forward as a core metric and we fully appreciate its limitations. However, we believe it was extremely important to get a sense of the number of patients and operations cancelled because beds were not available - this is a significant benchmark.

The figure of 278 refusals in a single month certainly highlights the need to examine this dimension in a sustained way in the future. Again, this feature of day-to-day experience is not routinely measured so we had no baseline to test against. The reality of the situation was further reinforced as we visited all 52 units nationally in our site survey of each critical care facility. In our interviews and meetings with professionals we heard and saw first-hand evidence that refusals pose a major problem.

Furthermore, we sense-checked results with hospitals and found that not only were refusals happening on the scale indicated, but the scale could possibly be greater, as medical/other staff did not look for beds but got patients 'specialed' at ward level, in order to give the level of care that was required. It should also be noted that our audit did not factor in any query in relation to critical care-qualified patients 'specialed' at ward level. Neither did our demand projections.

The net impact of the additional beds required to meet demand arising from the refusals was in the order of 70 beds to meet projected demand in 2009 while functioning under an 80% occupancy rate. While there is always room for a margin of error in audit and projection exercises, we do not believe that this requirement can be simply factored out.

2.1.5 Inappropriate use of existing capacity

It is apparent from our review that there is currently a degree of inappropriate use of critical care capacity. We acknowledge this and it clearly needs to be addressed in the context of the proposed re-shaping of the services.

However, in calculating the required increase in beds Level 1/0⁴ activity was removed. This is crucial – we have assessed capacity requirement based on an analysis of patient-type as currently in the system.

Our review does identify that “several units with a high number of Level 1/0 admissions also had a high refusal rate.” As part of the quality assurance process for June '08 activity audit, Prospectus identified units where irregular trends had been recorded to verify accuracy. This involved re-checking these data with the specific units and/or hospitals involved. However, seasonal factors and the once-off nature of

⁴ Level 1/0 is defined as no organ monitoring/support or gastrointestinal support only

the audit lead us to recommend the importance of ongoing rigorous monitoring on the nature of activity in critical care facilities.

While we can characterise Level 1/0 activity as ‘inappropriate’ it has also to be recognised that, pending radical reconfiguration of the existing general acute hospital capacity and work practices in Ireland, it is likely we will continue to have a small ongoing proportion of Level 1/0 care delivered in critical care units. This is due to the fact that there is overcrowding and lack of beds to provide Level 1/0 care (ward beds). As a consequence, a number of Level 1/0-type services (epidural care, pain relief type, cardiac monitoring, stepdown) may continue to be delivered within the critical care environment.

2.2. Outline of Methods and Definitions

2.2.1 Objective of analysis

The objective of the analysis was to advise on the appropriate number and configuration of critical care beds, within each of the four HSE areas to 2020, by projecting bed-days by specialty and levels of care.

2.2.2 Specialty

Results are presented by reason for admission and not specialty of unit. This approach acknowledges that not all specialist critical care is currently delivered within a specialist unit. Reasons for admission were categorised into the following specialties:

- General
- Neurosciences
- Cardiothoracic
- Liver
- Burns

For all admissions with reason for admission specialties other than General, additional data (organ support etc) were also reviewed to determine whether the admission required critical care in a specialist unit.

2.2.3 Levels of care

As defined in the Chapter 1 Introduction, Levels of care have been defined based on daily recording of organ monitoring/support, based on the definitions of the Critical Care Minimum Data Set (CCMDS; UK Department of Health).

- Level 3 was defined as advanced respiratory support or monitoring/ support of two or more organ systems (excluding gastrointestinal support and the combination of basic respiratory support and basic cardiovascular support).
- Level 2 was defined as monitoring/support of one organ system (excluding gastrointestinal support), or the combination of basic respiratory support and basic cardiovascular support.
- Level 1/0 was defined as no organ monitoring/support or gastrointestinal support only.

For admissions with one or more days of Level 3 care and one or more days of Level 1/0 care, but no Level 2 care (using the above organ support definitions), one day of Level 1/0 care was upgraded to Level 2 reflecting the Level 2 definition of "stepping down from higher levels of care".

2.2.4 Region

Projections have been broken down into the four HSE areas – HSE Dublin Mid-Leinster, HSE Dublin North-East, HSE South, and HSE West.

The regional breakdown has only been provided for general admissions as region has been based on the location of the hospital and not the origin of the patient. Results for specialties would therefore be skewed toward the locations of the few specialist units and would be representative of current provision rather than anticipated demand.

2.2.5 Outline of projection methods

Results are presented in a detailed table in Appendix L as the projected demand for critical care bed-days (at Level 2 and Level 3) by reason for admission and specialty of critical care required in each calendar year from 2008 to 2020.

Projected demand was calculated in the following steps:

1. Bed-days of care delivered in June calculated and broken down as Level 3, Level 2 and Level 1/0
2. Bed-days of unmet need for admitted patients in June estimated
3. Bed-days of care delivered and unmet need for admitted patients extrapolated to totals for 2008 using weights estimated from the Case Mix Programme Database
4. Bed-days of Level 2 and Level 3 care in 2008 inflated to allow for unmet need from patients not admitted to critical care
5. Projected demand calculated as bed-days of Level 2 and Level 3 care plus bed-days of unmet need for admitted patients and unmet need for patients not admitted to critical care
6. 2008 figures projected to 2020 based on population projections from the Economic & Social Research Institute

Each step is described in detail below, with the results integrated alongside. In describing the methodology below, reference is also made to the spreadsheet in L which presents the breakdown of the future bed projections.

2.3 Detailed Description of Methodology and Results of Data Analysis

2.3.1 Bed-days of care delivered in June 2008

2.3.1.1 Total bed-days of care (June 2008)

The total number of bed-days of care for each patient was calculated as follows:

1. Length of stay in hours/24, if recorded
2. If no length of stay was recorded, it was estimated from the number of calendar days based on the average values for admissions with both length of stay and calendar days recorded (see Figure 1 below):
 - 1 calendar day = 10/24
 - 2 calendar days = 22/24
 - > 2 calendar days = calendar days – 32/24
3. If no length of stay and no calendar days were recorded, it was imputed as overall mean by surgical status and unit type (see below)

Admissions still in the unit at 2/7/2008, were subsequently followed up for outstanding length of stay data. For admissions still in the unit at 2/7/2008 for whom follow-up data were not available, the remaining length of stay was imputed as the mean length of stay by surgical status and unit type (see below).

Estimating mean length of stay by surgical status and unit type

The length of stay by surgical status and unit type was estimated from exponential regression to take account of censored data (i.e. admissions still in the unit). Estimated mean lengths of stay in hours were:

- General ICU or ICU/HDU: Elective surgery (L) 61; Emergency surgery (M) 122; Nonsurgical (N) 189
- General HDU: L 43; M 49; N 120
- Cardiothoracic ICU: L 60; N 80
- Cardiothoracic HDU: L 48; N 67
- Neurosurgical ICU: L 106; M 367; N 352
- Liver HDU: L 69; M 28; N 64
- Burns ICU: N 189

Results

Of 1795 admissions in the database, 1323 (73.7%) had complete data on length of stay. At 2/7/2008, 324 admissions (18.1%) were still in the unit. Of these, 134 (41.4%) were subsequently followed up for accurate length of stay data and the remaining 190 (68.6%) had their additional length of stay estimated by surgical status and unit type. Of the remaining 148 admissions, 147 (8.2%) had the number of calendar days recorded, from which the length of stay was estimated, and one admission (0.06%) had no calendar days recorded, and their length of stay was imputed according to surgical status and unit type.

The total bed-days for each category of reason for admission are provided in the accompanying spreadsheet in Appendix L in columns B-F, broken down into the numbers attributable to complete lengths of stay (including subsequent follow-up of those still in the unit at 2/7/2008) (column B), estimated from bed-days (C), imputed (D), additional bed-days estimated for those still in the unit at 2/7/2008 (E), and the overall total (F).

Assumptions

- **Length of stay can be accurately estimated from the number of calendar days in the unit** (147/1795 admissions affected)

Analysis of the patients with complete data indicated this assumption was good (See Figure 1 below).

- **Missing length of stay imputed by the mean for admissions with the same surgical status admitted to the same type of unit** (1/1795 admissions affected)

As only one admission was affected by this assumption, the overall effect on the output is minimal.

- **Mean length of stay in censored data can be estimated using exponential regression** (191/1795 admissions affected)

Using exponential regression will result in a more accurate estimate of mean length of stay than using those with complete stays only. As length of stay has a very heavy right skew, the estimate from exponential regression (although greater than that using complete cases only) is still likely to underestimate the true value and therefore to be conservative. Using the Case Mix Programme data for 7,250 patients admitted in June 2008: the true mean length of stay was 4.7 days; the mean length of stay on observed data from June only was 3.5 days; and the estimated mean length of stay based on the exponential assumption was 4.1 days.

2.3.1.2 Bed-days by level of care (June 2008)

Within each specialty, bed-days of care delivered were broken down into:

- Bed-days at Level 3
- Bed-days at Level 2
- Bed-days of Level 1/0 – days receiving Level 1/0 care (as defined above) or “Ready for discharge” (excluding the final day for admissions leaving at Level 2 or Level 3); and days in excess of two calendar days for paediatric admissions (age<16)

The proportion of the total bed-days of care allocated to each category for each admission was based on the proportion of calendar days at each level. For example, a patient staying three calendar days with two at Level 3 and one at Level 2 and a length of stay of 60 hours would be allocated 40 hours at Level 3 and 20 hours at Level 2.

Results

The breakdown of the total bed-days into Level 3, Level 2 and Level 1/0 for each category of reason for admission are reported in columns G-I of the accompanying spreadsheet in Appendix L.

Assumptions

- **Bed-days can be allocated to levels of care in proportion to calendar days**

As the level of care on each calendar day is the highest level on that day and we do not know the exact time that the patient may have transitioned from one level to another, this approach may lead to a slight overestimate of bed-days at Level 3 relative to lower levels. Any affect of this is likely to be small.

2.3.2 Bed-days of unmet need for admitted patients

Unmet need for admitted patients was identified at the start of the critical care stay by the recording of a delay in the admission, or by management of the patient in recovery prior to admission. Unmet need at the end of the critical care stay was identified by the recording of an early discharge or by the patient receiving Level 3 care on their final calendar day (and not being transferred to another critical care unit). Bed-days of unmet need were calculated as:

- Additional bed-days required to prevent delay prior to admission – defined as hours of delay, if recorded, or mean delay if delay recorded but not duration and for patients managed in recovery prior to admission
- Additional bed-days required to prevent early discharge – estimated as one additional bed-day for patients discharged early and receiving Level 3 care on their final calendar day or not recorded as discharged early but receiving Level 3 care on their final calendar day and not transferred to another critical care unit, and 0.5 additional bed-days for patients discharged early and receiving Level 2 care on their final calendar day

Results

Of 1795 admissions in the database, 138 (7.7%) were reported as having a delay prior to admission and a further 9 (0.5%) were managed in recovery prior to admission to the critical care unit. Of the 138 delayed admissions, 129 (93.5%) had a duration of delay recorded. The mean (standard deviation) delay was 5.7 (8.9) hours, median (interquartile range) was 3 (1.5 to 6) hours, and the range was 0.5 to 72 hours. For the 9 admissions with no duration of delay recorded and the 9 admissions managed in recovery, the mean delay of 5.7 hours was used.

Of 1795 admissions in the database, 33 (1.8%) were reported as discharged early and received Level 3 care on their final calendar day, 36 (2.0%) were reported as discharged early and received Level 2 care on their final calendar day, and 132 (7.4%) were not reported as discharged early but received Level 3 care on their final calendar day and were not transferred to another critical care unit.

The breakdown of the bed-days of unmet need for admitted patients into additional bed-days required to prevent delay prior to admission and additional bed-days required to prevent early discharge for each category of reason for admission are reported in columns J and K in the spreadsheet in Appendix L.

Assumptions

- **Admissions with a delay prior to admission to the critical care unit would have benefitted from an increased duration of critical care equal to this delay (129/1795 admissions affected)**

The true impact of any specific delayed admission is impossible to assess; this assumption was considered reasonable. Applying this assumption contributed an additional 30.9 bed-days to June 2008, extrapolated to 386 bed-days for the year.

- **Admissions with no duration of delay recorded were assumed to have the mean delay of ~6 hours** (9/1795 admissions affected)

This was the only reasonable assumption to make in the absence of data on the actual duration of delay. Applying this assumption contributed an additional 2.25 bed-days to June 2008, extrapolated to 27 bed-days for the year.

- **Admissions managed in recovery due to a lack of critical care facilities would have benefitted from an increased duration of critical care of 6 hours** (9/1795 admissions affected)

The value of 6 hours was estimated from those with delayed admission that were not managed in recovery. In practice the duration spent in recovery due to a lack of beds is likely to be greater than that of a delayed admission that is not managed in recovery, so this assumption is conservative. Applying this assumption contributed an additional 2.25 bed-days to June 2008, extrapolated to 27 bed-days for the year.

- **Admissions discharged early and receiving Level 3 care on their final day would have benefitted from an additional 1 day of critical care** (33/1795 admissions affected)

It is impossible to say how much longer a patient discharged early would have remained in critical care if the bed was not required by another patient. The figures used for these assumptions were discussed among the expert group and considered reasonable. A modelling study from 20 UK critical care units estimated that mortality among patients discharged early would be considerably reduced if they remained in critical care for an additional 2 days⁵. Applying this assumption contributed an additional 33 bed-days to June 2008, extrapolated to 470 bed-days for the year.

- **Admissions not recorded as discharged early but receiving Level 3 care on their final day would have benefitted from an additional 1 day of (step down Level 2) critical care** (132/1795 admissions affected)

This assumption was based on the principle that, ideally, patients receiving Level 3 care should receive some step-down care at Level 2 before being discharged to the ward. Applying this assumption contributed an additional 132 bed-days to June 2008, extrapolated to 1,768 bed-days for the year.

- **Admissions discharged early and receiving Level 2 care on their final day would have benefitted from an additional half day of critical care** (36/1795 admissions affected)

As above, it is impossible to say how much longer these patients would have remained in critical care if the bed was not required by another patient. As these patients were receiving Level 2 care, we assumed a lower additional requirement for critical care than for those discharged early while receiving Level 3 care. Applying this assumption contributed an additional 18 bed-days to June 2008, extrapolated to 246 bed-days for the year.

2.3.3 Extrapolation to full 2008 data

Each admission in June was allocated a weight based on the inverse of the predicted probability of admission in June conditional on the observed data. These weights were estimated from the Case Mix Programme Database using a logistic regression of admission in June on age (restricted cubic spline

⁵ Daly K, Beale R, Chang RWS. Reduction in mortality after inappropriate early discharge from intensive care unit: logistic regression triage model. *BMJ* 2001; 322:1274-6.

with 4 degrees of freedom), gender, surgical status, and early or delayed discharge, using data from 70,546 admissions to 133 units in 2007 (see Figure 2 below). As a sensitivity analysis, weighting was repeated based on data from 1999 (prior to the significant injection of money into adult critical care in England).

Weights for admissions to Letterkenny ICU and HDU were inflated by a factor of 30/7 to adjust for having only one week of representative data due to closure of the ICU and nonstandard use of the HDU during June 2008.

The total bed-days of care for 2008 were estimated by multiplying the observed bed-days for each admission by their weight and summing. Data were then collapsed over age-group (0–14, 15–49, 50–64, 65–74, 75–84, 85+), gender, specialty of admission, and admission postelective surgery or not. Bed-days for admissions with missing age and/or gender (n=59) divided evenly over all possible categories (excluding ages 0-14) and weighted at 366/30.

Results

The extrapolation to full 2008 data is reported in columns M-P of the accompanying spreadsheet in Appendix L, broken down by level of care and unmet need for admitted patients.

The sensitivity analysis, using pre-1999 data from the Case Mix Programme Database, is reported in columns Q-T in the spreadsheet in Appendix L. Results from the sensitivity analysis were extremely similar to the primary results, and these were not taken any further.

Assumptions

- **The distribution of critical care admissions throughout the year is similar in Ireland to that in England, Wales and Northern Ireland**

This assumption is unverifiable in the absence of more complete data from Ireland covering an entire year; however, it would be reasonable to assume that the variation in number and case mix of admissions and the pressures experienced by critical care units would be similar between Ireland and the UK. Due to significant increases in bed numbers in England around the year 2000, the process was repeated using data from 1999. The total extrapolated bed-days from the sensitivity analysis differed from the primary analysis (based on 2007 data) by only 0.03%, indicating that the choice of year did not significantly affect the distribution of admissions throughout the year.

- **Mean length of stay is approximately constant throughout the year**

Basing the weights on numbers of admissions and using these to extrapolate bed-days makes the implicit assumption that the mean length of stay (by age, gender, surgical status and early or delayed discharge) remains constant throughout the year. Analysis of the Case Mix Programme data for 2007 indicated that this assumption was reasonable (see Figure 3 below).

- **A single week of data from Letterkenny was representative of the full year (18/1975 admissions affected)**

This assumption contributed an additional 1710 Level 3 bed-days and 260 Level 2 bed-days to the extrapolated figures for 2008, relative to extrapolating from the 1 week of data as if it represented the full month's admissions. As it was unlikely that Letterkenny ICU would remain closed for three quarters of the year, this approach to analysis was considered to give more

accurate results; however, due to the very short period of data from Letterkenny the extrapolations will be imprecise.

- **Bed-days for admissions with missing age/gender were divided evenly across age/gender categories and weighted at 366/30** (59/1795 admissions affected)

The observed distribution across the age-groups was (1%, 23%, 27%, 24%, 20%, 5%). Allocating those with missing age (n=57) in the distribution (0%, 20%, 20%, 20%, 20%, 20%) will have slightly over-estimated the numbers in the oldest age-group (85+). Any ultimate effect of this will have been small. The observed distribution of gender was 58% male, 42% female. Allocating those with missing gender (n=10) in the distribution (50%, 50%) will have very slightly overestimated the number of female admissions. The applied weighting of 366/30 is equivalent to admissions being equally distributed throughout the year, and is therefore conservative as there are known (in the UK) to be fewer admissions in summer than winter.

2.3.4 Inflation for unmet need in patients not admitted to critical care

The unmet need from patients not admitted to a critical care unit during 2008 was estimated as follows.

For general units:

- All refused/cancelled admissions during June (except inappropriate referrals) were inflated to an annual number of refusals using the average weight for admissions discharged early or delayed to reflect seasonal variation related to bed pressure.

For specialty units:

- Cancelled admissions during June due to cancellation of surgery only (other refusals were assumed to be subsequently referred to a general unit) were inflated to an annual number of refusals using the average weight for admissions discharged early or delayed.

Results

There were 278 refused admissions to general units in June 2008. These were inflated by a factor of 15.44 (the average weight for admissions discharged early or delayed) to an estimated annual number of refusals of 4292. To reflect these refused admissions, the estimated numbers of Level 3 and Level 2 bed-days were inflated by 27.9%, based on the extrapolated total number of admissions of 15,395.

There was 1 refused admission to a neurosciences unit and there were 2 refused admissions to cardiothoracic units due to cancellation of surgery. These were inflated by factors of 15.01 and 13.61 to give estimated annual numbers of refused admissions of 15 and 27, respectively. Consequently estimated numbers of Level 3 and Level 2 bed-days for neurosciences and cardiothoracic admissions were inflated by 0.72% and 0.63%, based on extrapolated total numbers of admissions of 2,077 and 4,334, respectively. There were no refused admissions to liver or burns units.

The estimated numbers of Level 3 and Level 2 bed-days due to unmet need in patients not admitted to critical care are reported in columns U and V, Appendix L.

Assumptions

- **All refused admissions other than those categorised as “inappropriate referrals” would have benefitted from critical care**

The category of inappropriate referrals was included so that only those referred patients requiring critical care would be included in these figures.

- **Refused admissions to general units were only refused by a single unit and were not subsequently admitted to a different unit**

This assumption cannot be verified and may not be true. Consequently, all subsequent stages of the projections have been performed with and without the inflation due to unmet need in patients not admitted to critical care. This assumption was not applied to specialist units, as it was presumed that any patient refused admission to the specialist unit would, at the least, be referred to the general unit in the same hospital.

- **All patients that would have benefitted from critical care will have been referred to a critical care unit**

It is possible that some patients will not have been referred to critical care, as hospital staff may be aware that they were unlikely to be admitted.

- **Seasonal variation in refused admission would be similar to seasonal variation in other factors related to bed-pressure**

Refused admissions are not recorded in the Case Mix Programme, so the numbers of refused admissions were extrapolated using the weight associated with early discharge. As both early discharge from the unit and refused admission to the unit reflect pressure on beds, this assumption was considered to be more accurate than assuming that refused admissions are evenly distributed throughout the year.

2.3.5 Projected demand

Projected demand for 2008 was estimated as the number of Level 2 and Level 3 bed-days delivered plus the bed-days of unmet need for both admitted and non-admitted patients. Bed-days of unmet need were split between Level 2 and Level 3 bed-days in proportion to the delivered care.

Results

The estimated total demand in 2008 in terms of Level 3 and Level 2 bed-days are reported in columns W and X of the spreadsheet in Appendix L.

Assumptions

- **Delivered care at Level 1/0 could be provided outside a critical care area and was not included in the projected demand**

Patients receiving only Level 1/0 care had no organs support recorded, and so this care could potentially be delivered outside a critical care unit. However, it should be noted that the proportion of delivered care at Level 1/0 identified in the Irish audit was much higher than one would expect relative to that in England, Wales and Northern Ireland (24.3% for Ireland versus 4% for June 2008 in the Case Mix Programme Database). This may suggest some under-reporting of organ support data. Including the delivered Level 1/0 care as genuine critical care demand would have resulted in an additional 1,854 bed-days in June, extrapolated to 24,625 bed-days for the year.

- **Unmet need would be distributed between Level 3 and Level 2 in proportion to the delivered care**

The majority of unmet estimated unmet need was from refused admissions; it was considered reasonable to assume that the critical care requirements of a refused admission are similar to those of an admitted patient. Taking the most extreme alternative assumption (that all unmet need was at Level 2) would result in an 18% reduction in the requirement for Level 3 beds offset by a 47% increase in the requirement for Level 2 beds.

2.3.6 Projection to 2020

Population projections for the years 2006, 2011, 2016 and 2021 by age-group, gender and HSE area were obtained from the Economic & Social Research Institute. Population projections for 2008 and 2020 were estimated by linear interpolation of the projections for 2006/2011 and 2016/2021, respectively.

Within each category defined by age-group and gender, the projected number of bed-days in year Y was estimated as the number of bed-days in 2008 divided by the population in 2008 and multiplied by the population in year Y.

Results

The projected demand in terms of Level 3 and Level 2 bed-days for the years 2011, 2016 and 2020 are reported in columns Y-AD in the spreadsheet in Appendix L (See also Figure 12 in Chapter 8 Recommendations for summary bed projections.)

Assumptions

- **Projections of critical care bed-days to 2020 assume a constant rate of use of critical care in each specialty by age-group and gender**

No other assumption can reasonably be made without knowledge of future changes in underlying health, service delivery and available treatments. Some potential changes (for example, reductions in smoking) are likely to decrease critical care requirements over this time horizon, some (for example, increasing obesity) are likely to increase critical care requirements, whereas others (for example, new surgical procedures) could either increase (for example, increased use of endovascular techniques) or decrease requirements (for example, by providing surgery to patients that would previously have been considered too high risk). It was considered impossible to quantify all these potential changes in any meaningful manner.

2.3.7 Translation of bed-days to total bed requirements

Bed-days were translated into total bed requirements based on the results for specialty of critical care required, and assuming average bed occupancies of 80% and 90%. Using an average occupancy of 80% (90%), one critical care bed is required for every 292 (328.5) bed-days of critical care (with all partial beds rounded up).

Results

The projected requirement for Level 3 and Level 2 beds at average occupancies of 80% and 90% for the years 2008, 2011, 2016 and 2020 are reported in columns AE-AT in Appendix L.

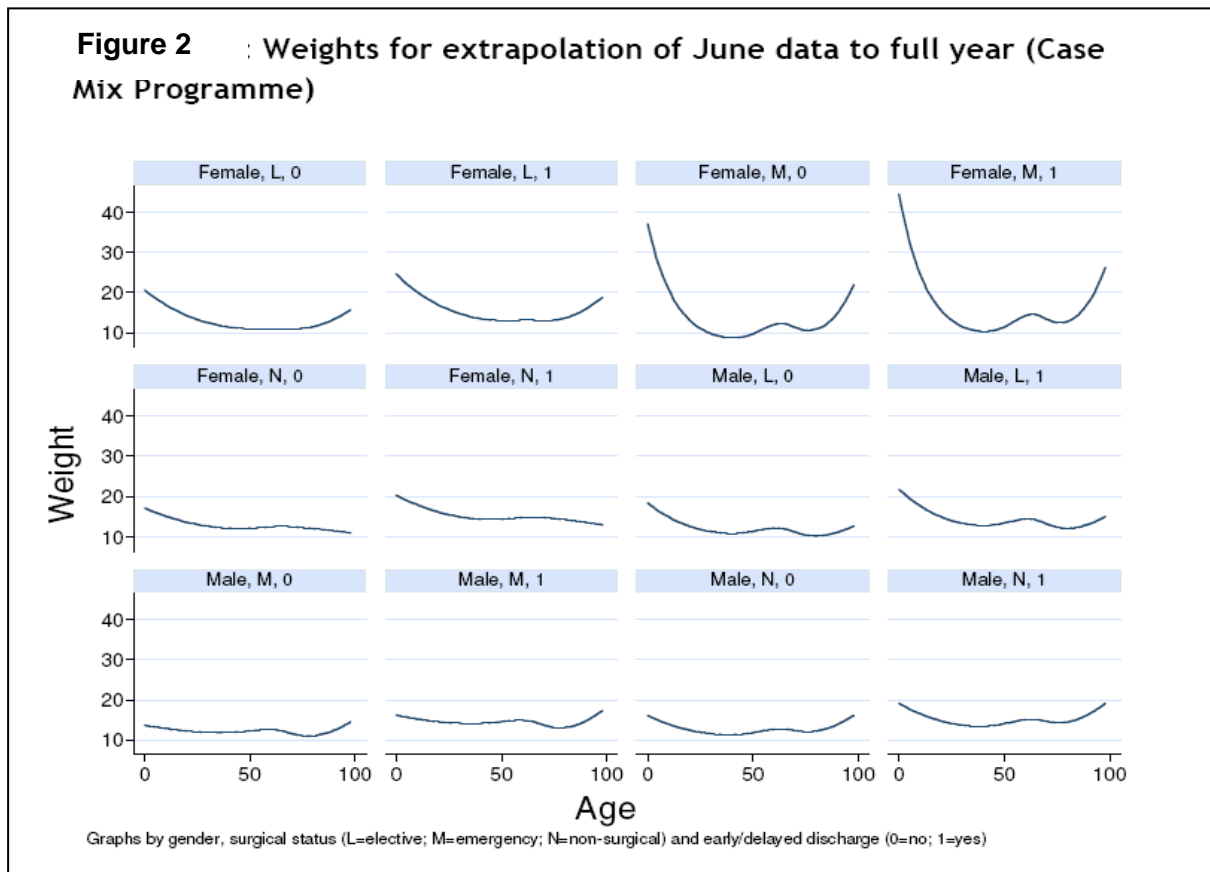
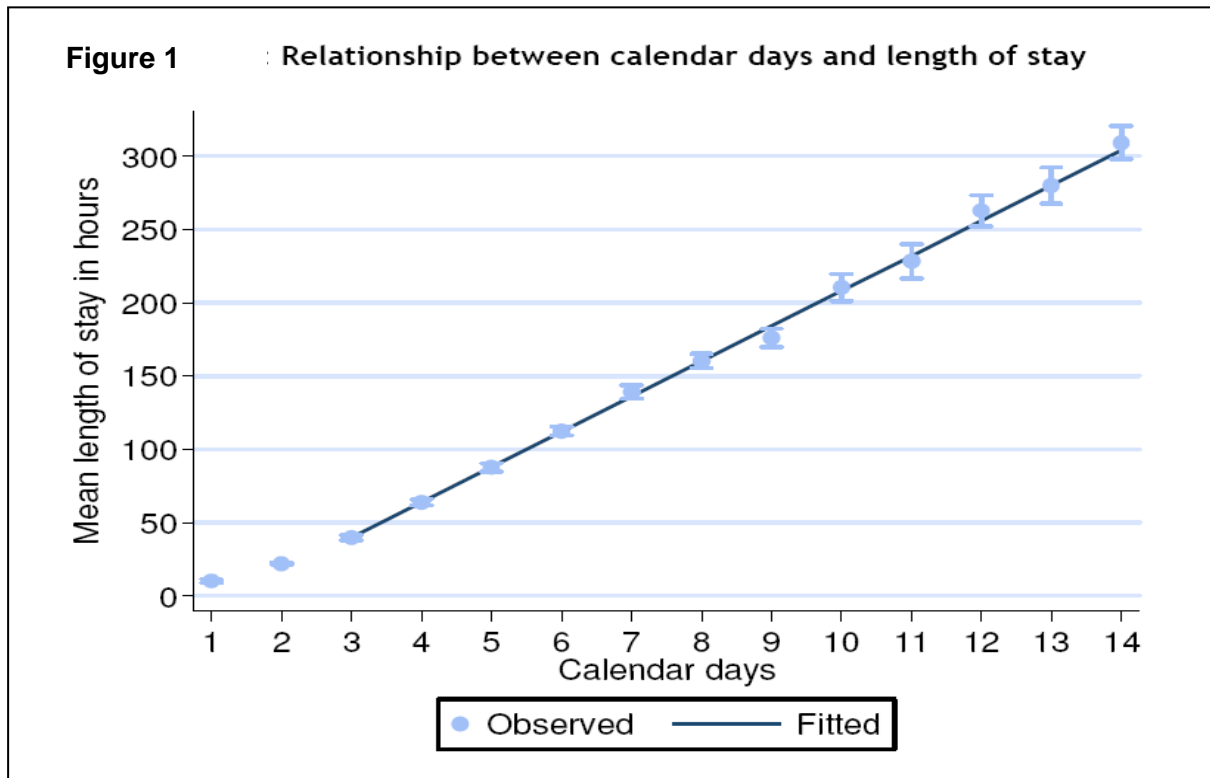
Assumptions

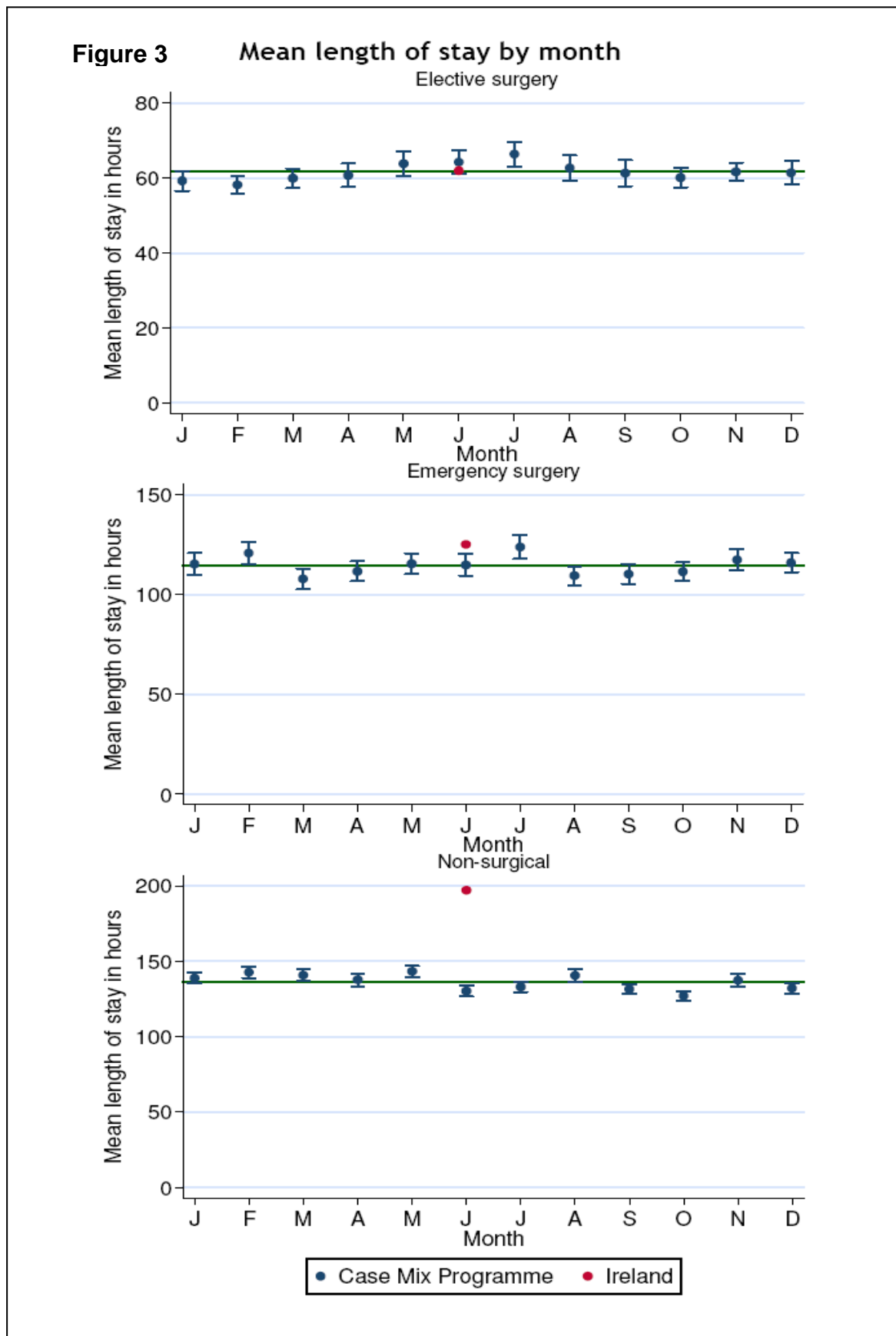
- **Critical care units should operate at an average bed occupancy of 80% (90%)**

Guidelines from the UK Intensive Care Society recommend that general critical care units should operate at an average bed occupancy of 60–70%, although higher occupancies may be appropriate in larger units, and that units should be able to accept 95% of appropriate emergency referrals. Assuming the presentation of new emergency referrals follow a random (Poisson) process with a constant rate, to be able to accept 95% of referrals while maintaining an average 80% occupancy would require that each critical care unit had at least 52 beds. However, having sufficient capacity to maintain occupancy at 80% would be a considerable improvement on the current situation.

2.3.8 Analyses excluding inflation due to unmet need in patients not admitted to critical care

The projections and translation into bed requirements from Sections 2.3.5, 2.3.6 and 2.3.7 were repeated excluding the inflation due to unmet need in patients not admitted to critical care. The results are presented in columns AU-BR in Appendix L.





CHAPTER 3
Context

3. Context

3.1 External Environmental Drivers

3.2 The Development of Critical Care

3.1 External Environmental Drivers

There are many factors in today's health service environment that impact both directly and indirectly on adult critical care. These are described under eight headings below: *Demographics; Economic environment; Health services policy; Quality and safety; Manpower planning; Education and research; Public attitudes and expectations; and Technological advances.*

3.1.1 Demographics

Ireland has a **growing, ageing population**. The 2006 census showed 8.1% population growth since the last census in 2002. The 2006 Census also showed an increase in older persons - the number of persons 65 and over has increased by 13% in the last 10 years reaching 467,000 in 2006. A 2005 CSO report predicts that the number of older persons (65 years and over) will increase every year, reaching 741,000 by 2021. It also predicts that the number of very old persons (80 years and over) will increase by two-thirds⁴. With the fact that the average age of critical care patients is currently 65, an ageing population will have a significant impact on the activity levels and the capacity required.

Ireland's **population distribution** is also an important factor in planning healthcare services. The Republic of Ireland has a relatively low population density, with an average of 60 people per square kilometre compared for example to the UK's 250 people per square kilometre. The 2006 Census showed that Ireland has 1.37 million people living in sparsely populated rural areas. This reality is important in planning the location and number of critical care units, balancing the need for an appropriate throughput and critical mass of cases with accessibility.

Finally, it is worth noting our **changing lifestyle** and how it impacts on health. Particularly relevant is the growing incidence of obesity and alcohol related illness which creates an increased risk of developing chronic health conditions such as cardiovascular disease. These conditions, in turn, are likely to lead to surgical complications and more challenging recovery pathways, and hence a greater demand for critical care.

3.1.2 Economic environment

Emphasis on resourcing and value for money is one of the biggest factors affecting all organisations across the public sector in Ireland today. Budgets are lean and with the economic downturn, resources are, for the most part, being reduced rather than increased. There is significant emphasis on HSE defined targets, with a subsequent linking of funding to performance. With a total budget of almost €15 billion indicated for 2009 (similar to that for 2008), HSE services are understandably the object of public scrutiny. The focus is on finding efficiencies and savings wherever possible.

Critical care is a resource intensive service, for example in the UK an intensive care bed costs approximately €2150 per day, compared to a ward bed which costs an average of €275 per day⁵. Therefore, in proposing a model for delivering critical care it is essential that appropriate accountability and performance management structures are in place.

3.1.3 Health services policy

A number of reviews and policy documents in recent years highlight specific developments and initiatives regarding the future organisation of health services and, in particular, acute services.

A suite of three reports, one on health service structures (**'Prospectus report'**), one on health financial systems and controls (**'Brennan report'**) and one on hospital manpower planning and organisation (**'Hanly report'**) led to the Government decision to establish a consolidated health service structure in 2003. One of the key features of this new system was to be the ability to organise services on a consistent and standards-driven basis across the entire health service map and to reduce or remove the possibility of patients falling out of care because of rigidities and boundaries across the system.

In relation to acute hospital services in particular, this vision of fully integrated planning and delivery of services for a quality result has been set out specifically in relation to hospital services in the North-East. Work is ongoing in relation to similar reconfigurations of acute hospital services in the Southern and Mid-Western regions. In all cases this re-design work is based on the belief that the existing configuration of hospitals at local and regional level neither serves patients well nor is sustainable. In response, it is essential to reshape local and regional services in a new relationship centred on the needs of patients delivered through a series of clinical networks. In addition, there is to be a new focus on giving primary and continuing care providers a central role.

The HSE's **Transformation Programme 2007-2010** places an emphasis on moving care closer to the patient where possible, on integrating services for a smoother patient journey, and ensuring effectively configured acute hospital services, that can provide optimal care and cost effective results. These principles must underpin all developments and initiatives. Some elements of the service transformation programmes are of particular relevance to the future of critical care: for example, the aim to develop integrated services across all stages of the care journey, the appropriate configuration of hospital services, implementing standards based performance measurement and developing a unified national ICT infrastructure and support services.

The **HSE's 2008 Service Plan** supports the implementation of the Transformation Programme, and outlines three key priorities:

- To direct the provision of care away from acute settings and towards services in the community where appropriate
- For those who require care in acute settings, to provide services in line with best international standards
- To deliver services within the allocation and within the employment ceiling

The **Strategy for Cancer Control (2006)** is currently being implemented. It aims to put in place a system that will reduce our cancer incidence, morbidity and mortality relative to other EU countries by 2015. It prioritises a number of areas, including: health promotion and prevention activities, screening for early detection, providing equitable access to care, and providing cancer control services which ensure best outcomes in keeping with international standards. The reorganisation of cancer surgical services has been prioritised. To date, the implementation of the Strategy has been structured around the centralisation of services into four managed cancer control networks within which there are eight specialist cancer centres (Beaumont Hospital, Mater Misericordiae Hospital, St James's Hospital, St Vincent's University Hospital, Cork University Hospital, Waterford Regional Hospital, Galway University Hospital (with linkages to Letterkenny) and Mid Western Regional Hospital Limerick). Although medical oncology services do not place significant demands on critical care services, the centres for major cancer surgery will, of course, have specific critical care needs.

The PA Consulting **Acute Hospital Bed Capacity Review (2007)** concludes that the incorrect placement of patients and inadequate care systems for managing patients result in inappropriately high usage of acute hospital beds. It makes recommendations around increasing community and home-based care, increasing access to diagnostics and assessment outside acute care, implementing protocol-based discharge planning and reviewing internal hospital processes to reduce patient delay. Although these recommendations are not specifically related to critical care, the more appropriate usage of acute beds should result in more capacity for timely discharges or step down from critical care units. PA Consulting's report also identified the requirement for a formal review of critical care capacity.

Development of **regional and local 'Centres of Excellence'** as set out in 'Improving Safety and Achieving Better Standards – An Action Plan for Health Services in the North East' (referred to above) will have a significant impact on the requirement for critical care services. The reconfiguration is focused on providing accessible and sustainable local and regional services, reducing current risks to patients and staff and providing high quality health services for the region. The model being implemented in the North East includes: a strengthened Emergency Care Network, including the deployment of an advanced paramedic workforce; the delivery of minor emergency, planned, diagnostic and other services in local hospitals and the regional hospital providing the full range of acute regional specialties for complex care and 24/7 emergency services. It is expected that this model of regional and local centres of excellence, with the underlying requirement of a catchment population of 300,000 to 500,000 for sustainability of the full range of acute services, may be mirrored in other areas of the country. This approach will impact on the future organisation of critical care services.

The ongoing **Co-location initiative** will result in the development of full service private hospitals co-located with 8 public adult hospitals around the country. With the requirement that services in the new private hospitals must mirror the public hospital service, it is envisaged that all of these private hospitals will include a critical care service. These and other private critical care services will be expected in due course to comply with the same defined standards as the public services and adhere to the expected implementation of hospital licensing.

A number of (non health-specific) Government initiatives and policies are also particularly relevant to this Review:

The **National Development Plan** 2007-2013 is the largest and most ambitious to date with €184bn planned spending over its 7 year timeframe. Within this, the Health Service Executive targets capital spend on primary care units and residential homes for the elderly and upgrading and developing new hospitals – this includes areas such as A&E, Infection Control and the new National Paediatric Hospital. Developments such as the investment in community services will impact on the way services are delivered in the future in the acute hospital setting. Within the worsening economic environment, it is important to recognise that the HSE Capital Programme has project proposals in place with a total value adding up to substantially more than the total funding available within the Capital Investment Framework. As a consequence political pressures will play a role in determining the speed of delivery of any given project, both at local and national levels.

Transport 21 (2006-2015) is a significant programme focusing on areas such as completing the inter-urban motorway network by 2020, improving the national roads network and developing further our regional airports. This infrastructure will be important for critical care on a number of levels, including the transport of critically ill patients and critical care staff, either to or between hospitals, and also the number and configuration of critical care units needed to provide an appropriate service nationally.

Finally, the **National Spatial Strategy** has been aligned with the National Development Plan so that investment is focused around achieving the growth of the gateway cities and towns. These towns therefore are likely to attract more investment and, indeed, larger populations. Again it would be important to factor this in when assessing the exact reconfiguration of critical care services.

3.1.4 Quality and safety

A new and vigorous focus on quality and safety is evident through many recent initiatives, including the establishment of the **Health Information and Quality Authority** (HIQA) and the growing number and frequency of quality related audits and reviews. HIQA drives quality, safety, accountability and the best use of resources in our health and social care services, whether delivered by public, voluntary or private bodies. HIQA's specific functions include: setting standards in health and social services, monitoring healthcare quality, social services inspectorate, health technology assessment and health information.

Quality and safety standards are now being dictated on a national level, and it will be necessary for critical care services to meet these standards and crucially, to localise quality standards and practices for the critical care environment. Audit systems must be put in place in order to monitor standards and evaluate patient outcomes so as to improve the quality of service delivered to our critical care patient population continuously.

Specifically, the **Report of the Commission on Patient Safety and Quality Assurance** (2008) highlights significant inadequacies in regulatory mechanisms for ensuring patient safety. The Commission makes a range of recommendations, all working towards embedding responsibility, accountability and safety as key priorities across the system. The implementation of the recommendations from the report will, most likely, introduce stronger and stricter hospital governance structures, clear accountability structures, clinical directorates, hospital licensing (including service-specific licences within the hospital e.g. for critical care), credentialing for health care professionals, and ensuring evidence-based service frameworks and national standards.

3.1.5 Manpower planning

Human resource and manpower issues are a growing consideration for all healthcare providers. The management of employment numbers within given ceilings is an ongoing reality for the HSE, leaving services short when staff take leave or resign. This is thought to be negatively impacting the quality of services, staff morale, ability to develop and expand services, and overall hospital capacity. Shortages in a number of specific staff types, such as allied health professionals and nurses are creating persistent difficulties. Currently there are approximately 43,000 nurses employed in the system, of which approximately 10,000 are from overseas, some of whom are leaving Ireland for better pay and lower cost of living. In addition, the Irish Nurses Organisation estimates that over the past 8 years approximately 12,000 Irish nurses have emigrated. Policy changes, such as the implementation of the European Working Time Directive, the reduced working week for nursing staff, and the revisions to the Consultant Common Contract will result in a challenge for all healthcare organisations, including critical care services, particularly in terms of the recruitment and retention of staff and provision of adequate cover.

Messages from the **Report of the National Task Force on Medical Staffing** (2003) are extremely important in considering the delivery of critical care. Recommendations focus on establishing a critical mass of patients for the safe provision of hospital services, health professionals working as part of a multidisciplinary team providing 24 hour care within an integrated network of hospitals and the requirement for clear lines of accountability and availability in the context of a 24 hour service. All of these factors are vital in providing safe and appropriate critical care, though the report's more specific recommendations around intensive care may need further examination, for example, the lack of reference to any 'high dependency' care and a lack of clarity around staffing levels.

Changes to the **Medical Consultant Contract** will have implications for the delivery of all acute services, including critical care services. The outcome of the contract negotiations, concluded during 2008, has resulted in four types of public consultant contracts being agreed. The four consultant contracts, as of July 2008, are:

Type A: Public practice only permitted

A consultant holding a Contract Type A is not permitted to engage in privately remunerated practice.

Type B: 80% public, 20% private practice on co-located hospital sites

A Consultant holding a Contract Type B may engage in private practice, only in hospitals or facilities operated by the employer, as part of activities that arise as part of the employment contract. This includes co-located private hospitals. The total volume of private practice cannot exceed 20% of the Consultant's clinical workload, in any of their clinical activities, including in-patient, day-patient and out-patient.

Type B: 80% public, 20% private on or off-site (only for consultants who previously held Category II contracts, and some Category I contracts).* This contract expires after the current post holder and eventually this contract will no longer exist. The volume of private practice may not exceed 20% of the Consultant's clinical workload.

Type C: Entitlement to treat private patients outside the public hospital campus

A Consultant holding a Contract Type C may engage in private practice in:

- Hospitals or facilities operated by the employer
- As part of such activities that arise as part of the employment contract, in co-located private hospitals on public hospital campuses
- In locations outside the public hospital campus, subject to completion of the 37 hour week
- The volume of private practice may not exceed 20% of the Consultant's clinical workload.

Consultants will also have the choice, of course, to work on a private only basis. This would be negotiated directly between the healthcare provider and the individual.

The new arrangements may have implications for critical care staffing. Currently, there are no consultant anaesthetists/intensivists holding private only contracts. This will therefore make the provision of critical care services in private stand alone hospitals difficult but could increase the throughput in public/co-location hospitals. In addition, the Type B contract, where consultant anaesthetists/intensivists would be working across sites (80%/20%), could lead to a reduction in the sessions available to the public hospital, which may lead to additional manpower requirements.

Over the past 10 years the nursing profession has developed significantly in response to service and professional change. A formal review of the role of the nurse by the **Commission on Nursing** in 1998 resulted in turn in the introduction of the clinical career pathway developed for nurses by the National Council.

There is an international shortage of **specialist nurses** in a number of areas including critical care. In recent years, to deal with this shortage, Ireland has recruited many nurses from the Philippines and

India, and continues to do so. This international recruitment drive has given rise to some problems with regard to the translation of qualifications. In many countries, post graduation qualifications in areas such as critical care may not exist. As a result, and despite many international nurses having years of experience in their own country, some Irish critical care units find it necessary to provide up-skilling and additional training. Furthermore, the reality that many overseas nurses may only spend a limited number of years in Ireland, before moving to work elsewhere, results in a loss of fully up-skilled staff and replacements requiring similar levels of training and up-skilling.

3.1.6 Education and Research

Medical education was the subject of two separate 2006 reports, by Fottrell and Buttimer. The report of the Working Group on Undergraduate Medical Education & Training, 'Medical Education in Ireland – A new direction'⁶ (otherwise known as the Fottrell Report) emphasises the importance of crossover between education and healthcare provision for medical education. It outlined the need to provide quality clinical training placements for undergraduate medical students, increase the number of undergraduate medical students significantly, ensure clinical settings have the capacity/infrastructure to deliver clinical training and to align clinical training curriculum objectives, student allocation and clinical capacity.

The report from the Postgraduate Medical Education & Training Group, 'Preparing Ireland's doctors to meet the health needs of the 21st century'⁷ (otherwise known as the Buttimer Report) recommends that universities/medical schools should, in coordination with post-graduate training bodies, have a central role in postgraduate medical education and training, in order to facilitate continuation from undergraduate to internship, through to postgraduate and CPD. The Buttimer report calls for more collaborative links between the universities, other third level institutions and the training bodies. This will underpin: clinical research; enhanced capacity to conduct high quality clinical research; appointments for consultants / clinical scientists with a major time commitment to research and protected time for research for other consultants; and strengthening of the research and academic elements in postgraduate training (to avoid the risk of losing some of Ireland's top graduates permanently to other countries).

Reform of medical education and training will impact on the method by which doctors are trained to work in critical care and indeed on how critical care programmes may be developed and implemented in the future.

Education and training for nurses has evolved considerably over the past ten years. In 1998, a review of nursing was carried out by the Commission on Nursing⁸. The findings of this review and the resulting recommendations have had profound implications on the development of the profession and on the role of the nurse in the health service. In particular, it resulted in the National Council's development of the clinical career pathway for nurses, leading to an increased number of nurse led services and the radical transformation of the provision of educational opportunities for nurses at both pre- and post-registration levels.

It should be acknowledged that prior to the 1998 report, a number of hospitals and regions had initiatives in place for developing specialists in nursing (e.g. the Mater Hospital ran a post-registration course in Critical Care as far back as 1970, and in 1996 the first nurse practicing at an advanced level was piloted in Accident and Emergency in St. James's Hospital). The formalising of the clinical career

pathway resulted in a widespread and better funded application of advanced and specialist nursing programmes.

It is also notable that more recently, nursing education has moved from the hospitals to being primarily university-based, which has led to nurses becoming more specialised at an earlier stage in their career. This may result in limited numbers of nurses wishing to specialise in critical care due to the limited exposure of student nurses to critical care during training.

Research in healthcare has been given increased policy impetus with the publication of a Forfás and Advisory Council for Science, Technology and Innovation paper on health research in 2006⁹. In addition, in 2007, the HSE published its own strategy for Medical Education, Training and Research¹⁰ and has begun to put in place structures for implementation.

Other initiatives include a trend towards the development of 'Academic Medical Centres', as seen by the establishment of the Dublin Academic Health Care (University College Dublin, Mater Misericordiae University Hospital, and St. Vincent's Healthcare Group), Trinity Academic Medical Centre (Trinity College Dublin, St James' Hospital, and the Adelaide and Meath, incorporating the National Children's Hospital) and the development of an academic medical centre structure by the Royal College of Surgeons in Ireland, Beaumont Hospital and Connolly Hospital Blanchardstown. The area of critical care is a core hospital service and how it links with, and facilitates education and research will be very important.

3.1.7 Public attitudes and expectations

Media and external reviews are highlighting failings of the healthcare system. As a result, patients and the wider public are demanding higher levels of service and increased transparency. Initiatives such as ratemyhospital.ie and the extension of the remit of the Ombudsman to include voluntary hospitals, are highlighting good and bad service throughout the system. It is important that patients and families remain at the centre of our health services and it has to be assumed that ever more sophisticated mechanisms for patient advocacy and interaction will be insisted upon by service-users, and built into our public system.

In particular, the publicity around a series of negative incidents brings attention to specific areas of care and to particular hospitals. Building on these incidents we have seen the understandable emergence of a number of national patient representative organisations seeking to sustain a focus on either general patient rights issues or else picking out particular services or themes on which to mobilise opinion.

3.1.8 Technological Advances

Today's healthcare organisations are faced with and are benefitting from many new technologies and advances in medical knowledge. The recent PA Consulting Acute Hospital Bed Capacity Review highlights some interesting trends in hospital services: the international trend for the decrease of acute hospital inpatient beds, with an 11% decrease in the countries of the Organisation for Economic Co-operation and Development (OECD) since 1995; the move towards elective admissions, with elective patients making up almost 61% of all patients in Ireland in 2005 and the reality that, internationally, systems are concentrating on treating patients as day cases where possible, with Ireland's day case rate at 12% below the OECD average.

Over recent years, advances in surgical specialisation and technology have enabled an increased amount of very complex surgery (e.g. cancer surgery), allowing for a greater variety and complexity of diseases to be treated. There has also been a shift in the traditional emphasis on hospital based advanced life support interventions by doctors, paramedics and nurses. There is an increasing focus on how, through evolving technology, the average person can save lives. The impact of this may be two-fold: on the one hand avoiding the requirement for formal critical care or, alternatively, resulting in patients who may not have survived previously requiring critical care.

Advances in **Information Communications Technology** are also impacting greatly on how healthcare is delivered and how hospitals and health services are run. Advances in networking, electronic records, health systems software, wireless technology, automation and e-learning are just some of the areas which will influence all areas of healthcare.

Critical care, in particular, is a high-tech environment and must endeavour to take advantage of relevant technologies as they arise. These advances may include pharmaceutical, therapeutic and advances in medical equipment and devices. It is essential also that the introduction of new technology is supported with the appropriate staff and supporting resources.

3.2 The Development of Critical Care

Critical care is defined as: *Advanced and highly specialised care provided to medical or surgical patients whose conditions are life-threatening and require comprehensive care and constant monitoring. It is usually administered in specially equipped units of a health care facility*¹¹.

Critical care units were developed in the late 1950s in response to advancements in medicine and surgery. Mortality was greatly reduced by the use of life support techniques normally used in the operating department combined with constant attention from medical staff and the concentration of these patients in a specific area within the hospital. In taking over the control of organs by mechanical means increasingly complex interventions were possible. High dependency beds were also introduced (in part) to provide step-down between intensive care units and ward bed areas.

As surgery and medicine has evolved, critical care services have developed in response. Some specialties have developed critical care units for their own purpose; these include high demand areas, such as neuroscience, cardiothoracic and burns. For the most part, the development of critical care has been reactive rather than proactive.

Traditionally critical care services were delivered by anaesthetic staff who were responsible for the care of the patient during the intensive period of ventilation, but the patient formally remained under the care of their primary physician or surgeon. The modern specialty of intensive care has evolved and has become an increasingly complex subject. Specific training for those delivering intensive care has become the norm and the role of the 'intensivist' (who may come from an anaesthetic, surgical, or medical background) has developed. The use of specially trained intensive care staff offers many advantages: the handling of complicated critical care procedures becomes routine, critically ill patients can have continuous care from experienced medical staff and knowledge and understanding of complex equipment and technology can be concentrated.

To date, in Ireland, there have been a number of studies and reviews on critical care services. These reviews agree on three major issues: a lack of capacity, inadequate staffing resources and a lack of uniformity in how critical care services are delivered.

CHAPTER 4
Current Reality

4. Current Reality

- 4.1 The Current Organisation of Critical Care
- 4.2 Governance of Critical Care at Hospital Level
- 4.3 Work Practices
- 4.4 Staffing, Education and Training
- 4.5 Transport and Transfers
- 4.6 Audit and Accreditation
- 4.7 Physical Infrastructure and Facilities

4.1 The Current Organisation of Critical Care

4.1.1 Introduction

The Republic of Ireland (ROI) has **37 hospitals** that currently provide adult critical care services. The 52 critical care units within these hospitals provide a wide range of services to meet the demands of the hospitals in which they are situated, including supporting medical and surgical needs as well as the Accident and Emergency department. The type of critical care provided ranges from low acuity critical care for patients requiring basic monitoring to complex critical care with patients on multi-organ support.

Traditionally there are 3 main categories (ICU, HDU, CCU) and 4 specialty areas (Neurosciences, Cardiothoracic, Liver and Burns) for critical care bedstock:

- **Intensive care (ICU):** These beds are designated to provide the highest level of critical care to patients in most need, with full support for the level of care provided. The level of care varies from hospital to hospital and unit to unit. Across the country there are three specialist ICU services: Cardiothoracic, Neurosciences and Burns.
- **High dependency care (HDU)** is often seen as 'step-down' for patients following an intensive care episode or for patients who require a high level of observation including complex post-operative care. It may also be a 'step-up' for ward patients who need a higher level of care but do not need intensive care. In addition, a very small number of post-anaesthesia care units (PACU) exist to serve the patient requiring post-operative critical care. Across the country there are two specialist HDU services: liver and cardiothoracic.
- **Coronary care (CCU).** These beds are designated as part of the cardiac services within hospitals and facilitate diagnosis, treatment and recovery from illnesses associated with the cardiac specialties. A major differentiating factor is that CCU beds do not facilitate advanced respiratory support (e.g. ventilation). CCU did not form part of this review process. However, the overlap of CCU beds with ICU and HDU beds in combined units was considered.

It should also be noted that approximately 35 critical care beds are currently provided in private hospitals. These were not within the remit of the Review and are not included in the statistics quoted.

Figure 4: Hospitals with critical care services by HSE area



HSE West ●	HSE South ●	HSE Dublin Mid Leinster ●	HSE Dublin North East ●
<ul style="list-style-type: none"> ▪ Letterkenny General Hospital ▪ Sligo General Hospital ▪ Mayo General Hospital ▪ Roscommon General Hospital ▪ Portiuncula Hospital ▪ University Hospital Galway ▪ Merlin Park University Hospital Galway ▪ Mid Western Regional Hospital Nenagh ▪ Mid Western Regional Hospital Ennis ▪ Mid Western Regional Hospital Limerick ▪ St John's Hospital Limerick 	<ul style="list-style-type: none"> ▪ Cork University Hospital ▪ Mercy University Hospital Cork ▪ South Infirmary-Victoria University Hospital Cork ▪ Mallow General Hospital ▪ Kerry General Hospital ▪ Bantry General Hospital ▪ Wexford General Hospital ▪ Waterford General Hospital ▪ St Luke's General Hospital Kilkenny ▪ South Tipperary General Hospital Clonmel 	<ul style="list-style-type: none"> ▪ Adelaide & Meath Hospital, incorporating the National Children's Hospital, Tallaght ▪ Naas General Hospital ▪ Midland Regional Hospital Mullingar ▪ Midland Regional Hospital Tullamore ▪ Midland Regional Hospital Portlaoise ▪ St Vincent's University Hospital Dublin ▪ St Colmcille's Hospital Loughlinstown ▪ St James's Hospital Dublin 	<ul style="list-style-type: none"> ▪ Louth County Hospital Dundalk ▪ Our Lady of Lourdes Hospital Drogheda ▪ Our Lady's Hospital Navan ▪ Monaghan General Hospital ▪ Cavan General Hospital ▪ Mater Misericordiae University Hospital Dublin ▪ Beaumont Hospital Dublin ▪ Connolly Hospital Blanchardstown

4.1.2 Number of critical care beds

There are currently 289 open and funded adult critical care beds situated across the Republic of Ireland (as confirmed with the HSE's Performance Monitoring Unit). Critical care beds are designated as either ICU or HDU, and include a mix of general critical care beds and dedicated specialty critical care beds. The beds are broken down by region in Figure 5 below.

Figure 5: Table showing current critical care bed numbers, by HSE area, specialty and type.

Current configuration of GENERAL CRITICAL CARE beds by HSE area and level		
HSE Area	Type	Number of beds
HSE West	ICU	40
	HDU	25
HSE South	ICU	40
	HDU	6
HSE Dublin Mid Leinster	ICU	46
	HDU	18
HSE Dublin North East	ICU	46
	HDU	19
<i>Total General Beds</i>	<i>ICU</i>	<i>172</i>
	<i>HDU</i>	<i>68</i>
	<i>All</i>	<i>240</i>
Current configuration of adult SPECIALTY CRITICAL CARE beds (nationally)		
Specialty Type	Type	Number of beds
Neurosciences	ICU	10
	HDU	0
Cardiothoracic	ICU	15
	HDU	18
Liver	ICU	0
	HDU	4
Burns	ICU	4
	HDU	0
<i>Total Specialty Beds</i>	<i>ICU</i>	<i>29</i>
	<i>HDU</i>	<i>20</i>
	<i>All</i>	<i>49</i>
Total Critical Care Beds	ICU	201
	HDU	88
	All	289

At the time of the review, 39 critical care beds were reported as not open. The reasons given were: Not staffed, 66%; lack of funding, 17%; under construction/not commissioned, 17%. These 39 beds are not included in the future bed requirement projections, and as such if opened would reduce the capacity problem to some degree, and the capital expense envisaged for implementation of the new model.

4.1.3 Configuration of critical care services

The organisation of critical care services varies across the country. There are single units which provide only one type of critical care, either ICU or HDU. There are combined units which provide a mixture of ICU and HDU care, and there are units which combine ICU and/or HDU care with CCU care.

The table below shows the bed numbers in different configurations of critical care units by HSE area. It is worth noting that the majority of combined units are seen in the smaller hospitals. The table includes ICU and HDU beds only. Therefore, within a combined ICU/CCU for example, only the number of beds designated as ICU have been included.

Figure 6: Current Configuration of open adult critical care (ICU and HDU) beds by HSE area and unit type

Unit Type	HSE West	HSE South	HSE Dublin Mid Leinster	HSE Dublin North East	Total
ICU Only	33	29	49	42	153
HDU Only	16	0	24	17	57
ICU/HDU	4	8	6	10	28
ICU/HDU/CCU	2	9	0	12	23
ICU/CCU	13	6	7	2	28
Total	68	52	86	83	289

The data presented were collected through two quantitative information gathering streams: a one month audit of activity data carried out in every critical care unit for the same 28 day period, and an overview questionnaire gathering information on the current status of each critical care unit in Ireland. The audit was the first time such a comprehensive exercise had been carried out in the Republic of Ireland, resulting in the most detailed and thorough critical care data collected to date.

For the purposes of recording current bedstock, hospitals were asked for their designated 'ICU' and 'HDU' beds, reflecting the terms most commonly used across the health service, including how the beds are designated (and funded) by the HSE.

For the analysis of critical care activity, to assess the type of patient care delivered within different units, three levels of care definitions were used. These were applied based on the daily recording of organ monitoring/support as defined in the Critical Care Minimum Data Set (CCMDS; UK Department of Health) presented in Appendix O.

- Level 3 was defined as advanced respiratory support/mechanical ventilation or monitoring/support of two or more organ systems (excluding gastrointestinal support and the combination of basic respiratory support and basic cardiovascular support)
- Level 2 was defined as monitoring/support of one organ system (excluding gastrointestinal support) or the combination of basic respiratory support/mechanical ventilation and basic cardiovascular support.
- Level 1/0 was defined as no organ monitoring/support or gastrointestinal support only. This level of care is not typically defined as part of the remit of critical care, and is care that should be available on a general ward.

It is important to note that the information presented in this section is based on a one-off data collection exercise and, when interpreting these data, we must consider a number of potential limitations:

- The data collected were for the month of June 2008 only. This month was described as a relatively quiet month and some hospitals had experienced cutbacks in their elective surgical throughput
- One unit closed for upgrading during the month
- Many units also contained CCU beds and although the CCU data has been removed through quality review, it could impact on the overall activity recorded.

4.1.4 Critical care profile and activity, a snapshot by HSE region

The following tables present the summarised findings of the review of critical care services with a range of indicators shown per critical care unit, presented by hospital and HSE area. The data comes primarily from the results of the 28 day activity audit, but also reflects the information collected via the overview questionnaire. The tables show the critical care service configuration and activity per critical care unit (or as one figure where a combination of ICU, HDU and/or CCU care is provided in a single unit). In order to maintain confidentiality hospital names are not given. Where hospitals have multiple critical care units they are grouped together. In addition, for hospitals with dedicated specialist critical care units, the units and their activity are shown but the particular specialty has not been identified.

It should be reiterated that the information collected is that of 28 days of critical care activity during June 2008 and a one-off questionnaire also completed during June and July 2008. In order to further validate the findings presented below and throughout this report, it is vital that more data are collected and analysed across a longer period of time. Nonetheless, the information presented below paints a clear picture of how critical care is delivered across the country and indeed, highlights many of the problems and challenges, as described in the commentary accompanying each table.

Three indicators in particular may benefit from further explanation:

- 'Refusal Rate' is based on the number of requests that were made to an ICU or HDU that could not be fulfilled, as a proportion of all admissions within the unit. In many cases when critical care is required the bed or service is not requested as the staff are aware that the unit is full or that their critical care requirement is not as acute and is unlikely to be accepted. Of course, admission refusals could also be counted multiple times if requests were made to more than one unit.
- 'Unit Type' states whether a unit was a single ICU or HDU or was a combined unit with a mix of ICU, HDU and/or CCU beds. Where units included CCU beds the activity data was removed before analysis and in the case of ICU/HDUs, patients were identified depending on the acuity of care provided. In some cases the distinction between the types of care provided and indeed the staffing attached to the units and the care was not clear cut.
- Availability of isolation facilities under the heading '*% of admissions where isolation facilities were available to those who required them*' is derived from the 28 day activity audit and the notation (-) is used to record where hospitals reported that isolation facilities were not required during that period.

HSE West

Region Snapshot – HSE West	
Population	1,012,413
Number of hospitals with critical care services	11
Number of critical care units	16
Total number of designated critical care beds (HDU and ICU)	68
Total number of admissions during June 2008	497
Staffing	
<i>Consultant Anaesthetists/Intensivists providing critical care services</i>	41
<i>NCHD (Including Registrar and SHO grades)</i>	44 (WTE)
<i>Nursing (including CNMs, Clinical Facilitator & Staff Nurses)</i>	332.7 (WTE)
<i>HCA</i>	13.8 (WTE)
<i>Clerical</i>	5.2 (WTE)

Figure 7: Critical Care Activity, HSE West, June 2008

HSE West													
Hosp.	Unit Type	Number of Beds	Number of Adms	ALOS (Days)	Levels of Care Provided			% of Bed Days where a patient received ARS	% of admissions where isolation facilities were available to those who required them	Refusal Rate	Delayed Adms	Early Disch	Delayed Disch
					Level 0/1	Level 2	Level 3						
2	ICU	3	28	2.5	43%	31%	26%	28%	100%	0%	4%	25%	0%
	ICU / CCU	1	9	2.5	56%	17%	28%	22%	-	0%	0%	0%	0%
35	Specialist ICU	3	19	2.7	13%	38%	50%	23%	100%	0%	0%	0%	26%
	HDU	6	56	2.8	46%	33%	22%	5%	100%	29%	14%	9%	16%
	ICU	10	40	2.3	8%	13%	79%	67%	20%	20%	13%	3%	3%
12	ICU / CCU	2	30	2.9	73%	13%	15%	6%	0%	0%	7%	7%	7%
5	ICU / CCU	4	34	2.7	34%	23%	42%	21%	100%	3%	6%	6%	0%
21	ICU/HDU	4	48	1.8	53%	36%	11%	13%	50%	15%	4%	0%	6%
15	HDU	6	54	2.1	43%	35%	23%	6%	75%	7%	6%	4%	9%
	ICU	7	27	2.7	3%	16%	80%	73%	33%	7%	22%	0%	7%
16	ICU / HDU / CCU	2	16	3.2	57%	14%	29%	20%	-	0%	0%	13%	0%
14	HDU	4	22	3.5	63%	16%	21%	8%	100%	0%	9%	5%	14%
	ICU	5	28	2.6	25%	35%	40%	32%	80%	21%	0%	7%	11%
28	ICU / CCU	3	40	2.0	50%	10%	40%	8%	-	3%	5%	10%	3%
29	ICU	5	24	2.9	14%	26%	60%	48%	67%	0%	4%	4%	4%
26	ICU / CCU	3	22	2.5	64%	10%	26%	11%	0%	0%	0%	5%	5%
Total		68	497										

Volume, acuity and complexity of care delivered in some units was very low. In some cases the majority of care delivered in critical care units would correspond with high observation or ward care.

- In five ICUs (i.e. those designated as ICUs or ICU/CCUs excluding standalone HDUs or HDU/CCUs) more than 50% of the care delivered was at Level 1/0 (including one ICU where 73% of care delivered was at Level 1/0). In those five units the proportion of Level 3 critical care ranged from 15% to 40% (average 28%) and the % of bed days where patients received Advanced Respiratory Support (ARS) was between 6% and 22% (average 13%).

Inadequate capacity in the Intensive Care Units (ICUs) delivering very complex care left some High Dependency Units (HDUs) delivering large amounts of level 3 care without the appropriate staffing.

- Two Intensive Care Units delivered high proportions of very acute critical care with 80% and 79% of their care delivered at Level 3 and the % of bed days where patients were receiving Advanced Respiratory Support (ARS) at 73% and 67% respectively. In these two units 26% patients were discharged early and 22% admissions were delayed (average figures).
- The proportion of Level 3 care delivered in three HDUs in this region was greater than 20%. Two of these units were in the same hospitals as the two ICUs described above.

Specialist services are under pressure due to the lack of adequate step down facilities.

- The only specialist ICU in the region recorded that more than a quarter of patients spent longer than required in ICU.

Isolation facilities were generally not available for patients who required them.

- In the two ICUs providing the highest acuity of critical care, isolation facilities were often unavailable when required: they were only available 20% and 33% of the times they were needed on admission.
- Two ICUs recorded that isolation facilities were not available in any of the cases when they were required on admission.

Access to critical care was a major problem in the larger units

- In units where high level of acuity and complexity of care was delivered, there was also a high level of refused admissions. In two hospitals this was greater than 20%.
- In smaller units delivering less complex critical care (i.e. high proportions of level 1/0 care and low proportions of level 3 care), the refusal rate was much lower: Of the six ICUs providing more than 40% of their care at Level 1/0, the average refusal rate was 0.5%, this included a 0% refusal rate in five of the units.

HSE South

Region Snapshot – HSE South

Population	1,081,968
Number of hospitals with critical care services	10
Number of critical care units	12
Total number of designated critical care beds (HDU and ICU)	52
Total number of admissions during June 2008	450
Staffing	
<i>Consultant Anaesthetists/Intensivists providing critical care services</i>	49
<i>NCHD (Including Registrar and SHO grades)</i>	49 (WTE)
<i>Nursing (including CNMs, Clinical Facilitator & Staff Nurses)</i>	276.4 (WTE)
<i>HCA</i>	9.8 (WTE)
<i>Clerical</i>	3.6 (WTE)

Figure 8: Critical Care Activity, HSE South, June 2008

HSE South													
Hosp.	Unit Type	Number of Beds	Number of Adms	ALOS (Days)	Levels of Care Provided			% of Bed Days where a patient received ARS	% of admissions where isolation facilities were available to those who required them	Refusal Rate	Delayed Adms	Early Disch	Delayed Disch
					Level 0/1	Level 2	Level 3						
30	ICU / HDU / CCU	5	54	2.3	47%	33%	20%	6%	50%	0%	9%	13%	9%
33	ICU	5	23	1.9	6%	56%	38%	48%	50%	13%	4%	17%	4%
13	ICU / HDU	4	29	2.1	41%	41%	19%	23%	100%	48%	3%	7%	7%
7	ICU / CCU	4	31	3	49%	14%	37%	43%	0%	0%	0%	6%	3%
3	ICU / HDU / CCU	2	36	1.3	35%	39%	25%	17%	0%	0%	0%	6%	3%
9	Specialist ICU	6	33	1.9	32%	24%	44%	34%	-	58%	0%	3%	0%
	HDU	0	24	4.7	55%	18%	27%	9%	50%	0%	4%	8%	8%
	ICU	7	80	2.9	21%	20%	59%	45%	67%	40%	18%	3%	18%
36	ICU / CCU	2	41	2.1	23%	27%	49%	20%	0%	2%	5%	2%	0%
	ICU / HDU	4	27	2.2	26%	21%	53%	48%	14%	19%	26%	30%	4%
37	ICU	5	24	2.1	28%	26%	47%	33%	0%	0%	4%	4%	0%
20	ICU	6	25	3.4	6%	42%	52%	58%	-	52%	8%	16%	4%
18	ICU / HDU / CCU	2	23	2.9	40%	43%	17%	7%	100%	17%	13%	13%	0%
Total		52	450										

Volume, acuity and complexity of care delivered in some ICU units were very low.

- Of the twelve units designated as ICUs, four units provided less than a quarter of their care at Level 3 and five units delivered Level 0/1 care more than 35% of the time.
- In two ICUs the amount of bed days where patients received ARS was only 6% and 7%.

Severe pressure on beds was evident in some units while in other units there was little or no evidence of pressure on beds

- Two hospitals delivered 46% of the total critical care for the region, with one hospital accounting for 137 of the 450 critical care admissions during June 2008.
- High pressure on beds was seen in the ICU with the highest number of admissions (80) with 59% of its care delivered at Level 3. A refusal rate of 40% was recorded. In this unit an overall lack of capacity outside the ICU seemed to be a problem, with 18% of discharges delayed.
- The highest refusal rate (60%) was recorded in one specialist ICU, perhaps due to the lack of dedicated HDU services.
- In one ICU the Average Length Of Stay (ALOS) was less than 2 days and 30% of patients were discharged early.
- One ICU in particular showed little evidence of pressure on beds or acute critical care. It delivered 75% of care at Level 1/0 and 2, had an ALOS of less than 1 day and did not record any refused admissions or early discharges.

The lack of isolation facilities posed a major problem for the control of infection

- Five of the twelve units recorded having access to isolation facilities less than 15% of the time required, with four of those units stating that isolation facilities were not available any of the times required.

HSE Dublin North-East

Region Snapshot – HSE Dublin North-East	
Population	928,619
Number of hospitals with critical care services	8
Number of critical care units	11
Total number of designated critical care beds (HDU and ICU)	83
Total number of admissions during June 2008	452
Staffing	
<i>Consultant Anaesthetists/Intensivists providing critical care services</i>	39
<i>NCHD (Including Registrar and SHO grades)</i>	60 (WTE)
<i>Nursing (including CNMs, Clinical Facilitator & Staff Nurses)</i>	396.6 (WTE)
<i>HCA</i>	14.3 (WTE)
<i>Clerical</i>	6.25 (WTE)

Figure 9: Critical Care Activity, HSE Dublin North-East, June 2008

HSE Dublin North East													
Hosp.	Unit Type	Number of Beds	Number of Adms	ALOS (Days)	Levels of Care Provided			% of Bed Days where a patient received ARS	% of admissions where isolation facilities were available to those who required them	Refusal Rate	Delayed Adms	Early Disch	Delayed Disch
					Level 0/1	Level 2	Level 3						
10	ICU / HDU / CCU	6	40	2.0	32%	36%	32%	44%	-	13%	10%	0%	3%
11	ICU / CCU	2	25	3.0	8%	53%	39%	25%	100%	0%	12%	12%	4%
6	ICU / HDU	4	19	4.5	35%	23%	42%	34%	100%	16%	0%	21%	5%
8	ICU	5	33	2.1	16%	39%	44%	46%	100%	3%	9%	6%	3%
25	ICU / HDU	6	20	2.9	35%	26%	38%	41%	33%	0%	0%	0%	0%
19	Specialist HDU	8	52	2.9	4%	53%	43%	8%	100%	0%	0%	0%	0%
	HDU	9	64	2.8	22%	54%	23%	12%	67%	27%	5%	2%	33%
	ICU	17	95	3.2	8%	21%	71%	65%	86%	23%	8%	2%	18%
22	ICU/HDU/CCU	6	11	2.9	60%	32%	8%	5%	-	0%	0%	0%	27%
4	ICU	10	41	4.1	21%	15%	65%	70%	33%	2%	10%	5%	5%
	Specialist ICU	10	52	3.8	26%	5%	70%	61%	0%	27%	6%	10%	6%
Total		83	452										

The highest volume and highest complexity of patients were admitted through critical care in one hospital in this region

- A total of 211 admissions (46% of total admissions in the region) received critical care in one hospital across its ICU and HDU services.
- Three units (across two hospitals) provided a high proportion of Level 3 care (between 65% and 71%) with correspondingly high levels of bed days where patients received ARS (between 61% and 70%).
- Across the region, an average of 1 in 4 patients who required critical care did not get admitted with the highest refusal rates recorded in the larger (more acute) units.

A high level of acute critical care was delivered in all but one ICU

- Three ICUs in particular (including one specialist ICU) had high levels of acuity with more than 60% of care delivered at Level 3 and more than 60% of bed days where patient received ARS.
- However, in one ICU 92% of the care delivered was at Level 0/1 and 2.

Availability of isolation facilities was mixed in this region

- Isolation facilities were available 100% of the times they were required in four units.
- However, one hospital showed a particular lack of isolation facilities - the specialist ICU had no isolation facilities available, and the large general ICU providing a high level of complex critical care only had isolation facilities available one third of the time that they were required.

The specialist ICU had a major lack of capacity

- A 27% refusal rate was recorded.
- 10% of patients were discharged early.

HSE Dublin Mid-Leinster

Region Snapshot – HSE Dublin Mid-Leinster	
Population	1,216,848
Number of hospitals with critical care services	8
Number of critical care units	16
Total number of designated critical care beds (HDU and ICU)	86
Total number of admissions during June 2008	428
Staffing	
<i>Consultant Anaesthetists/Intensivists providing critical care services</i>	35
<i>NCHD (Including Registrar and SHO grades)</i>	50 (WTE)
<i>Nursing (including CNMs, Clinical Facilitator & Staff Nurses)</i>	468.62 (WTE)
<i>HCA</i>	20.13 (WTE)
<i>Clerical</i>	9.7 (WTE)

Figure 10: Critical Care Activity, HSE Dublin Mid-Leinster, June 2008

HSE Dublin Mid-Leinster													
Hosp.	Unit Type	Number of Beds	Number of Adms	ALOS (Days)	Levels of Care Provided			% of Bed Days where a patient received ARS	% of admissions where isolation facilities were available to those who required them	Refusal Rate	Delayed Adms	Early Disch	Delayed Disch
					Level 0/1	Level 2	Level 3						
17	ICU / CCU	3	21	1.8	47%	20%	33%	40%	-	0%	0%	0%	0%
23	ICU / CCU	4	25	2.63	31%	31%	38%	38%	-	12%	0%	0%	0%
24	HDU	6	2	3.2	100%	0%	0%	0%	-	0%	0%	0%	0%
	ICU	4	20	3.1	9%	26%	66%	79%	25%	10%	0%	5%	0%
1	HDU	2	23	1.4	46%	24%	30%	18%	0%	83%	9%	17%	0%
	ICU	9	37	4.7	33%	18%	49%	56%	25%	127%	11%	8%	16%
27	ICU / HDU	6	26	2.4	56%	27%	17%	23%	-	19%	4%	8%	4%
34	ICU	4	14	3.1	10%	48%	43%	23%	-	0%	0%	0%	14%
31	Specialist ICU	4	2	0.6	0%	0%	100%	100%	100%	0%	0%	0%	0%
	CT HDU	4	30	2.8	14%	81%	6%	2%	-	0%	20%	3%	10%
	Specialist ICU	6	22	2.0	0%	46%	54%	46%	-	0%	5%	0%	9%
	HDU	4	40	1.8	26%	54%	20%	10%	-	90%	13%	3%	3%
	ICU	15	65	2.5	11%	19%	70%	67%	71%	0%	23%	2%	6%
32	ICU	7	41	3.4	9%	22%	69%	45%	100%	0%	12%	10%	5%
	Specialist HDU	4	32	2.9	76%	5%	19%	0%	50%	0%	3%	0%	13%
	Specialist HDU	4	28	2.5	79%	16%	5%	0%	-	0%	0%	0%	21%
Total		86	428										

A high level of acute critical care was delivered in almost all intensive care units in the region

- One hospital provided 37% of the critical care in the region (160 of 428 admissions)
- In one specialist ICU 100% of care was delivered at Level 3
- Four ICUs delivered in excess of 65% of their care at Level 3 and an average of 73% of bed days where patients received ARS.
- However, in one ICU only 17% of critical care delivered was at Level 3

There appeared to be sufficient specialist ICU and HDU capacity in the region

- Less than 2% of patients were discharged early from specialist HDUs
- No patients were refused admission to specialist ICUs or HDUs
- Three of the specialist HDUs recorded significant percentages of delayed discharges (ranging from 10% to 21%)

Isolation facilities were generally not available

- Only three units recorded favourable access to isolation facilities when required (ranging from 71% to 100% availability).

Regional activity snapshot – key conclusions

Taken together, the messages from our analysis paint a picture of a critical care system with wide variations in practice, inherent inefficiencies due to fragmentation of resources and patient safety issues, compounded by infrastructural deficiencies. **Above all there is a lack of capacity, however the evident inappropriate use of available beds and the current configuration of the critical care units add to the capacity problem and further reduces patient access to critical care beds across the country.** There are currently 52 units all providing critical care, some which are refusing complex patients, and others where the throughput is not sufficient to maintain staff competencies. As a result we believe patients may be put at risk. These two key findings are explored further below:

Capacity

In considering the current capacity of critical care in Ireland, it is vital that the number of patients and beds are considered in conjunction with other factors. These include for example, the availability of high observation or step-down care, the availability of outreach services, or the option for transferring patients back to their referring hospital once their complex critical care episode is complete. Considering the information presented above, in addition to information gathered and observations made on hospital visits, it is clear that capacity and patient flow difficulties are a common occurrence.

- Over the 28 day period, there were 278 **admission refusals** (for non-clinical reasons) to critical care suggesting a lack of appropriate available beds. This figure refers to the number of times that a request was made to a critical care unit for a bed, and was refused. It is recognised that this may include multiple bed requests for the same patient. But it is also expected that there may be many critical care bed requirements that were not recorded due to physicians and surgeons working around the capacity issue, and not making a request. While acknowledging that this figure is not scientific and has its limitations, site visits and qualitative information gathering confirmed it as a relevant indicator of access to critical care beds, and with the advice of our critical care advisors it was factored into future bed projections (See also Chapter 2 for a more detailed description of the methodology)
- A significant number of critical care **beds were used inappropriately** during the data collection period, suggesting a difficulty in accessing the correct level of critical care bed for the patient's need as well as a difficulty in accessing general ward beds for discharge from critical care. A number of hospitals which recorded refusals, also recorded Level 1/0 activity. The units where this occurred were sense-checked, as part of the quality assurance process for the Review. In considering the impact of this on future bed projections, it must be recognised that, pending radical reconfiguration of the existing general acute hospital capacity and work practices in Ireland, it is likely hospitals will continue to provide a proportion of Level 1/0 care delivered in critical care units. Therefore, the refusals in hospitals where Level 1/0 care was also taking place should not be discounted from projected requirements.
- Over the data collection period 5% of **internal ward transfers** from critical care occurred between the hours of 10pm and 4am, suggesting that critical care beds were not available for emergency admissions, with early discharge of patients to create space for another admission.

Regional activity snapshot – key conclusions (cont.)**Configuration of critical care units**

It is widely accepted by critical care clinicians that intensive care units require a throughput of 200 level 3 patients per annum in order to maintain staff competencies and skill in the care of the complex critical care patient. Using this as a benchmark for the data collected, the following deductions can be made.

- Of the 37 hospitals providing critical care across the country, 10 do not have the throughput of critical care activity required to maintain staff competencies.
- 9 hospitals across the four HSE areas are providing the vast proportion of all critical care (in terms of volume and acuity) and are under significant pressure, requiring additional capacity to meet demands, especially step-down capacity.
- The remaining 18 hospitals are providing a range of critical care services and, although capacity is an issue and specific difficulties exist for certain services, the need is not as acute as in the larger hospitals.

Critical care isolation facilities are another important benchmark. International guidelines¹ state that at least one cubicle is required for every six beds, and bed spaces should be 20 m²

- Nationally isolation facilities are poor or non-existent (with few exceptions) presenting significant infection control risks.

Further findings from the Review including quantitative and qualitative data analysis, presenting the current realities and challenges under the areas of governance, work practices, staffing, transport, audit and accreditation and infrastructure, are presented in this chapter below.

4.2 Governance of Critical Care at Hospital Level

The **management of critical care units** in Ireland is divided between those that are led by consultant anaesthetists who have a special interest in intensive care medicine, specifically appointed anaesthetist/intensivists and other consultants with a special interest in intensive care medicine. Across the 37 hospitals providing critical care services, 53% of hospitals state that they have a named Critical Care Director in position (18 hospitals).

The **decision making** in relation to admission and discharge of patients to and from critical care units is taken by a range of individuals. In 53% of units such decisions are taken jointly by the primary physician/surgeon and by the consultant anaesthetist/intensivist. In 20% of units an anaesthetist/intensivist takes the decision to admit/discharge while the remaining 27% of units' decisions in relation to admission and discharge are taken by a lead physician or surgeon.

Although the **consultant intensivist led unit** approach has only been introduced in 10 hospitals to date, primarily major academic teaching hospitals, it is a system which appears to work well. Primary physicians and surgeons remain involved with the care of their patient, but the overall responsibility lies with the intensivist. Staff in the units where a consultant intensivist has responsibility for all patients state this ensures the best possible patient care, facilitating smoother and quicker admission and discharge, and increasing the continuity of care for the patient.

As stated above, 53% of hospitals providing adult critical care services have a specifically appointed Critical Care Director. However, of the 18 Critical Care Directors in place, only 4 have **dedicated sessions** assigned for the role. Of the four Directors with time dedicated to their role, the sessions allocated are, on average, 3-4 per week.

Nursing management structures vary across the different types of critical care units and hospitals. Almost all units (94%) have a CNM 2 or 3 with responsibility for the day-to-day running of the unit. Although many of these are, in theory, supernumerary, discussions reveal they almost always have a concurrent patient workload due to staff shortages and difficulties in securing staff for cover. The most common arrangement was for the unit to be led by a CNM 2 and a number of CNM 1s who rotate to provide 24 hour leadership. There are also areas where the units are managed by a CNM with responsibility for a number of other non-critical care areas as well. In most cases there is a CNM level nurse in place 24/7 in all units.

The CNMs report to the Divisional Nurse Manager (DNM). With the exception of one hospital, the Divisional Nurse Managers were responsible for a number of areas within the hospital, including Critical Care. In most hospitals the DNM was seen as providing support to the CNM in relation to staffing levels, educational sessions, etc.

4.3 Work Practices

Work practices refers to the way in which critical care is planned and delivered at hospital and unit level, taking into account the existence and application of policies and procedures, and the staff structures for the delivery of care.

Work practices vary from unit to unit and depend on the numbers and mix of staff, how the unit is governed (See Section 4.2), what level of care the unit is providing, and what internal and external challenges that unit faces.

Advanced nursing practice was not evident in most critical care units in Ireland, with the exception of one unit where there was one nurse practising as a CNS (providing outreach services) and in another

unit where there were 3 ANPs practicing in Cardiac Thoracic specialty (which included caseload responsibilities for the cardiothoracic critical care patient).

In all units work practices rely strongly on the existence of **policies and procedures** to guide practice. During hospital visits, policies in the critical care units were reviewed and discussed. The level to which critical care units across the country have localised policies and procedures varies greatly.

Critical care specific policies are not widely in place except for admission and discharge and medication management policies which were implemented in the majority of units. More **general policies** such as risk management, infection control and health and safety exist in the vast majority of units but they are largely hospital wide policies, rather than adapted or focused on critical care.

The implementation of **unit specific admission and discharge policies** is regarded as vital by staff. In units where these policies are not in place, there is competition between consultants for critical care beds, inappropriate placement of patients in critical care is likely and an unnecessary amount of medical and nursing staff time is spent discussing patient admission and discharge. Where discharge policies were not implemented it was common for patients to remain in the unit for longer than their level of acuity required.

Although a majority of units did have specific admission and discharge policies, in many cases these were quite dated and had not been reviewed regularly. Regardless of whether admission and discharge policies were in place, it was noted that almost all units operated a practice of identifying and agreeing the 'next patient out' on a daily basis so as to prepare for potential emergency admissions.

In the large number of **combined critical care units**, where intensive care, high dependency care and coronary care were provided together, there was a lack of clarity relating to policies and resulting work practices. In some cases, combined units were consistently occupied by very acute, complex cases, preventing HDU and/or CCU patients accessing the unit. Furthermore, in combined units, the development and implementation of many policies was seen as more difficult due to the broad range of patient types and care being delivered.

One particular practice of note is **outreach from the critical care unit**. 'Outreach' refers to any care, advice or other support that staff from within the critical care service are providing outside the critical care unit. Some degree of 'outreach' service was provided in 56% of hospitals but usually on an ad-hoc and unresourced basis. Only 9% of units are resourced to provide any form of outreach service. According to doctors and nurses outreach services in place (ad-hoc and formal) range from providing advice by phone on individual cases to requests from colleagues for patient assessment and treatment at ward level.

Work practices in relation to **critical care for paediatric patients** vary across the country. Dedicated paediatric critical care (for children up to 16 years) is formally provided in two standalone paediatric hospitals, located in Dublin. However, during the one month data collection, 2.4% of patients admitted to adult critical care units were children. This figure, and discussions with critical care staff throughout the country, suggests that critical care is provided to children within the adult setting. This is usually for children requiring short term critical care services, often in support to small paediatric departments within a regional acute hospital. Although plans are in place to reconfigure paediatric services

nationally, which includes the transfer of all children requiring critical care to a single tertiary centre, it is envisaged that a minimal level of care will be required going forward, in particular the stabilization of children in preparation for transfer. Critical care staff felt also that it is not always possible to transfer paediatrics emergencies to the stand alone paediatric hospitals in Dublin, particularly children whose condition could deteriorate significantly during transfer.

Multidisciplinary team working is evident in all critical care settings, although largely at an informal level. Medical and nursing staff work very closely together but the involvement of other staff groupings, in particular allied health professionals and health care assistants is less structured. From visiting the hospitals and speaking with staff, a multidisciplinary approach was evident in most cases although, only 43% of units state they undertake regular multidisciplinary team meetings. Slightly more units (51%) conduct regular multidisciplinary ward rounds. There are many factors which may drive this, including perhaps the widespread lack of AHP staff dedicated to critical care (further details in Section 4.4), which intensifies the difficulty in freeing up time to enable AHP input to a structured and formal multidisciplinary approach.

4.4 Staffing, Education and Training

This section describes the current reality in relation to the staffing of critical care across the country. The tables below present the staffing data gathered via the overview questionnaire. It should be noted that these data were collected during the summer of 2008, and may not be 100% complete due to difficulties in accessing and collecting such detailed information at short notice and in a limited time period. However, the figures collected present a useful overview of the number and breakdown of staff.

Following the tables, specific staff groupings are discussed in turn, including: medical, nursing, health care assistants, support staff, and allied health professionals.

Number of Staff by Region – Summary

Region	Number of beds	Anaesthetists / Intensivists	NCHD	Clinical Nurse Managers	Nursing Clinical Facilitators	Staff Nurses	HCA's	Ward Clerks
HSE West	68	41	44	45.9	2	284.8	13.8	5.2
HSE South	52	49	49	47.15	2.33	226.92	9.8	3.63
HSE Dublin Mid-Leinster	86	35	50	53.75	20.12	394.75	20.13	9.7
HSE Dublin North-East	83	39	60	47.6	13.9	335.1	14.3	6.25
Totals	289	164	203	194.4	38.35	1241.57	58.03	24.78

Figure 11: Critical Care Staffing by Unit, Hospital and HSE Region

Hospital	Unit Type	Number of beds	Anaesthetists / Intensivists *	NCHD *	Clinical Nurse Managers (WTE)	Nursing Clinical Facilitators (WTE)	Staff Nurses (WTE)	HCA's (WTE)	Ward Clerks (WTE)	ANP (WTE)
HSE West										
2	ICU	3	3 Anaesthetists / Intensivist share 9 sessions, on-call 1:3	5 Anaesthetist Registrars	2	0	29.5	1.5	1	0
	ICU / CCU	1	as per ICU	0	0	0	0	0	0	0
35	Specialist ICU	3	4 Intensivist + 5 Anaesthetists share 15 sessions, on-call 1:9	4 Anaesthetist Registrars (rotating) + 2 SHOs (rotating)	5	0.5	57	3	0	0
	HDU	6	Demand Basis	0	3	0.5	13.2	0	0.25	0
	ICU	10	As per Specialist ICU	As per Specialist ICU		0	0	0	0	0
12	ICU / CCU	2	No consultant staff assigned to the unit	0	2	0	12.8	0	0.5	0
5	ICU / CCU	4	7 Anaesthetists / Intensivist cover (15 sessions) on-call 1:6	5 Anaesthetist Registrars + 1 SHO (monthly rotations)	2	0	26	0	0	0
21	ICU/HDU	4	Demand Basis	0	3.5	0	14	0	0.5	0
15	HDU	6	Demand Basis	0	5.5	0	10.7	4.9	0.2	0
	ICU	7	6 Anaesthetists / Intensivist share sessions, on-call 1:7.5	4 Anaesthetist Registrars (rotating) + 1 SHO	6.5	0	30.7	1.4	1	0
16	ICU / HDU / CCU	2	3 Anaesthetists / Intensivist share sessions, on-call 1:3	0	2	0	11.5	0	0.5	0
14	HDU	4	Demand Basis	0	1.8	0	9.3	0	0.25	0
	ICU	5	5 Anaesthetists share sessions, on-call 1:8	2 Anaesthetist Registrars +6 SHO	6.1	1	20.6	2	0.5	0
28	ICU / CCU	3	2 Anaesthetists / Intensivist share sessions, on call 1:2	2 Anaesthetist Registrars	2	0	14	0	0.25	0
29	ICU	5	2 Anaesthetists / intensivist share sessions, on call 1:8.5	1 SPR + 3 Registrars + 4 SHOs	3.5	0	23	1	0.125	0
26	ICU / CCU	3	4 Anaesthetists / Intensivist share sessions, on call 1:4	2 Registrars (rotating) + 2 SHO	1	0	12.5	0	0.125	0
Total		68	41	44	45.9	2	284.8	13.8	5.2	0
HSE South										
30	ICU / HDU / CCU	5	6 Anaesthetists / Intensivist share sessions, on-call 1:4/5	1 SPR + 3 Registrars + 2 SHOs	3	0	27	1	0.5	0
33	ICU	5	6 Anaesthetists / intensivist share sessions, on-call 1:6	4 Anaesthetist Registrars+ 3 SHOs (rotating)	2	0	19.5	0	0.125	0
13	ICU / HDU	4	6 Anaesthetists / Intensivist share sessions, on-call 1:6	6 Anaesthetist Registrars rotating	2	0	15.4	0	0.25	0
7	ICU / CCU	4	6 Anaesthetists / Intensivist share 15 sessions, on-call 1:6	4 Anaesthetist Registrars (rotating)	7	0	17.2	1.3	0.5	0
3	ICU / HDU / CCU	2	1 Anaesthetist cover with sessions from physicians and general surgeons(4)on-call 1:2	General cover from 3 NCHDs (medicine and surgery)	2	0	14	0	0	0
9	Specialist ICU	6	5 Anaesthetists / Intensivist share 11 sessions, on-call 1:7	2 Anaesthetist Registrars +1 SHO	9.25	1.33	47.2	2	0	0
	HDU	0	Demand Basis	0	0	0	0	0	0	0
	ICU	7	As per Specialist ICU	As per Specialist ICU	8	1	36	0.5	0	0
36	ICU / CCU	2	As per ICU / HDU		1				0.25	
	ICU / HDU	4	8 Anaesthetists		1				0.75	
37	ICU	5	4 Anaesthetists / Intensivist share sessions, on-call 1:4	5 Anaesthetist Registrars	2	0	15	0	0.25	0
20	ICU	6	5 Anaesthetists / Intensivist share sessions, on-call 1:6	5 Anaesthetist Registrars + 2 SHOs	8.8	0	26.12	4	1	0
18	ICU / HDU / CCU	2	2 Anaesthetists, 3 surgeons, 3 Physicians share sessions, on-call 1:3	1 Medical Registrar + 7 SHOs	1.1	0	9.5	1	0	0
Total		52	49	49	47.15	2.33	226.92	9.8	3.625	0

* Medical staffing relates to the number of NCHDs and consultants who have dedicated time allocated to the critical care unit

Hospital	Unit Type	Number of Beds	Anaesthetists / Intensivists *	NCHD *	Clinical Nurse Managers (WTE)	Nursing Clinical Facilitators (WTE)	Staff Nurses (WTE)	HCAs (WTE)	Ward Clerks (WTE)	ANP (WTE)
HSE Dublin Mid-Leinster										
17	ICU / CCU	3	4 Anaesthetists, on-call 1:4	4 Anaesthetist Registrars	2	0	15.5	0	0	0
23	ICU / CCU	4	5 Anaesthetists / Intensivist share sessions, on-call 1:5	6 Anaesthetist Registrars	2	0	14.17	0	0.05	0
24	HDU	6	Demand Basis	0	2	0.5	0	0	0.25	0
	ICU	4	5 Anaesthetists / Intensivist share sessions, on-call 1:5	6 Anaesthetist Registrars (rotating)	2	1	18.8	0	0.4	0
1	HDU	2	As per ICU	0	1.3	0	9	1	0	0
	ICU	9	3 Anaesthetists / Intensivist share sessions, on-call 1:6	1 SPR (dedicated) + 1 Registrar (dedicated)	6	2	48.81	4.25	0.25	0
27	ICU / HDU	6	3 Anaesthetists / intensivist share sessions, on-call 1:3	4 Anaesthetist Registrars	2	0	11.34	0.38	0.25	0
34	ICU	4	7 Anaesthetists / Intensivist share sessions, on-call 1:7	7 Anaesthetist Registrars	2	0	21.9	1	0	0
31	Specialist ICU	4	Surgeon cover (Anaesthetists: Demand Basis)	2 SPRs	2	0	20.5	1.5	0.5	0
	Specialist HDU	4	Demand Basis	0	4	0	18	1	1.5	0
	Specialist ICU	6	Surgeon cover (Anaesthetists: Demand Basis)	1 SPR + 4 Registrars + 2 SHOs	8	0	25	2	1.5	4
	HDU	4	Demand Basis	0	1.5	0.5	16.5	0	1.25	0
	ICU	15	5 Anaesthetists / Intensivist (dedicated) on-call 1:10	3 Anaesthetist Registrars + 1 medical (rotating) + 1 SHO(fellow)	7.5	4	98	1	0.75	0
32	ICU	7	3 Anaesthetists / Intensivist share sessions, on-call 1:4	1 SPR + 6 Registrars	10.27	4	57.23	5	3	0
	Specialist HDU	4	As required / On Demand	As Required	0	8.12	10	3	0	0
	Specialist HDU	4	Specialist Surgeons as Required	As Required	1	0	10	0	0	0
Total		86	35	50	53.57	20.12	394.75	20.13	9.7	4
HSE Dublin North East										
10	ICU / HDU / CCU	6	12 Anaesthetists / Intensivists share sessions on-call 1:10	7 Registrars (rotating) + 6 SHOs rotating)	7.5	1	32.5	1.8	0.5	0
11	ICU / CCU	2	2 Anaesthetists and 1 physician, on-call 1:3	2 Registrars (rotating)+ 1 SHO	2	0	11.5	0	0.25	0
6	ICU / HDU	4	5 Anaesthetists / Intensivist share 15 sessions, on call-1:5	5 Anaesthetist Registrars (monthly rotations)	2(acting)	0	8	2	0.25	0
8	ICU	5	5 Anaesthetists / Intensivist share 15 sessions per week, on-call 1:5	6 Anaesthetist Registrars (rotating) + 1 SHO	4	0.5	25	0.5	0.5	0
25	ICU / HDU	6	2 Anaesthetists / Intensivist share session, on-call 1: 4/5	3 SPRs + 5 Anaesthetist Registrars	2	1	15	0	0	0
19	Specialist HDU	9	As per ICU	0	6.5	1	25	2	1	0
	HDU	8	Demand Basis	0	6.1	1	29	0.5	0.5	0
	ICU	17	4 Anaesthetists / Intensivist share sessions, on-call 1:8	4 SPRs + 2 Registrars + 1 SHO	6.5	5.4	86.6	0.5	0.5	0
22	ICU/HDU/CCU	6	3 Anaesthetists, 3 physicians cover, on-call 1:3	5 Anaesthetist Registrars + 5 SHOs	1	0	17	2	0.75	0
4	ICU	10	6 Anaesthetists / Intensivist share 15 sessions, on-call 1:6	3 Registrars (FT) + 4 rotating+1 SHO	6	2	44	1	1	0
	Specialist ICU	10	As per ICU	As per ICU	6	2	41.5	4	1	0
Total		83	39	60	47.6	13.9	335.1	14.3	6.25	0

* Medical staffing relates to the number of NCHDs and consultants who have dedicated time allocated to the critical care unit

4.4.1 Medical Staff

As outlined in Section 4.2, the majority of critical care units are staffed by **consultant anaesthetists** (or in a smaller number of cases intensivists). From data collected, the average number of critical care sessions (per week) utilised by an anaesthetist is 2.25 and the equivalent rate for an intensivist is 4.19.

Consultant staffing in the critical care unit varies across different hospitals and services. There is 24/7 dedicated consultant cover by a consultant anaesthetist/intensivist who does not have any other parallel responsibilities in 17% of units. However this is somewhat atypical. In many cases, the units are covered by a dedicated consultant anaesthetist/intensivist during daytime hours but out of hours are covered by the on-call consultant anaesthetist while covering other areas concurrently (operating theatre, A&E, etc). In some cases, during daytime hours, the consultant covering the unit has other concurrent responsibilities.

The **rotation pattern for consultants** working in the critical care service also varies across units and hospitals. In a number of units, consultant staff rotate on a daily or even sessional basis. It has been suggested that weekly rotation offers better continuity of care, and minimises any communication difficulties that sometimes occur when consultants are changing daily.

Postgraduate training for intensive care exists mainly in the rotations associated with the Diploma of the Irish Board of Intensive Care Medicine (DIBICM). Since this began in 1996 there have been more than 100 graduates, 98% of whom have a base speciality of Anaesthesia. Many of these graduates are currently working in Irish critical care units.¹²

3.4.2 Nursing Staff

The **profile of nursing staff** in critical care units varies depending on the size, type and location of hospitals. As outlined under the section on Governance (Section 4.2), the majority of units have a CNM 2 or 3 leading the unit.

There are approximately 1500 (whole time equivalent) critical care nurses (including CNMs and Clinical Facilitators) working across the 37 hospitals with adult critical care services. Of the total number of critical care nurses, 65% are within urban hospitals and 35% are within rural hospitals. The average length of critical care nursing service is 6.5 years. This figure ranges from nurses with critical care experience of more than 20 years to those with less than 2 years.

Currently **nurse:patient ratios** for critical care patients in Ireland vary from 1:1 to 1:1.5 for ICU patients, with the exception of specialist units where the ratio could be up to 1.2:1, and 1:2 to 1:3 for HDU patients. Difficulty was experienced in determining the accuracy of ratios due to the large amount of critical care provided in units combined with coronary care with a shared staff complement.

Nursing staff in critical care services are under **significant pressure**, mainly due to the lack of capacity and high occupancy rates. It was also expressed that the current national employment ceilings added significantly to the current pressures due to not being able to replace staff who leave or those who are on leave for various reasons. Data shows there is a significant amount of nursing capacity lost through **leave**.

<i>Type of leave</i>	<i>Average hours per week</i>
Sick leave	49
Maternity	57
Parental	17

In addition, nursing staff provide a large amount of **administrative and clerical work** in the units. Tasks such as answering the phone, taking laboratory reports and filing, for example, were often within the remit of the nurse.

Education and practical skills acquisition are an essential requirement to ensure nursing staff have the appropriate level of skills, knowledge and competence. There is little standardisation of training. The courses run vary from unit to unit and there are different expectations around training and competencies. It is encouraging that more than 80% of critical care units have an induction, foundation or orientation programme in place. However, these courses have only been in place for the past 2-3 years and the content and duration of these in-house programmes differ greatly from hospital to hospital.

Currently, there are a number of post graduate diplomas and higher diplomas critical care courses (delivered at Level 9) available in Dublin, Cork and Galway. They include the following:

- Post Graduate Diploma in Critical Care Nursing (National University of Ireland, Galway and University College Cork)
- Graduate Diploma in Critical Care Nursing (University College Dublin)
- Higher Diploma in Critical Care Nursing (Royal College of Surgeons in Ireland)

Just under half of all units had professional development plans in place, demonstrating the need for education and training to be further developed and standardised.

Availability of nurse training, education and development initiatives nationally

<i>Initiative</i>	<i>% of critical care units</i>
<i>Professional development plan for critical care (induction course, etc.)</i>	49%
<i>Baseline competency assessment completed on commencement of employment</i>	68%
<i>Induction/orientation programme in place</i>	83%
<i>Formal competency assessment for agency nurses</i>	9%

Nineteen hospitals run in-house **critical care 'foundation' courses** to develop a skill base for nurses working in the critical care service but the content and level of these in-house courses varies considerably depending on the hospital. The level of knowledge attained also appears to vary quite significantly as these hospital based programmes are not accredited.

The **level of formal qualification** of critical care nurses varies greatly. The data collected show that 56% of nurses have post-registration qualifications in critical care. At the other end of the spectrum, for 11% of nurses, an in-house critical care course (less than 6 months duration) is their highest level of critical care training. It should also be noted that, although mandatory, only 50% of nurses working in adult critical care have an Advanced Cardiac Life Support qualification. There was no significant difference in nursing qualifications between urban and rural hospitals: with 54% and 59% having post-registration qualifications in critical care.

Due to the current shortage of nurses, **recruitment and retention** of critical care nurses is a major priority for hospitals. Comprehensive orientation programmes that prepare nurses for their role as patient care providers have been shown to be an integral component to retention. Although critical care units in Ireland fare well in relation to induction programmes (in place in 83% of units) there is a need to have uniformity in these courses from a national perspective.

Clinical Facilitators are in place in 36% of critical care units. The role of the clinical facilitator was established to provide support to nurses in the clinical environment in order to enhance clinical teaching and learning. However, the role of the facilitator differs from unit to unit and ranged from the delivery and facilitation of the post-graduate courses to support of ongoing professional development and in-service training. Currently, few clinical facilitators are supernumerary and, like Clinical Nurse Managers, even if the position is in theory supernumerary, staff shortages and the need to cover leave results in many clinical facilitators having a significant clinical workload.

4.4.3 Health Care Assistants

The presence of health care assistants (HCA) was recorded in 65% of critical care units in Ireland with just 53 WTEs. Urban hospitals have 74% of all healthcare assistants with 26% in rural hospitals. Of health care assistants working within critical care services, 81% have completed up to level 5 FETAC qualification, 10% have completed a hospital induction course as their highest level of healthcare training, and 9% are yet to complete any form of specific healthcare training.

From discussions with health care assistants on hospital visits, in many cases they did not feel they were an integrated member of the multidisciplinary team and were involved mainly in domestic and cleaning roles rather than functioning as Health Care Assistants.

4.4.4 Support Staff

Very few units have access to dedicated clerical, administrative or secretarial support. Data show that only 15% of units have dedicated secretarial support, and only 19% have dedicated ward clerks. Some units can access support services as part of general hospitals resources but these are by no means

commonplace. In fact 68% quote no access to secretaries, and almost no access to data clerks. In the majority of hospitals, critical care unit cleaning services were provided by the standard contract cleaners, with no specific training or guidance relating to critical care.

The lack of support staff, including cleaning, housekeeping, clerical and data clerks was a widespread problem for critical care units. The lack of support services available means that nursing staff carry out a broad range of clerical, housekeeping and data related tasks. It is entirely inappropriate that a highly trained but limited resource such as critical care nurses should be required to undertake duties that do not reflect their skills and which dilute their availability to the patients.

4.4.5 Allied Health Professionals

Allied Health Professional (AHP) support is available to almost all units around the country. However, the type of professionals and amount of time they are available varies greatly. From information collected, the most available AHP support are dietetics and pharmacy (though primarily during daytime hours) with 85% and 81% of units having daytime access. The majority of units do not have access to much AHP support out of hours, with the exception of physiotherapy and chaplaincy.

Although some units have a **specific allocation of AHP time**, the most common way of working involves the AHPs visiting the unit daily to see patients who have been referred to them. Referrals to the AHPs are usually made by the consultant staff.

Staff within the critical care units are generally **fairly satisfied with their access to AHP support** but there are concerns that the amount of time that AHPs could spend in the unit is not sufficient. Similarly, when speaking with the AHP staff, the main concern is the support being provided to critical care patients is often at a 'general' or 'high' level - if more dedicated time was allowed for, AHP staff could work more closely with the medical and nursing staff and provide a more comprehensive service to the unit and its patients.

Critical care training for AHPs is also an issue. On the whole, critical care training for AHP staff is very much ad hoc and on-the-job. For specific AHPs, for example physiotherapy, a large amount of time is dedicated to on-the-job training due to on-call arrangements and having to ensure a basic level of critical care competency across all members of the on-call team. For other AHP groups there was an opportunity for certain staff members to take an individual focus on critical care so the training was not such a constant drain on resources.

4.5 Transport and Transfers

Inter-hospital transfers are a fundamental issue facing critical care units in Ireland today. Moving critical care patients from one facility to another was stated as a **serious challenge** across almost all units. No specific part of the transfer process was highlighted as particularly problematic; all areas were quoted as difficult.

Difficulties were widespread and related to all areas of the transfer process. Extensive communications and negotiations were required to secure a bed in another unit (this was a particular challenge with neurosurgical beds). Securing an ambulance (999/emergency calls are prioritised over critical care inter-hospital transfers) was often slow. The process of the transfer of the patient and having to provide staff to accompany the patient left units short-staffed. Transferring staff were often delayed during the process at the receiving hospital and sometimes had to transfer the patient on to a different hospital or back to the referring unit.

There are **few standard processes** or protocols in existence in relation to the transfer of critical care patients and, in different hospitals, requests for critical care beds are dealt with by different staff.

The **Mobile Intensive Care Ambulance Service (MICAS)** is, in theory, an appropriate service for critical care patients. MICAS was set up in 1996 and operates as a centralised retrieval system for inter-hospital transport of critically ill patients. It provides a safe, consistent and auditable service. This service was set up to serve the perceived need of a regional transfer service but to date, the majority of transfers are between the greater Dublin area hospitals. The service is unavailable to many units, and latest data show that 30% of emergency ICU referrals cannot be accommodated. These limitations exist for a number of reasons, including: restricted hours of operation (5 days, 9am-5pm), lack of dedicated staff and access to only a single vehicle, based in Dublin, which is relatively old and not always reliable. In reality, the vast majority of critical care patients have to be transferred by standard ambulances and use varying levels of specialist equipment.

Many units have stated that their services are put under pressure as a result of their anaesthetic and/or critical care unit staff having to accompany critically ill patients on transfers. In addition, organising the transfer (securing an appropriate bed) is often extremely time consuming involving many phone calls and interactions with various different staff members in the 'receiving' hospital.

In relation to primary transport, **new ambulance protocols**, in particular bypass procedures are being put in place in some areas but are not yet widely implemented. These redirect patients to larger more appropriate hospitals but at present only relate to trauma cases. Currently, skill levels of the ambulance service need upgrading with retraining to Advanced Paramedic level.

4.6 Audit and Accreditation

Use of the best evidence alongside routine collection, validation and analysis of standardised, accurate data are essential to support both the service delivery, organisation and clinical decision-making for adult critical care services. Currently, such standardised, accurate (complete, valid and reliable) **data are almost non-existent**.

The current administrative national database system, **HIPE (the Hospital In-Patient Enquiry Scheme)**, **does not distinguish between care delivered in a critical care unit from care delivered in the rest of the acute hospital**. Furthermore, HIPE does not distinguish between specialty of critical care provided, for example, between adult, paediatric or neonatal care or between level of care – intensive care or high dependency care. HIPE data are neither accurate nor sophisticated enough for rigorous risk (case mix) adjustment to allow meaningful comparisons of outcome and activity to guide effective clinical care.

The limited existing data available on adult critical care services was used to inform this Review. This consisted of previous reports and studies predominantly conducted by the ICSI and data from individual critical care units who collect and analyse their own case mix, outcomes and activity. The latter, unfortunately, are not standardised across units. As explained earlier therefore, to gain a more meaningful snapshot of the case mix, outcomes and activity of adult critical care services, a national audit of the admissions in June 2008 was conducted.

4.7 Physical Infrastructure and Facilities

Across Ireland there is **significant variation in the physical space and layout** of critical care units, with many well below internationally recognised standards (e.g. the UK's HBN 57 standards). As a result, risk management is an ongoing concern for the service.

Figure 12: The percentage of critical care units which have access to specific dedicated facilities (reflecting the presence of the facilities, not their quality or adequacy)

Facility available	% Units
Open plan nursing station	91%
Clean utility room	55%
Dirty utility room	77%
Storage room	87%
Staff hand washing / gowning area	64%
Waiting area	49%
Medical offices	47%
Nursing offices	72%
Staff rest area	62%
Overnight accommodation for relatives	38%
Pantry	64%
Interview room	13%

The **physical layout** of the majority of critical care units is far from desirable. There is widespread lack of circulation space around beds in most units and, in many cases, equipment and consumables are being stored within the main unit. Although 87% of units have a designated storage room available, it is almost always insufficient for the unit's needs. Family facilities are poor: less than half (49%) of all critical care units have a family room and only 38% have the facility for family members to stay overnight. From hospital visits it was evident that in many units, the only space for families is a multi-purpose room which might also be used for meetings, staff breaks, storage, etc.

The administrative working areas available for all staff are also minimal and, in many units the nursing stations impinge significantly on the clinical space. Dedicated **teaching or meeting spaces** are available to less than half (47%) of all critical care units.

Facilities and infrastructure for infection control are poor across the majority of units with 23% of units not having a designated dirty utility room and 36% of units not having a staff hand washing/gowning area. In the relatively small number of hospitals where single (or 'isolation') rooms are in existence, they are usually not fit-for-purpose. For example, nationally there are only 22 single rooms with airflow for protective isolation. The table below gives a breakdown of single rooms available regionally:

HSE Area	Number of critical care beds	Number of single rooms (without airflow for protective isolation)	Number of single rooms (with airflow for protective isolation)
HSE West	68	10	5
HSE South	52	9	2
HSE Dublin Mid-Leinster	86	16	6
HSE Dublin North-East	83	6	9
<i>Total</i>	<i>289</i>	<i>38</i>	<i>22</i>

From the data collected during the June 2008 activity audit it was identified that a large proportion of patients could not access the required isolation facilities. Isolation facilities were only available to between 30-40% of patients who required them.

Type of unit	% of admissions where isolation facilities were available to those who required them
ICU	37
ICU/CCU	43
HDU	24

Information Communications Technology infrastructure varies widely. Although some units use purpose-built information systems, the majority of units keep records manually, if at all. It is also worth noting that general hospital and HSE systems (HIPE) do not record critical care activity specifically.

Access to diagnostics, in general, is good with 96% of hospitals having 24/7 access to standard radiology and pathology and most also having near patient testing available in the unit.

Staff stated that **access to clinical or biomedical engineers** for the maintenance of critical care equipment is satisfactory. In terms of the equipment, the main difficulty is the lack of space for storage, the risk of equipment being tampered with while being 'stored' in inappropriate spaces and the possibility of infection control risks following inappropriate storage. A small number of units have a full time clinical engineer who works from a space within, or adjacent to, the critical care service. This works particularly well.

CHAPTER 5
Research and Best Practice

5. Research and Best Practice

- 5.1 The Configuration of Critical Care
- 5.2 Governance of Critical Care
- 5.3 Work Practices
- 5.4 Staffing, Education and Training
- 5.4 Transport and Transfers
- 5.6 Audit and Accreditation
- 5.7 Physical Infrastructure and Facilities

As described in the review methodology, reviewing and understanding international practice in critical care was a vital input to the development of the model and recommendations for the future delivery of critical care services in Ireland. In addition to reviewing critical care standards from a number of different countries and gaining input from local and international critical care experts, a broad literature review was completed. The findings from this exercise are presented below under the same seven headings as the current reality (Chapter 4) and recommendations (Chapter 8): The configuration of critical care; governance; work practices; staffing, education and training; transport and transfers; audit and accreditation; and physical infrastructure and facilities,

5.1 The Configuration of Critical Care

Changing Models of Care

Past reports suggest the present configuration of critical care services is inherently inefficient and expensive. Changes in medicine and increases in specialisation have created clinical and economic reasons for concentrating critical care services in a limited number of specialist centres.

These changes, compounded with workforce shortages and the restrictions in working hours, have greatly increased the size of population required to support a full range of services and provide a sufficient case load for clinicians to maintain their skills¹³. The separation of planned from unplanned work may also have advantages in terms of reducing the disruption to elective care caused by emergency pressure.

Reforming the organisation of acute services

One study by Lyons et al.¹⁴ indicates that, ideally, hospitals providing the full range of regional services require catchment populations of 350,000 to 500,000 in order to ensure safe and effective patient care, to support training and to allow clinical personnel to maintain expertise. It also indicates that a population of 200,000 to 250,000 is required to support hospitals with the minimum range of acute services to deal with emergency and acute patients. It must be recognised however, that this is only one study, and factors

other than population, for example geographic factors, the need for a critical mass of cases for maintenance of skills, and the level of healthcare services which are available within the community must be considered in the (re)organisation of services.

In the same study Lyons et al considers critical care bed requirements to serve a population of 500,000. They demonstrated that the number of beds required is dependent on the number and size of Intensive Care Units in individual hospitals, showing that fewer beds were required if they were delivered in a smaller number of units.¹⁵ It states that for the 500,000 population the average daily bed requirement is 16 general ICU beds and 24 HDU beds, provided that the need for the entire catchment area was provided in one unit¹⁶.

The 2003 Report of the National Task Force on Medical Staffing ('the Hanly Report') also considers catchment populations required for different types of hospitals and states that international literature indicates populations of 200,000 – 250,000 are needed to support a hospital with the minimum range of acute services required to deal with emergency and acute patients. The literature indicates that hospitals providing the full range of regional services require even larger catchment populations (350,000 – 500,000) to ensure safe and effective patient care, support training and allow staff to maintain expertise¹⁷.

While there is no research suggesting the minimum population base recommended for critical care, we can look to the recent experience of other countries in this area. Hospitals which do not meet a baseline requirement for critical mass often run the risk of their resources being misused and diluted or fragmented across too many hospitals. The Netherlands, Belgium and Denmark have recently centralised acute care in a smaller number of hospitals in order to improve patient outcomes, facilitate reduced working hours for junior hospital doctors and improve the delivery of care.

Hospital networks

National policy in Ireland has steered towards more formal networks following the Cancer Strategy (2006). The concept of networks is well established internationally and it is suggested that they will become the main form of health service organisation in the next twenty years. These network based organisations will encourage more widespread integration of services and improvement in quality of care¹⁸. It is also suggested that clinical networks allow for continuous working relationships between individual clinicians and their organisations, improving the care for patients required across a range of institutions¹⁹.

Advocates of clinical networks suggest that they can²⁰: Make more efficient use of staff; reduce professional boundaries; allow good practice to be shared; put patients at the centre of care; and improve access to care.

Bed Configuration and Utilisation

Currently, there are 37 hospitals in the Republic of Ireland that have adult critical care facilities. Numerous reports have stated there is a shortage of critical care beds²¹ and a high admission refusal rate for patients requiring intensive care²². The most recent published data for Ireland demonstrate a marked deficit of intensive care beds compared with other EU countries as well as a shortfall in intensive care

consultant staff²³. (See Chapter 4 for analysis of bed configuration and utilisation carried out as part of this Review)

The percentage of ICU patients who might be more appropriately managed in a HDU depends upon both local circumstances and the methods used to define a high dependency patient. Thus, the perceived national shortage in ICU beds might be improved by the reclassification and re-staffing of some units with high dependency beds. This reclassification and redistribution of critical care beds may help relieve pressure on critical care services.

Opinions vary concerning the use and provision of HDU or ICU beds²⁴. There is clear evidence that high dependency care improves the survival of critically ill patients. High dependency care (Level II) beds require extra nursing staffing and resources in comparison to at-risk (Level I) beds.

Casemix/HIPE Unit data (2008) from the Health Service Executive presents the annual costs of operating critical care beds in Ireland as follows:

Type of Unit	Direct Pay	Direct Non-Pay	Overheads	Drug Costs	Total
ICU	372,719	155,025	90,613	93,871	712,228
Specialist ICU	415,785	102,542	119,723	50,889	688,939
HDU	227,062	62,064	60,840	16,697	366,663

Research suggests the demand for high dependency care is growing²⁵, due to increasing frequency of surgery in aged patients with co-morbidities, improvements in technology, and increasing complexity of surgery²⁶. HDUs provide a valuable service for patients at risk of postoperative complications²⁷. The inappropriate placement of high dependency patients in intensive care beds may lead to increased costs, delayed admissions and/or cancellation of major surgery.

In 1995, only a small proportion of UK hospitals possessed a high dependency unit but this number has increased significantly. The expansion of HDUs may also result in a significant number of patients on the general wards benefiting from this level of care²⁸. Patients who were deemed to require critical care have an increased mortality if they receive care outside these units²⁹. The presence of critical care patients on general wards adversely affects patient outcomes.

Bed occupancy

Queuing theory suggests when utilisation increases above 80-85%, the rate at which admissions are rejected increases exponentially. Sinuff finds that the refusal of critically ill patients to a critical care unit is associated with a three-fold increase in mortality³⁰. [It should be noted however, that Sinuff's study was based on a large (18 bed) urban unit and is not portable to the very small units.] Small increases in average occupancy are accompanied by rapid degradation of the ability to handle new admissions. This research suggests that continuously high occupancy levels must be limited and a predictable number of empty beds must always be maintained in readiness³¹.

Thus, the development of step down units and the management of the elective surgery scheduling process can produce a much smoother demand curve. In support of the need for occupancy levels to be limited, the recent Acute Bed Capacity Review in Ireland suggested that acute hospital bed numbers should be planned on the basis of an average of no more than an 85% occupancy level³².

5.2 Governance of Critical Care

Organisational models for critical care units

There are essentially three types of critical care units: open, closed and hybrid units. Although a majority of units have an open structure, there is a growing body of literature suggesting that closed units offer improved efficiency^{33 34 35} and patient outcomes^{36 37 38}. The three types are described below:

The Open Unit - In an open system the physicians directing the care for each individual ICU patient may have clinical responsibilities outside the intensive care unit and are not based within critical care. They may or may not choose to consult an intensivist (if one exists in such a unit) to assist in the management of the patient. The main advantage of an open unit is thought to be continuity of care. The physician directing the care may have a long-standing relationship with the patient and can continue this relationship through the critical care episode. However, the lack of unit-wide leadership and an integrated, multi-disciplinary plan of care can lead to fragmented care as different sub-specialists manage their own 'organ' or area of expertise. In addition, nursing and AHP staff find it difficult to resolve conflicts in the management of the patient³⁹.

The Closed Unit - In the closed system, care is provided by critical care physicians. In this type of unit, physicians certified in critical care by one of several specialty boards (Internal Medicine, Anaesthesiology or Surgery) automatically assume responsibility for all admitted patients and the delivery of intensive care. All other physicians contribute to care through consultation with the intensivist during the patient's stay in the unit.

A variety of studies reported in the literature have documented more favourable outcomes and less resource utilisation when ICU patients are managed in a closed system compared with an open system. In a recent systematic review of the literature, the total body of evidence suggests that hospital Length of Stay (LOS) can be reduced significantly in ICUs that operate according to the closed model⁴⁰. Individual studies also point to lower mortality, fewer overall complications and shorter ICU and hospital LOS in closed units compared with open units⁴¹. Reports from medical and surgical intensive care units have suggested that care under an intensivist-model of ICU care is associated with: Greater potential for the use of standardised protocols for care; improved leadership and staff relationships; and less confusion and conflict.

Given the substantial investment associated with intensivist cover and the shortage of intensivists, not all ICUs in Ireland will be able to establish this model. There is also often opposition by some physicians to the establishment of closed units due to fear that services may be curtailed substantially. Opponents of this unit type often argue that continuity of care is significantly interrupted⁴² and that an established patient-doctor relationship may be compromised and care becomes fragmented. However, this argument

is difficult to sustain in the face of the outcome evidence referred to above and the widespread adoption of the closed unit model in major centres internationally.

Hybrid Units - A hybrid model is a combination of both types of units (open and closed). Thus, the patient's consultant physician may be involved in the care along with a supervising intensivist. The intensivist assumes some or all aspects of the patients care⁴³. This hybrid model preserves the consultant physician or surgeon's input. However, the main disadvantage of this organisational model is the potential for confusion over who has the ultimate responsibility for the patient.

The Intensivist Directed Model - Studies have shown that the greater use of intensivists in the ICU has significantly reduced hospital mortality^{44 45} and complications⁴⁶. Presence of a full-time ICU physician reduces the likelihood of excess ICU length of stay⁴⁷ thus improving care and efficiency^{48,49}. This observation lends support to the growing literature that states that full-time ICU physicians reduce costs and improve outcomes in a variety of critical care settings^{50 51 52}.

Possible explanations include: Level of physician experience⁵³; use of written or unwritten protocols to manage common problems; more effective team-working within critical care; better communication within the healthcare team⁵⁴ and between the healthcare providers and family members; more rapid response to developing clinical issues; and fewer complications from procedures⁵⁵.

Haupt presents guidelines on Intensivist cover⁵⁶:

- Ideally, 24 hour in-house coverage should be provided by intensivists who are dedicated to the care of ICU patients and do not have conflicting responsibilities.
- If this ideal situation is not possible, 24 hour in-house coverage by experienced physicians (board-eligible/ certified surgeons, internists, anaesthesiologists, or emergency medicine physicians) who are not intensivists is acceptable when there is appropriate backup and supervision. This arrangement requires an intensivist to be on call and physically present in the hospital within 30 minutes for complex or unstable patients.
- The intensivist should be able to respond to >95% of emergency requests within 5 minutes.
- Physicians (staff and/or fellows) or physician extenders covering the critical care units in-house should have advanced airway management skills and Advanced Cardiac Life Support qualifications.
- Ideal intensivist-to-patient ratios vary from ICU to ICU depending on the hospital's unique patient population. Hospitals should have guidelines for these ratios based on acuity, complexity, and safety considerations.

Since mechanical ventilation and the presence of infection increase LOS, the presence of full-time physicians who can more rapidly manage these factors may explain some of the benefit^{57 58}. It is also speculated that critical care units with intensivists may also have more experience and comfort with end-of-life decisions thus reducing the duration of futile technological support.

Some literature recommends that a critical care representative should serve on the Medical Staff Executive Committee and Bioethical committee. Proactive ethics consultation has been shown to improve decision-making, shorten LOS and better meet the physical and psychosocial needs of dying patients and their families^{59 60}.

Nursing leadership - Where clinical directorates are implemented, it is important that nursing retains a strong sense of identity and is responsible for ensuring the highest standard of professional care for patients. In some countries, such as Australia, the clinical lead (in a directorate structure) is held by the nurse manager. Such posts are held with the approval of all staff working within a directorate and appear to operate very successfully where a nurse or midwife has a combination of clinical awareness and management skills to manage a directorate effectively. Skills required include strategic and systems thinking, establishing policy, systems and structures, leading on vision values and processes, working at corporate level and staff development.

5.3 Work Practices

Regardless of the type of unit, best practice recommends that the intensivist and primary consultants collaborate proactively in the care of patients. In all types of organisational structure, an intensivist must be given the authority to intervene and care directly for the critically ill patient in urgent and emergent situations.

The ideal situation would, however, be that all orders regarding a patient's care should be channelled through a unit-based intensivist to ensure optimal care and to minimise conflicting approaches to care. If these principles are followed, the distinctions between open and closed units and the divisive implications associated with the use of these organisational terms no longer exists.

Critical care policies and procedures

Admission and discharge policies specifically for critical care are vital. They improve the flow of patients through an improvement in internal processes. Patients admitted to ICU early in the course of their illness, before maximal deterioration in their condition have a survival advantage⁶¹. Delays in facilitating admission to ICU for critically ill patients increase the likelihood of mortality⁶². In closed ICUs it is much easier to enforce admission criteria in the ICU⁶³.

The aim of the admission policy is to:

- Improve categorisation of patients for whom timely admission to a critical care unit is essential
- Improve categorisation of patients for whom admission to a critical care unit is inappropriate
- Improve the utilisation of existing critical care bed capacity
- Manage internal organisational factors that influence LOS, bed occupancy and bed utilisation
- Clarify the links with local incident management policies, contingency plans, and triggers for the implementation of these plans

A number of findings support the use of admission and discharge policies, namely: The relative risk of premature discharge is inversely related to the availability of ICU beds⁶⁴. Premature discharge of patients is associated with increased mortality in these patients⁶⁵. Unplanned discharges from ICU late at night results in the increased chance of morbidity and mortality⁶⁶.

More generally, there is a requirement for a broad range of critical care specific policies. Research suggests that the following policies must be available to all ICU personnel and must be reviewed annually.

- Admission and discharge criteria and procedures⁶⁷
- Transport policies⁶⁸
- A total quality management/continuous quality improvement program which addresses the following quality indicators: Safety, Effectiveness, Patient-centredness, Timeliness, Efficiency, and Equity
- A list of staff competent for procedures/skills used in the ICU
- End-of-life policies (e.g. including requirements for “do-not-resuscitate” orders)
- Procedures for determining brain death
- Organ donation protocols
- Management of agitation and sedation protocols

Critical care outreach

Patients with a potential need for some form of critical care support may be found on all wards throughout the modern hospital⁶⁹. There are a number of different service models which share the general aim of providing better and more focused care for these patients in general hospital wards. Concerns about these patients when outside the critical care environment have been well documented⁷⁰. An approach to the recognition and management of these patients has been the development of early warning systems and outreach services.

The development of critical care outreach (CCO) has stemmed from financially constrained health care systems, increasing patient acuity and limited critical care bed capacity⁷¹. CCO is a method of enhancing the access to critical care expertise for all potentially critically ill patients in the hospital, especially in cases when there is a limited availability of critical care beds. CCO can be defined as the extension of services beyond current limits and is associated with the phrase ‘critical care without walls’. The concept of CCO was conceived in Australia in 1990. It has since been successful across England and is used extensively in the US, UK and Canada. It has also been introduced in Italy, Denmark, Sweden and Norway with the primary improvement being reduction in in-hospital cardiac arrests. It should be noted that CCO is not a substitute for appropriate critical care capacity.

Unlike medical emergency teams which tended to focus on emergency events, CCO also provide follow-up visits to patients discharged from the ICU. The need for this service has been established in the literature which indicates suboptimal management of both patients discharged from intensive care and patients at risk of deterioration on hospital wards^{72 73 74}. Current deficiencies in the management of critically ill patients have been identified as: poor knowledge and failure to recognise clinical urgency^{75 76}, inadequate supervision⁷⁷ and a failure to seek advice⁷⁸.

The essential **objectives of an outreach service** are to: Avert admissions through early recognition of deteriorating patients by better use of routinely observed vital signs; ensuring timely admission to critical care to ensure the best outcome⁷⁹; support patients discharged from critical care to the wards; and share critical care skills and experience⁸⁰.

Research reports the introduction of critical care outreach teams have: Reduced emergency admission rates from wards⁸¹; reduced cardio-pulmonary arrest rates before admission^{82 83 84}; improved survival to discharge from hospital after discharge from critical care⁸⁵; reduced non-do-not-resuscitate (DNR) deaths⁸⁶; significantly decreased readmission to critical care⁸⁷; reduced in-hospital cardiac arrests⁸⁸; reduced lengths of stay and mortality^{89 90}; reduced night referrals or out-of-hours admission⁹¹; improved physiological scores for patients admitted to the ICU from the ward⁹²; and reduced costs compared to staffing an HDU.

There are a number of different operational models of outreach care⁹³ but the underlying principle remains the same. These services vary⁹⁴ in terms of:

- The track and trigger system in place that prompts review by an outreach service
- The activities they undertake (such as direct bedside support, follow-up of patients discharged from critical care to the ward, or education and training)
- The composition of the teams (such as doctor-led or nurse-led, or size of team)
- The availability of the outreach service (such as round the clock or office hours)
- The coverage of wards (such as selected wards only or complete coverage).

Despite the variations, literature suggests the CCO systems should consist of four elements⁹⁵: crisis detection and response triggering mechanism; clear composition of CCO Team; a governance structure to organise resources; and an evaluation mechanism to evaluate and promote hospital process improvement.

Following a review of critical care services in the UK, 'Comprehensive Critical Care' (*a framework for the organisation and delivery of critical care throughout the National Health Services*) was published. It made recommendations about the development of critical care services throughout the NHS, and made central funding available for trusts wishing to set up these services. Many trusts established successful critical care outreach programmes which were led by nurse consultants.

In York, for example, a clinical note⁹⁶ summarises their approach to critical care outreach which included forming a team of mixed discipline senior nurses (seconded from their posts in critical care, theatre recovery, general surgery, medicine and orthopaedics) who, with the eight sessions per week of consultant support, provided a hospital-wide outreach service. The outreach programme focused on the roll-out of a modified 'Patient at Risk' scoring system to provide a framework for referral to the outreach programme. This was supported by teaching sessions for all nurses on how to apply the scoring system. In operation, outreach teams followed a standard procedure which included visiting every ward in the hospital every day, to ensure accessibility and visibility, and also committed to responding to all paged calls for help within five minutes.

Non-invasive ventilation

Non-invasive ventilation (NIV) is becoming established as an important modality in the management of acute respiratory failure and allows for a cohort of patients who would otherwise end up in ICU to be cared for outside of critical care. NIV has also been used to wean patients from invasive ventilation and has been successfully used on ICU, HDU, respiratory wards and general wards. An acute NIV service must have a named consultant with overall responsibility for the service. This is usually a respiratory physician but might also be a consultant nurse specialist or a clinical scientist⁹⁷.

5.4 Staffing, Education and Training

Literature suggests that the critical care environment presents a number of challenges to **recruiting and retaining** a sufficient number of appropriately trained staff – specifically: physical, mental and professional challenges.

Physical challenges are often presented by the critical care working environment, including inappropriate lighting, annoying and confusing alarm systems and inappropriately designed workstation layout⁹⁸. Mental challenges are as a result of the emotionally charged atmosphere of the critical care unit, where decisions must be made quickly and staff are routinely exposed to patient suffering and family distress⁹⁹. Professional challenges include autonomy, group cohesion, effective communication and management workloads¹⁰⁰.

Literature documents a broad range of strategies to improve the recruitment and retention of healthcare professionals. These include¹⁰¹:

- Redesigning critical care units using ergonomic science
- Involving critical care staff in decision making
- Hiring additional staff to relieve the pressure and decrease the workload of current critical care workers
- Establishing burnout assessment and prevention programmes
- Reducing workplace violence by creating an aggression-free environment
- Offering staff support groups
- Holding regular inter-disciplinary meetings to discuss difficult cases
- Giving critical care staff more autonomy and flexibility in setting their work schedules
- Offering professional training in communication and conflict resolution.

5.4.1 Medical staff

Staffing requirements

Research supports a closed model of ICU practice where admission, discharge and referral policies are under the direction of an intensivist, thus improving cost-benefit and patient outcomes^{102 103}. Tarnow-Mordi highlights that, in order to meet the demands of a fully functional intensive care unit, appropriate and adequate numbers of staff are necessary as high medical and nursing workloads are associated with error and adverse patient outcomes¹⁰⁴. The Hanly report¹⁰⁵ recommends that a minimum of 7 intensive care consultants be in position for a population of 350,000, although the fact that Hanly does not provide for high dependency care suggests this figure may be too low. Intensive Care Society standards¹⁰⁶ state an ICU consultant team can manage 8 beds i.e. 16 -20 bed would require two teams (not including provision for on-call). Oh's Intensive Care Manual¹⁰⁷ recommends an appropriately experienced specialist be rostered exclusively to an ICU at all times. This specialist should also have the benefit of dedicated registrar support in order to enable the unit to function effectively and safely.

Bloomfield et al¹⁰⁸ contend that coverage of an ICU with physicians is mandatory for future cost-efficiency and quality of care. The question remains, however, as regards how best to provide such coverage. The authors suggest that, within teaching hospitals, use of residents and fellows can assist in providing intensive care in a cost-efficient manner. This study concluded that the use of residents and fellows within a major tertiary health centre is more cost efficient than the use of non-physician providers such as nurse practitioners or physician assistants.

In 2006, the Intensive Care Society in the UK published Standards for Consultant Staffing of Intensive Care Units¹⁰⁹. The standards outline a range of requirements for intensive care service delivery, most notably including:

- All units must have a named Director of Intensive Care
- A whole time Director, with primary responsibility including a commitment to patient care and management of the ICU, should be considered for ICUs with more than 20 Level 3 beds.
- There must be 24 hour cover of the ICU by named consultants with appropriate experience and competencies to manage the patients in that unit
- All units must have a minimum of 15 programmed activities (4 hour sessions) of consultant time totally committed to intensive care medicine each week per eight Level 3 beds
- Consultants should not be rostered for any other clinical commitment when covering the ICU during daytime hours

The Welsh 'Designed for Life' critical care standards have similar requirements for Consultant Staffing¹¹⁰. These include (for a Level 3 unit):

- Availability of 24 hour on-site anaesthetic cover
- A minimum of 14 daytime consultant sessions so as to provide for 7 day working and an extra allocation to allow for on-call.

The Australasian 'Minimum Standards for Intensive Care Units'¹¹¹ define medical staffing requirements for different levels of intensive care unit. They recommend that the medical director of Level II units (defined in Australia as those *capable of providing a high standard of general intensive care, including complex multi-system life support and capable of providing mechanical ventilation, renal replacement therapy and invasive cardiovascular monitoring for a period of at least several days*) and Level III units (defined in Australia as a *tertiary referral unit, capable of providing comprehensive critical care including complex multi-system life support for an indefinite period*) and the majority of all senior staff appointed to Level III units should be Fellows of the Joint Faculty of Intensive Care Medicine. They also state that sufficient specialist staff with experience in intensive care to provide for administration, teaching, research, reasonable working hours and leave of all types is necessary. The standards also specify that except for Level I units (defined in Australia as those *capable of providing immediate resuscitation and short term cardio-respiratory support for critically ill patients*) there must be at least one specialist exclusively rostered to the unit at all times together with 24 hour full-time junior medical staff with an appropriate level of experience rostered exclusively at all times.

Information gathered informally from Critical Care Experts estimates that consultant staffing required for an 8-bedded critical care unit in Wales would be 1.5 consultants and in Northern Ireland would be 1 consultant and 2 Specialist Registrars. These figures are based on a 12 hour shift, a 37.5 hour working week and a 22% factor for leave.

The following table presents a summary of the medical staffing levels as set out by a number of different jurisdictions presented at an ICSI meeting¹¹²:

Jurisdiction	Medical Director in place	Intensive Care Specialist : Patient ratio	In-training Doctor : Patient ratio
Australia (Joint Faculty)	Yes, Intensivist	1 : 12 daytime	-
Netherlands (Richtijn 2005)	Yes, Intensivist	0.45 : 1	0.6 : 1
UK	Yes, Intensivist	15 PAs : 8 beds (=1.5 WTE: 8 beds)	-
ESICM	Yes, Intensivist	5 : 6-8 beds (rota)	-
IBICM	Yes, With ICM sessions	-	-

Training

The Irish Board of Intensive Care Medicine (IBICM) was established in 1996 under the auspices of the Conjoint Board of the Royal College of Surgeons of Ireland, the Royal College of Physicians of Ireland and the College of Anaesthetists. The Intensive Care Society of Ireland is a constituent member and actively runs courses and scientific meetings.

The remit of the IBICM involves the promotion of specialty training and examination in intensive care medicine in Ireland through: Advising on training requirements; inspection of those hospitals seeking recognition for training in intensive care medicine; managing the examination of the Diploma of the Irish Board of Intensive Care Medicine (DIBICM); awarding the DIBICM to those graduates of both the examination and the programme of training defined within the regulations of the IBICM. In excess of 100 graduates have completed the DIBICM with many of these proceeding to fulfil the role of consultant posts with sessional commitment to intensive care within Ireland.

There are two categories of consultant post available to specialists in intensive care medicine in Ireland, both defined by the National Hospitals Office - Consultant in intensive care medicine and Consultant anaesthetist with a special interest in intensive care medicine. In order to satisfy the eligibility criteria for both the posts one must first complete the DIBICM or an equivalent (amongst a range of other agreed criteria).

Internationally, intensive care medicine has been recognised as a specialty for a number of years in some countries including the United States, Australia and New Zealand. Intensive care medicine is recognised as a specialty in certain EU countries. It is worth noting also that in Spain, intensive care medicine is now a mono specialty. In addition, it is recognised as a subspecialty across the UK. Currently, in Ireland there are two teaching hospitals (the Mater Misericordiae University Hospital and St. James’s Hospital) accredited, and internationally recognised for training in intensive care medicine.

Joint Faculty of Intensive Care Medicine of Ireland

It is understood that the proposed Joint Faculty, currently under consideration, will unite the College of Anaesthetists (RCSI), Royal College of Physicians of Ireland and the Royal College of Surgeons of Ireland for the following three key objectives: Achieve recognition for and promote the development of the specialty of intensive care medicine in Ireland; promote Fellowship of the Faculty; and promote education and training in intensive care medicine in collaboration with the Intensive Care Society of Ireland.

The Faculty aims to achieve the above objectives by:

- Structuring education and training in intensive care medicine in Ireland in order to provide a specialist intensive care medicine service
- Administering a specific curriculum and schedule of higher specialist training for doctors who wish to specialise in intensive care medicine and to accredit those doctors who have satisfactorily completed higher specialist training
- Taking responsibility for continuing professional development programmes in intensive care medicine
- Promoting and developing undergraduate and postgraduate medical education in academic institutions and liaising with intensive care academic institutions both nationally and internationally
- Acting as the recognised training body for the specialty of intensive care medicine provided for in the Medical Practitioners Act 2006
- Liaising with other similar international organisations.

5.4.2 Nursing staff

In considering critical care nursing it is useful to understand the broader context of nursing in Ireland before looking at the specific role and duties of the critical care nurse.

Career Pathways for Nurses in Ireland

It is appropriate that nursing and midwifery practice should develop to meet the ever-changing needs of the population and the health service, and should take place by an organic expansion of the current nursing role. Nursing roles across the spectrum of acute and critical care have been evolving and advanced practice in nursing and midwifery has developed internationally and nationally. In the United Kingdom, this has taken the form of the Nurse Consultant and in the United States this has more frequently become advanced nurse practitioners and clinical nurse specialists. Expansion of nursing roles within Ireland has been based on the scope of practice framework in 2000. This framework focuses on the range of roles, functions, responsibilities and activities which registered nurses are educated, competent and have authority to perform.

Advanced nursing practice

The Commission on Nursing¹¹³ recommended the further development of a defined career pathway for nurses beyond the level of generalist, which included the undertaking of formally recognised specialist post-registration courses at a minimum level of diploma for Clinical Nurse Specialists (CNS) and at masters level for Advanced Nurse Practitioners (ANP).

The role of the ANP was developed in Ireland in 2002 with the introduction of a Framework to develop ANP posts. In 2005, the National Council conducted a preliminary evaluation of the roles. This evaluation showed that where the role had been introduced it was successful. Today, the roles are spread over a wide variety of care areas, indicating that roles have been developed in response to health service need. The strong clinical focus (i.e. the retention of expert nurses in direct patient care) of the ANP role was the original aim of the National Council and this has proven successful. These posts continue to be developed and progressed, however, they have been slow to develop in the Critical Care setting¹¹⁴.

The defined role of the Clinical Nurse Specialist includes working with medical colleagues and/or interdisciplinary teams within a specific area of specialisation and includes evidence based practice, research and audit. Subsequent to the recommendations of the Commission, a framework for introducing the CNS role was established by the National Council for the Professional Development of Nursing and Midwifery¹¹⁵.

The defined role of the Advanced Nurse Practitioner includes utilising advanced clinical nursing knowledge and critical thinking skills to independently provide optimum patient care through caseload management of acute and/or chronic illness. The role includes: autonomy in clinical practice, expert practice, professional and clinical leadership and research (National Council for Professional Development). The National Council put in place a framework for the implementation of ANP posts¹¹⁶. It is a two part process which involves development of the job description and site preparation for the role and the accreditation of the nurses as an ANP. ANP's must be registered nurses on the live register of An Bord Altranais and educated to Master's level, with 7 years' post-registration experience including 5 years in the chosen speciality or area of practice. They are accredited by the National Council of Nursing and Midwifery and are required to be re-accredited on a 5 yearly basis

Nursing Management

Nursing services are continuously undergoing change and development in virtually all service sectors with growing demand levels, broader contribution to service delivery and increasing levels of sophistication and specialisation. In parallel, the health and social services are undergoing major changes with increasing emphasis on service standards and accountability, value for money and consumer empowerment. Nurse managers need to develop competencies to deliver today's services and to lead the evolution of services in this changing environment. Developing competencies will enable nurses to assess their developing needs and plan their own development.

Divisional Nurse Managers - The primary purpose of the role of the Divisional Nurse Manager is to co-ordinate the development and delivery of nursing services across a significant service sector and have defined management responsibility with explicit delegation of authority from directors of nursing and chief nursing officers. Competencies for this position include: Strategic and system thinker; establishing policy, systems and structure; leading on vision, values and process; working at corporate level; and developing staff.

Clinical Nurse Managers- The primary role of the role of the Clinical Nurse Manager is to co-ordinate and lead the implementation and delivery of nursing activities within a circumscribed unit of service. Competencies for this position include: Leading on clinical practice and service quality; building and leading a team; planning and organisation; and promoting evidence based practice.

The role of the nurse in critical care

“Nursing the critically ill patient is continuous and intensive, aided by technology and based on application of the nursing process – assessment of need, planning appropriate interventions, implementing the interventions and evaluating care”¹¹⁷ The Canadian Standards for Critical Care Nursing Practice separate the ‘critical care nursing process’ into five distinct phases:

- *Assessment* - continuous, comprehensive and holistic, using all available and appropriate sources
- *Data Interpretation* – formulating a nurses diagnosis based on analysis of patient data which indicate a need for nursing intervention
- *Planning* - developing a holistic plan of care including prioritised interventions developed in collaboration with the patient, family and health care team
- *Implementation* - delivering the plan of care consistent with independent and interdependent nursing functions
- *Evaluation* - consider outcomes of care delivered and revise in response to changes

The Canadian standards were further developed and defined within ‘Ontario’s Critical Care Strategy’ standards for critical care nursing¹¹⁸. These standards are organised into five categories each with competencies statements and their associated criteria or performance behaviours. Competence is based on the critical care nurse’s ability to integrate and apply knowledge based on judgement, skill level, and previous experience. The five major categories are: Professional behaviour/ethics; continuing competence and research; client and nurse safety/risk prevention; therapeutic and professional relationship/caring; and clinical skills, knowledge, integration and critical thinking.

American literature defining the competency profile of the critical care nurse¹¹⁹ sets out specific tasks underneath ten headings: Perform ongoing patient assessment; provide patient physical care; administer/manage patient medication; manage technical equipment; assist with specialised procedures; advocate patient/family needs; collaborate with healthcare team members; maintain a safe environment; documentation of medical managements; and promote professional development.

Nurse staffing for critical care

Nurse staffing levels must be independently defined based on the specific role of the nurse, the type of care being provided and the type of unit. The following standards and nurse:patient ratios may be useful for reference.

The **Intensive Care Society critical care standards**¹²⁰ set out suggested nurse staffing standards, and state that as a general rule: patients requiring intensive care need at least 1:1 nursing and patients requiring high dependency care, require, on average, 1 nurse : 2 patients.

The **Australasian ‘Minimum Standards for Intensive Care Units’**¹²¹ define nursing staffing requirements for different levels of intensive care unit, but note that the nurse:patient ratio, and the total nursing staff required depends on many variables such as the total number of patients, severity of illness of patients, the method of rostering nursing staff on 8 or 12 hour shifts, as well as individual policies for support and monitoring in each unit.

Type of unit	Nurse:Patient Ratio
Level I (capable of providing immediate resuscitation and short term cardio-respiratory support for critically ill patients) and Level II (capable of providing a high standard of general intensive care, including complex multi-system life support...and capable of providing mechanical ventilation, renal replacement therapy and invasive cardiovascular monitoring for a period of at least several days)	Should be capable of providing a nurse:patient ratio of 1:1 for all critically ill patients
Level III units (tertiary referral unit, capable of providing comprehensive critical care including complex multi-system life support for an indefinite period)	Should be capable of providing a nurse:patient ratio of greater than 1:1 for all critically ill patients
An artificially ventilated patient needs at least one nurse at the bedside at all times, a ventilated patient with more complex support such as renal replacement therapy and inotropic support may need two nurses per patient for at least some of the shift. Others such as post-operative patients admitted for overnight monitoring and treatment with a continuous epidural and supplemental oxygen, may require only one nurse per 2-3 patients. Allowances must be made for meal breaks, handover times, holidays, sickness, study leave, etc.	

An unpublished study references **international norms** for nurse:patient ratios, and for Intensive Care Units (providing Level 3 care). Examples include: England - 1:1, France - 1:3, Switzerland - varies from 1:1 to 1:2, Greece - varies from 1:2 to 1:3, and Finland varies from 1:1 to 1:2.

The Royal College of Nursing¹²² definition of the role of the critical care nurse focuses on the nurse needing the right knowledge, skills, associated staff ratios and competencies to meet the needs of a critically ill patient without direct supervision. It also states that when assessing staffing requirements for a critical care area, a number of factors should be taken into account:

- Workload and skill required to meet patient needs (including patient dependency)
- The role of critical care nurses
- Staffing levels and skill mix of the multi-professional team
- Contribution of health care assistants
- Presence of a supervisory shift leader
- Nursing work other than direct patient care
- The critical care facilities and physical environment
- Flexible working patterns.

In addition, Haupt¹²³ offers guidelines for nurse managers in Critical Care. A nurse manager is appointed to provide precise lines of authority, responsibility, and accountability for the delivery of high-quality patient care. Specific requirements for the nurse manager include the following:

- A RN (registered nurse) with a BSN (bachelor of science in nursing) or preferably a MSN (master of science in nursing) degree.
- Certification in critical care or equivalent graduate education.
- At least 5 years experience working in a critical care unit.
- Experience with health information systems, quality improvement/risk management activities, and healthcare economics.
- Ability to ensure that critical care nursing practice meets appropriate standards¹²⁴.
- Preparation to participate in the on-site education of critical care unit nursing staff.
- Ability to foster a co-operative atmosphere with regard to the training of nurses, physicians, pharmacists, respiratory therapists, and other personnel involved in the care of critical care unit patients.
- Regular participation in ongoing continuing nursing education.
- Knowledge about current advances in the field of critical care nursing.
- Participation in strategic planning and redesign efforts.

Physician-nurse collaboration

Research evidence has shown a correlation between unit-level organisational collaboration and patient outcomes and states that the importance of doctor-nurse collaboration in ICU care delivery should not be underestimated¹²⁵. Further, good communication is central to the development of good collaboration¹²⁶, nurses' reports of collaboration can be positively associated with patient outcomes, and more collaboration in making transfer decisions are associated with a lower risk of negative patient outcomes (death and readmission), controlling for severity of illness¹²⁷. Input from both professions produce better decision making, leading to better outcomes because the decisions are based on more complete information¹²⁸.

Advanced Nurse Practice in critical care

The nature of advanced nursing practice in the context of critical care has been evaluated in several studies^{129 130 131}. American literature states that the demand for acute care nurse practitioners (ACNPs) to work in collaboration with physicians in acute and critical care settings is growing. Acute care nurse practitioners are one of the largest groups of advanced nurse practitioners in the United States¹³². The purpose of the expert level practitioner and ACNP is to provide advanced nursing care, to patients who are acutely ill, across the continuum of care¹³³.

The introduction of ACNP roles have resulted in decreases in overall hospital length of stay, outpatient waiting times, and improved overall satisfaction from patients^{134 135 136 137 138 139}. Research studies have attempted to evaluate the impact of nursing roles on patient outcomes, but have encountered numerous methodological difficulties^{140 141}. The role has also been attributed to improved patient functional status,

enhanced symptom resolution and increased sense of well-being. Overall, the value of ACNP care has been well established in several studies assessing the outcomes of ACNP practice^{142 143 144 145 146 147}.

In Ireland, Critical Care Nurses work to a high level of specialist knowledge and skill and operate in a generalist environment. As a result there is little evidence of specialism at Clinical Nurse Practice or Advanced Practice in the Critical Care units. However many nurses have identified the opportunity to develop to advanced practice level particularly in the area of Critical Care Outreach or Stabilisation and transfer services¹⁴⁸.

Critical care nurse recruitment and retention

Although a shortage of nurses, particularly specialist nurses, is much quoted, there is not a large amount of literature discussing the issue. The American Association of Critical Care Nurses notes that the shortage of nurses is challenging hospitals internationally to provide safe, quality care to acute and critically ill patients. Although workplace conditions are typically cited as the leading cause of the shortages, other factors, including a rapidly ageing registered nurse workforce, have been implicated. Furthermore, in the US and in some European countries, fewer young people are choosing nursing as a career and graduating classes of registered nurses are decreasing in size. Remedies for the acute and critical care nursing shortage will require highly innovative initiatives and multiple long-term strategies. One solution to workplace issues may lie in the philosophy of the Magnet Hospital programme. The advanced practice nurse can play a significant role in providing leadership in addressing factors and designing comprehensive and innovative strategies directed at recruitment and retention of registered nurses in acute and critical care settings.

Although nursing is still seen as a desirable career choice in Ireland, local reports, such as the review of Critical Care Services in the Eastern Region¹⁴⁹ have noted a growing shortage of qualified critical care nurses and widespread variation in staffing and vacancies between hospitals. Nursing vacancies have reduced as a result of international recruitment drives but high turnover remains a significant challenge. A number of areas were identified as requiring continuing and further work in order to retain nurses and include the identification of staffing ratios based on patient dependency, education and training, promotional pathways, leadership and outreach services. The National Council for Professional Development¹⁵⁰ introduced the Continuing Professional Development framework as a lifelong learning process, to assist nurses both personally and professionally in further develop their careers. The presence of strong clinical career pathways support recruitment and retention, and should include generalist, specialists and advanced practitioners across all areas working with other professions using an inter-disciplinary approach.

Until 2003 there was little information available in Ireland on the exact number of nurses in employment. Following a detailed study commissioned by the Department of Health and Children in 2002, 'Towards Workforce Planning'¹⁵¹, a national human resource minimum dataset for use by all organisations employing nurses was established. This data set is described as a clinical instrument for the successful implementation of workforce planning. It collects information on turnover rates, vacant positions and underlying reasons for staff leaving employment.

5.4.3 Healthcare Assistants

The potential role of Healthcare Assistants (HCAs) in the ICU has yet to be fully explored^{152 153}. Chang (1995)¹⁵⁴ recommends the use of support HCAs to alleviate nursing shortages and support the activities of the nursing staff. Hind et al. (2000)¹⁵⁵ stated that due to the changes and complexity of patient care the introduction of HCA's would enhance quality of care by allowing qualified nurses greater time with their patients. Thornley (2000)¹⁵⁶ argues that the notion that HCAs are 'unskilled' or 'untrained' is a misconception. This is supported by the introduction of FETAC (level 5) qualification, which enables support workers to acquire recognition and accreditation of skills and competencies.

It has been suggested that identification of how to incorporate HCAs into specialised areas such as ICU is essential when considering resource utilisation¹⁵⁷. The research literature shows a wide variation between units in relation to the activities undertaken by HCAs, and their training. A majority of staff feel that the HCAs role should be extended, to include tasks such as washing patients, BM stick analysis, mouth and eye care, urine output measurements, assisting with meals and drinks, feeding patients, maintenance of equipment, preparing and dismantling dressing trolleys and general cleaning of bed spaces, the sluice, kitchen and equipment. However, the majority of staff feel that the HCAs require a "combination of theoretical, technical skills and practical assessments in their training/education programme to support their extended role"¹⁵⁸.

In 2001 the DoHC in Ireland recommended that the grade of Healthcare Assistant be introduced as a member of the nursing team to assist and support the nursing function 'to support the delivery of patient care under the supervision and direction of qualified nursing staff'¹⁵⁹. An educational programme at certificate level was developed for HCAs and piloted in 2001. This programme was evaluated in 2002¹⁶⁰ and is now available throughout the country at FETAC Level 5. This programme enables the support worker to acquire recognition and accreditation of skills and competencies. However there is currently no specific module in relation to the skills and competencies required to support an expanded role for the HCA in a Critical Care setting.

5.4.4 Support staff

Nursing staff account for over fifty percent of ICU expenditure; thus, it appears appropriate they be "employed for duties suitable to their skills, with tasks not requiring registered nurses being delegated to support staff"¹⁶¹. Both Knox et al.¹⁶² and Pearce¹⁶³ stated that nurses need to be freed from the burden of administrative and house-keeping tasks in order to allow them to use their knowledge and skills on their clinical role. The Royal College of Nursing¹⁶⁴ supports this stance and states that "Nurses roles should not include making up for a shortfall in administrative, clerical, technical and cleaning staff".

5.4.5 Allied Health Professionals

Allied healthcare professional (AHP) input into ICU care has been the subject of extensive analysis in recent years, in terms of skill mix and numbers required, and services to be provided and matters relating to grading.

An appropriately balanced team of staff including therapy professions and support staff is essential to the effective delivery of critical care services. Many of these professions do not have designated time in ICU

but their input is essential to the overall management of all critically ill people. Their contribution must be taken into account during the planning and resourcing of critical care services.

Currently there is a shortage of AHPs in Ireland with the need for increases endorsed by the Health Strategy (2001). This strategy provides for an extra 1,330 physiotherapist, 985 speech and language therapists and 875 occupational therapists to be trained by the year 2015¹⁶⁵.

Dietitians

The Intensive Care Society Standards suggest that dietetic input to critical care services should be 0.05 to 0.1 WTE per critical care bed¹⁶⁶. It is recommended that this input be at Senior Grade. This time allocation takes into consideration the time required for research, student training, audit, outreach services and continued professional development.

Important research findings suggest outcomes such as rates of infection, lengths of stay, and costs can be decreased by the early initiation of enteral feeding^{167 168 169 170}. Therefore, there should be nutritional protocols for critically ill patients to improve the adequacy and timeliness of nutrition support^{171 172}. In order for dietitians to develop competence in this area, it is recommended that there is peer review within the network group.

Occupational Therapists

There are currently no nationally or internationally defined OT staffing levels for critical care. Currently, in Ireland occupational therapists who work in critical care also cover other wards.

Speech and Language Therapists

Speech and language therapists (SLTs) have a role in the assessment and management of patients with communication difficulties. Mechanically ventilated patients report high levels of frustration when communicating their needs¹⁷³ due to the undervaluing of communication in ICU and their level of arousal¹⁷⁴. It is well documented that prompt intervention in the management of dysphagia can prevent costly and life threatening complications such as aspiration pneumonia¹⁷⁵.

The Welsh 'Designed for Life' standards¹⁷⁶ have a developmental standard which aims for enough SLTs to allow up to 3 patients per session to be seen.

Pharmacists

The role of the pharmacist in the intensive care unit is evolving rapidly to a new responsibility for ensuring definite drug therapy outcomes that improve the patient's quality of life.

'Critical Care Pharmacist' is not a recognised clinical specialty. There are no recognised minimum staffing requirements for pharmacists in an ICU. The Intensive Care Society in the UK has recommended 0.05 to 0.1 WTE pharmacists is required per single level III and for every two level II critical care beds. This staffing level is recommended to enable the clinical pharmacist to contribute to tasks such as training, service improvement and protocol development. They have also recommended that the ICU should have a dedicated pharmacist input.

The career structure for hospital pharmacists is currently divided into basic grade, senior and Chief II pharmacist. Chief II pharmacists are service managers, and there are currently no Chief II posts in critical care pharmacy. Thus, there is no recognised career path for clinical pharmacists in critical care and many highly skilled pharmacists are not retained in this area. This means that pharmacists who

have respected expertise in this field cannot progress their careers while working within critical care. There are no nationally accepted guidelines on the type and nature of competencies required by pharmacists working in critical care.

With regard to medication safety, Moyen et al. stated that critically ill patients are prescribed twice as many medications as patients outside of the ICU. Medication errors are common in an ICU and nearly all patients will suffer a potentially life-threatening medication error at some point during their stay in critical care¹⁷⁷. They are an important cause of patient morbidity and mortality. Many of these errors are preventable.

Dedicated ICU clinical pharmacists are important healthcare ICU team members¹⁷⁸. There is a substantial body of published evidence that the critical care pharmacist has a beneficial impact on patient care including a reduction in patient morbidity and mortality¹⁷⁹. Research has shown that including a pharmacist in multidisciplinary care rounds results in the:

- reduction in prescribing errors¹⁸⁰
- identification of adverse drug reactions^{181 182 183}
- continuity in individualised pharmacotherapeutic care¹⁸⁴
- medication safety promotion¹⁸⁵
- direct cost saving on drugs¹⁸⁶

Physiotherapists

The Intensive Care Society in the UK has recommended there should be 3.5 WTE of physiotherapy time for a 17 bedded critical care unit. Guidelines published by the ESICM¹⁸⁷ recommend one dedicated physiotherapist per 12 beds. A recent European survey¹⁸⁸ of ICU physiotherapists showed that one in four ICUs had no exclusive physiotherapist, and two out of three had no physiotherapist available at night¹⁸⁹.

In Europe physiotherapists perform both respiratory therapy and mobilisation or physical therapy. Specialisation does exist in respiratory therapy in Europe but this is localised with prominence in the UK. Nava et al.¹⁹⁰ states that the European physiotherapist performs the same role as a respiratory therapist, with involvement in the weaning process and the administration of NIV as well as the more traditional rehabilitation procedures. There is a strong variation in the number, role and profile of respiratory physiotherapist in critical care areas across Europe. This variation is due to factors such as staffing levels, training, and expertise^{191 192}.

Several studies have been conducted on the role of the physiotherapist in critical care. The research literature has well documented the benefits of including a physiotherapist during the weaning process^{193 194 195}, from mechanical ventilators. Other studies suggest that a physiotherapist should be leading the weaning team¹⁹⁶.

The benefits of physiotherapists during the weaning process include: Reduced patient anxiety¹⁹⁷; reduced duration of mechanical ventilation and the cost of intensive care¹⁹⁸; reduced length of stay; and fewer complications than standard care. Horst et al.¹⁹⁹ reported that protocol-based weaning by respiratory therapists leads to more rapid extubation and reduced hospital stays than physician directed weaning. The research also supports the physiotherapists' involvement in the monitoring and adjustment of NIV, a process requiring considerable time input, and constant availability, particularly at initiation²⁰⁰.

5.5 Transport and Transfers

A rapid and effective transport system for critically ill patients is a necessity rather than a luxury, and we must ensure that transport is not the weakest link in the chain in caring for critically ill patients²⁰¹.

Excluding patients who have suffered major trauma, most inter-hospital transport of critically ill patients is semi-elective in nature and should be of the highest standard. The reason for transfer can be divided into clinical and non clinical:

- Clinical reasons include undertaking a transfer to provide the patient with specialist care which is not available locally.
- Non-clinical transfers occur due to insufficient critical care capacity locally.

Clinical Transfer

Many patients have to be transferred to large tertiary hospitals (hub) in order to receive emergency care and access specialist services, and as a result, emergency inter-hospital transport is vital. This transport will also be required by patients brought to a local hospital but who urgently need to be transferred to a specialist hospital (spoke).

A recent review of inter-hospital transfers in an extended urban environment found no adverse clinical effects of initial transport and stabilisation with an average of 186 minutes at the outlying hospital²⁰². Another study noted a trauma system in a rural environment with transport times of 2 to 3 hours may benefit from transportation to and stabilisation in hospital before transfer to definitive care²⁰³.

In order for a transfer protocol to work, appropriate facilities and staff experienced in resuscitation should be available at the local hospital. One of these staff may then accompany the urgent transfer or a retrieval team may arrive, complete stabilisation and resuscitation for transfer, and effect the transfer. Local factors must be taken into consideration, including the geographic distances between local hospitals and tertiary care centres. Geographic factors challenge each region of the country and close co-operation between hospitals in each Critical Care Networks is essential²⁰⁴.

Trauma research has shown that patients who are directly transported to a definitive care facility have shorter length of stay and lower mortality^{205 206}. Research evidence from Scotland shows that longer pre-hospital travel times do not increase mortality or length of stay^{207 208}.

It is recommended that trauma patients are referred directly to a trauma centre. Other patients where transport to a critical care unit is:

- greater than one hour would benefit from admission to a local community hospital for early interventions and stabilisation before transfer to definitive care setting.
- less than thirty minutes will benefit by bypassing the non-definitive critical care facilities²⁰⁹.

Bypass protocols will need to be developed to ensure that the most seriously ill would be taken direct to trauma centres by ambulance instead of the closest hospital.

Mode of Transfer

Effective transfer systems generally appear to incorporate both road and air transport capacity. For example, in the West of Scotland 3.5% (13/365) of patient transfers are conducted by air, the rest by road²¹⁰. Road transfer has the advantage of being low cost, rapidly mobilised, less dependent on weather and provides better patient monitoring. Helicopters have the advantage for long distances but this advantage is reduced if landing facilities are not available at referring and receiving hospitals. Transport via helicopter is very expensive²¹¹, however, air transport can be very beneficial in light of the local terrain, roads, traffic, inter-hospital distances and health budget.

Staffing Requirements

The frequency of complications during inter-hospital transfer can be reduced if the critically ill patient is adequately resuscitated, monitored and accompanied by trained staff^{212 213 214 215 216 217}. The transfer team should consist of at least two suitably experienced attendants, one of whom should be a medical practitioner with suitable training in intensive care medicine, anaesthesia or other acute specialty provided they have the appropriate skills²¹⁸.

There is evidence that the use of dedicated transfer teams provides a more efficient transport mechanism and improves outcomes i.e. reduces associated morbidity and mortality^{219 220 221 222}. Retrieval teams avoid resources being stretched in smaller referring hospitals^{223 224}. It is recommended that the team should have a Director, who should be an Intensive Care Consultant, and have a high level of consultant input²²⁵.

Training and Equipment

Standardisation and optimisation of equipment and training are complementary requirements. Ideally, all equipment should be standardised to enable the seamless transfer of patients between hospitals without the interruption of drug therapy or monitoring²²⁶. Modern two-way communication between ambulances and receiving hospitals is a necessity and communication with the receiving hospital should be continuous^{227 228}. Transportation by personnel lacking suitable training may result in a higher incidence of life threatening complications^{229 230}.

Preparation for the Transfer

The preparation for transfer is the most time consuming part of the transfer process and can often take longer than the transfer itself²³¹. There is a balance, however, between stability and timely intervention. Patient outcomes often depend on time-sensitive critical care interventions^{232 233 234 235 236 237}. Thus, the impact of delays in transfer on outcome could be considerable²³⁸. Current delay times for thrombolytic treatment in Ireland exceed recommended therapeutic times and suggest the need for interventions to reduce delay²³⁹.

Physiological instability^{240 241 242} during transfer frequently occurs, and is often due to lack of proper assessment²⁴³ and stabilisation, before transfer. Patients should be resuscitated and stabilised before transport²⁴⁴ to avoid complications during the transfer^{245 246 247}.

Transfer Standards

Transfer protocols should be specific and made readily available to hospital personnel so that delays in transfer are avoided. When a transfer is required for capacity reasons, guidelines on which patient to transfer should be established²⁴⁸.

There is evidence to suggest that experienced anaesthetists, nurses and paramedics working to establish agreed local protocols and quality assurance programmes yield optimum results²⁴⁹. These protocols should be consistent with established national and international standards and should not necessarily replace clinical judgement but provide a safe framework in which judgement may be exercised. Local protocols should be subject to regular review and audit.

These protocols should incorporate:

- Which patients should be referred if the transfer is due to capacity reasons
- When a transfer should be made
- Who is responsible for accepting the patient
- The preparations and arrangements for the journey itself so that there is no unnecessary delay
- When the responsibility for the patient is transferred from the referring to the receiving hospital
- A mechanism for reporting critical incidents

The quality of transfer should be audited. The transfer team should keep a copy of the transfer record and critical incidents for audit purposes.²⁵⁰

5.6 Audit and Accreditation

Outcome audit

With a remit for England, Wales and Northern Ireland, the Intensive Care National Audit & Research Centre (ICNARC) has, for over ten years, promoted the culture for, and co-ordinated the collection and validation of, high quality clinical data on adult critical care services through their Case Mix Programme. Comparative reports, incorporating risk (case mix) adjusted hospital mortality and other relevant quality indicators, are provided to participating units, to hospital's critical care delivery groups and to critical care networks with a view to informing both local and network-wide planning, supporting development, integration and performance monitoring and organisation of the service delivery.

As well as providing comparative reports, national data are used by ICNARC to inform policy. One example of this, at a national level, is where national data were used to highlight the decreased likelihood of surviving to hospital discharge for patients discharged from critical care units at night (22:00 to 06:59)²⁵¹; subsequently adopted by NICE in their clinical guidelines on the acutely ill patient in hospital²⁵². The Case Mix Programme has also permitted the evaluation of new technologies²⁵³ and new ways of organising service delivery²⁵⁴ within critical care.

Process audit

More recently, the adoption of packages of interventions known as care bundles (a 'care bundle' is a group of interventions related to a disease process that, when executed together, result in better outcomes than when implemented individually, e.g. 'ventilator bundle', 'central line bundle', 'severe sepsis bundles') have been recommended by the English Department of Health. However, the evidence base underpinning both the interventions, and whether implementation and compliance with these package(s) improves outcomes, is limited. Current best practice suggests that adoption of these packages of interventions, while ensuring equitable provision of care, is accompanied both by local process audit (considering the degree of compliance with both the interventions and the package) and by outcome audit (measurement of any change in relevant outcomes), over time²⁵⁵.

5.7 Physical Infrastructure and Facilities

It is important to note that, in addition to the requirement for infrastructure and facilities to be fit for purpose for the type of care being delivered, "decisions about...staffing and skill mix will be affected by the layout of a unit...If there is complex layout of a unit, and a lower visibility for observation of patients, more qualified nursing staff will be required"²⁵⁶

In the UK Department of Health's guidance on healthcare facility requirements 'Health Building Note' standards, offer a specific set of standards for Critical Care. HBN 57 facilities for critical care units²⁵⁷ set very clear standards for physical infrastructure. HBN 57 defines clear standards for 'critical care areas' (CCAs) The guidance outlines the main principles in planning facilities for critically ill people including the provision of sufficient space in bed areas, increasing the number of single bedrooms, reducing Healthcare Associated Infection (HCAI), the patient's right to privacy and dignity, strategies for noise reduction and maximising natural light. The standards are set out in great detail including, for example, the immediate patient environment, unit adjacencies, design and configuration, equipment, security, maintenance and cleaning and electrical requirements.

In relation to the high level patient requirements, the standards state that all level 2 and level 3 critically ill patients need:

- A bed space that is large enough to permit all clinical interventions and accommodate multi-parameter monitoring and life-support systems
- Access to medical gases and electrical outlets
- Access to a comprehensive range of therapies for organ system failure, including dialysis equipment
- Protection of their privacy and dignity
- Natural daylight with outside views wherever possible
- Comfortable waiting and rest facilities for their relatives and other visitors

Haupt sets out the required Support Services for level III and level II centres²⁵⁸ as follows:

Support service	Level I and II Centres
Laboratory services	<ul style="list-style-type: none"> • Clinical laboratory available 24hrs a day (providing basic haematologic, chemistry, blood gas, and toxicology analysis). • POCT^{259 260} or rapid transport systems (e.g. pneumatic tubes)
Radiology and imaging services:	<p>24 hrs per day diagnostic and therapeutic radiologic procedures</p> <ul style="list-style-type: none"> • Portable chest radiographs. (Required due to therapeutic changes in 66% of intubated patients and 23% of non-intubated patients²⁶¹). • Interventional radiologic capabilities (invasive arterial, venous diagnostic techniques) • Computed tomography and computed tomography angiography. • Duplex Doppler ultrasonography. • Magnetic resonance imaging and magnetic resonance angiography. • Echocardiography (transthoracic and transesophageal). • Fluoroscopy.
Services provided in unit:	<p>Rapid access analysis of traditionally laboratory bound diagnostics and direct patient imaging.</p> <ul style="list-style-type: none"> • Continuous monitoring of the electrocardiogram (with high/low alarms) for all patients²⁶². • Continuous arterial pressure monitoring (invasive and noninvasive). • Central venous pressure monitoring. • Transcutaneous oxygen monitoring or pulse oximetry for all patients receiving supplemental oxygen. • Equipment to maintain the airway, including laryngoscopes and endotracheal tubes. • Equipment to ventilate, including ambu bags, ventilators, oxygen, and compressed air. • Emergency resuscitative equipment. • Equipment to support hemodynamically unstable patients, including infusion pumps, blood warmer, pressure bags, and blood filters. • Beds with removable headboard and adjustable position, specialty beds. • Adequate lighting for bedside procedures. • Suction. • Hypo/hyperthermia blankets. • Scales. • Temporary pacemakers (transvenous and transcutaneous). • Temperature monitoring devices. • Pulmonary artery pressure monitoring. • Cardiac output monitoring. • Continuous and intermittent dialysis and ultrafiltration. • Peritoneal dialysis. • Capnography. • Fiberoptic bronchoscopy. • Intracranial pressure monitoring. • Continuous electroencephalogram monitoring capability. • Positive and negative pressure isolation rooms.²⁶³

Point of Care Testing (POCT)

Point-of-care testing is rapidly growing and is particularly important in critical care units as it provides short turnaround times for a number of biochemistry and haematology analyses. This type of testing may bring challenges relating to quality control, training, increased cost and territoriality issues²⁶⁴.

Critical Care Technology

A study carried out across ten Brazilian medical-surgical ICUs in 1996²⁶⁵ showed that the ability of Brazilian ICUs to reduce hospital mortality was associated with the amount of technology available in these units. However, it should be noted that this study looked at the combination of technology availability, staffing, and diagnostic diversity, suggesting that for technology to be fully exploited, it will require the appropriate staffing and support.

Craft²⁶⁶ predicts that, by integrating both local and remotely located resources into a virtual whole, by making more readily accessible capabilities that used to exist outside of the care unit, by integrating all of the care unit capabilities into a seamless whole and by equipping the unit's staff with powerful decision support tools and on-demand reference information, current trends in technology are likely to increase both the efficiency and effectiveness of tomorrow's critical care environments.

Craft²⁶⁷ outlines key information technology trends that will impact the critical care unit:

- Advanced Networking
- More powerful and new kinds of computing platforms
- Better computer-human interface mechanisms
- Changes in instrumentation
- Advances in software infrastructure
- Increasing levels of interoperability among off-the-shelf products
- Automation support for many mechanistic tasks
- Ongoing development of decision support tools
- Just-in-time provision of reference materials

Conclusion

The following Chapters outline the proposed model for critical care in Ireland, and our specific recommendations for the implementation and delivery of the service. Both the model and the recommendations are built upon our analysis of the current reality of the service, as detailed in Chapter 4 and on the international best practice and research as presented and discussed in this Chapter.

CHAPTER 6
**Principles for the Model for
the Delivery of Critical Care**

6. Principles for the Model for the Delivery of Critical Care

- 6.1 Patient Focus**
- 6.2 Evidence-based**
- 6.3 Multi-disciplinary Care**
- 6.4 Critical Mass**
- 6.5 Access**
- 6.6 Phasing**
- 6.7 Supporting Reform**
- 6.8 Practicality**

In developing a national approach to delivering excellent and safe critical care it is vital that the model and its implementation are underpinned by a number of principles.

6.1 Patient Focus

The patient and their family must be the focus in developing a model for critical care services. The priority must be that the model enables the provision of highest quality care in a safe and timely manner. Care should be provided to the right patient, at the right time, in the right place by the right staff. The environment should facilitate this care while respecting the patient and their family. The patient within the critical care service is often unable to communicate for himself and it is therefore important that family and close friends are also considered throughout the care continuum.

6.2 Evidence-based

All practices within the critical care environment should be evidence based. The development of standards, care pathways and models of care must be firmly grounded in best international practice and the patient must be at the centre of all care.

6.3 Multi-disciplinary Care

The critical care patient requires input from many different experts. All aspects of the planning and delivery of critical care, including governance, work practices, and staffing must be built upon a multi-disciplinary approach. The integrated input and involvement of intensive care specialists, medical and surgical specialists, allied health professionals, and all nursing and non-nursing support will support the patient receiving the best critical care.

6.4 Critical Mass

Critical care is a complex and specialised area. Staff must be highly skilled and experienced and have a high level of competency in the delivery of the full range of critical care that their unit provides. In order for a critical care service to provide the highest quality care, the unit must have a critical mass of patient types.

6.5 Access

With 4.4 million people over a 27,000 square mile area the Republic of Ireland has a relatively low population density. With the exception of Dublin and its population of 1.7 million, Ireland's population is spread quite thinly across the rest of the country. In fact, the 2006 Census showed that Ireland has 1.37 million people living in sparsely populated rural areas. Low population density means that it is more difficult to reach critical mass in healthcare and, as a result, some people may have to travel further to reach an appropriate healthcare setting. Critical care service delivery will need to take accessibility and distance into account and ensure that remote or removed areas of the country are considered.

6.6 Phasing

This Review suggests significant changes are required to the way in which critical care is delivered and, indeed, where it is delivered. It is clear, however, these changes need to be appropriately phased. Services cannot be removed from any area until there is a system in place for that patient group to be efficiently and effectively cared for elsewhere. Increases in capacity in certain hospitals (particularly those with greater amounts of more complex critical care activity) along with appropriate transport, must be provided before critical care services are reorganised across the country. In addition, certain aspects of critical care services, in particular areas or units, require urgent development, particularly around physical unit infrastructure, and these must be prioritised.

6.7 Supporting Reform

This Review is taking place at a time where many other aspects of the health system are also under review. National initiatives such as the implementation of Primary Care Teams, the National Cancer Control Programme, the reorganisation of cancer surgery, and the development of local and regional 'centres of excellence' must all be taken into account. Critical care is a service area and in many ways the critical care required will be driven by what type of acute and non-acute services are being provided and where. However, the accessibility to critical care services of our population is a key consideration. The proposed model and recommendations take into account this balance.

6.8 Practicality

In today's economic environment, focus on value for money and practical implementation are very important but must not be at the detriment of quality of care to patients. The model and recommendations take into account the implementation of the changes, and the potential challenges around this but do not compromise on quality of care.

CHAPTER 7
**Recommended Model for the
Delivery of Critical Care**

7. Recommended Model for the Delivery of Critical Care

- 7.1 A Networked Approach to Critical Care
- 7.2 Definitions of Critical Care for this Review
- 7.3 Co-ordination of Critical Care Services
- 7.4 Summary

This section describes the recommended model for the delivery of adult critical care in the Republic of Ireland. It is based on best practice as well as Irish demographics and the healthcare system. Following this section, Chapter 8 presents specific recommendations for the delivery of critical care within the context of this model.

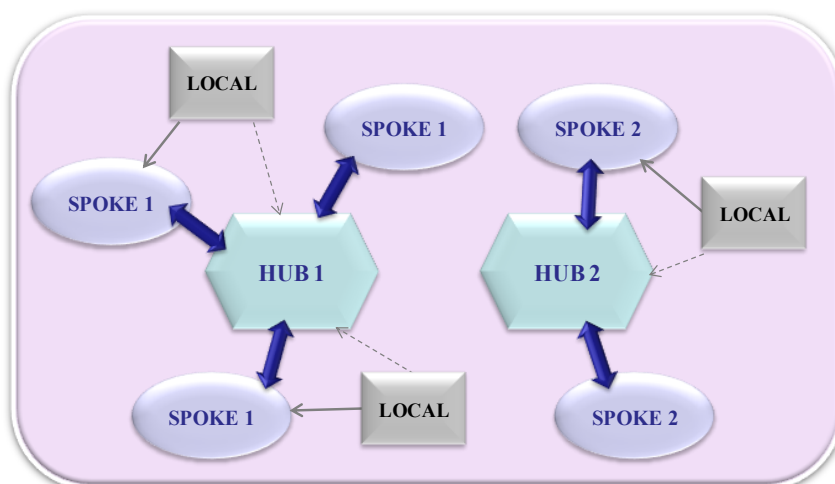
7.1 A Networked Approach to Critical Care

The model for adult critical care must be underpinned by clear standards, procedures and guidelines for critical care. These should ensure that the patient has access to the most appropriate service and critical care unit, which meets environmental and clinical standards and has appropriately skilled and experienced critical care staff to provide the service that the patient requires.

The recommended model for the delivery of adult critical care is underpinned by a **network approach**, in which 'hub', 'spoke' and 'local' hospitals will work together to provide the patient with safe and high quality critical care, in a timely manner. Each network will comprise a number of groups of 'hub', 'spoke' and 'local' hospitals, as shown in the diagram below.

Each network's geographical setup should be based on a combination of ensuring an appropriate number of patients to achieve critical mass, while balancing such issues as travelling distances and fitting with existing HSE organisational boundaries.

For example, a critical care network made up of two 'hub' hospitals, five 'spoke' hospitals and three 'local' hospitals.



It is our view that the geographical boundary of the current HSE administrative areas would serve as suitable Critical Care Networks. However, it is important that these are validated against other ongoing health service developments, for example: the exact configuration of adult acute services, including major trauma, the future of A&E services in smaller hospitals, and the evolving HSE administrative area boundaries.

Clearly it is not possible at this stage to dictate the exact configuration (i.e. number of critical care units and number of beds per unit) and the network structure due to these unknowns. It is outside the scope of this review and above all, the configuration of critical care services is driven by the structure of acute hospital services. Given these are still in evolution, it would be unwise to state a firm recommendation in this regard.

Each critical care network will be **self-sufficient in terms of critical care** having the appropriate numbers and mix of facilities to provide the full range of critical care services. There will be a small number of exceptions to this regional self-sufficiency approach in the case of national specialty units which have a limited number of centres (for example Neurosurgery).

Each critical care network will have access to a dedicated resource to **support all inter-hospital transfers** of all patients fulfilling agreed 'critical care' criteria. The transfer service will have dedicated medical and/or nursing staff assigned and appropriate vehicles and equipment. The critical care transport service will operate based on agreed guidelines and procedures. It will focus on ensuring that patients requiring transfers between 'hub' and 'spoke' critical care hospitals are moved in a timely manner, in an appropriately equipped vehicle, and supported by staff who are experienced in the transfer of critical care patients. The proposed model for transfer is discussed in further detail in the recommendations section (Chapter 8).

Each critical care network will have its own **management structure**. A **Critical Care Network Group** should be established to drive both strategic and day-to-day issues within the network. This group should include the Clinical Lead for Intensive Care from each of the network hospitals, nursing and AHP representatives and other appropriate stakeholders. The group would be expected to meet on a regular basis (at least monthly) and their role would include reviewing the operations of the network, the transfer system, quality, patient outcomes, education and research, training, staffing and budgeting. The network will be assigned a budget for the delivery of critical care services across all of the hospitals, and will distribute the budget as appropriate. (See R2 for further detail)

7.2 Definitions of Critical Care for this Review

There are many different classification systems for defining critical care. These vary from focusing on the type of critical care which the patient requires (ICS, 2002)²⁶⁸; to the type of facility that is required to provide critical care (Haupt, 2003)²⁶⁹. (See Appendix M for a summary of the ICS and Haupt definitions)

The manner in which critical care is defined in this Review and used in describing the proposed model for the delivery of critical care in the Republic of Ireland is adapted from these ICS and Haupt definitions. Two different categories of critical care have been detailed below. It is important to note

that these definitions have been customised for the Irish context, are different to both the ICS or Haupt definitions, and must be further reinforced by national standards for critical care.

Figure 13: Definitions of the types of critical care provided for the purposes of this Review and its recommendations

Category	Criteria
<i>Critical Care in a 'spoke' Hospital</i>	<p>Patients who require critical care but do not require long term complex multi-organ support or sub-specialist care (e.g. neurosurgical, cardiothoracic)</p> <p>This level of care is appropriate for patients:</p> <ul style="list-style-type: none"> • Needing short term multi-organ system monitoring and support • Needing advanced respiratory support in the form of short term ventilation or longer term uncomplicated ventilation (<i>specific limits must be defined as part of the national standards</i>) • Needing pre-operative optimisation • Needing extended post operative care • Moving to step-down care (e.g. no longer needing level 3 care) • With major uncorrected physiological abnormalities (<i>major disturbances to the function of any body system which would include failure or dysfunction of any particular organ system (e.g. heart, lung, kidney)</i>)
<i>Critical Care in a 'hub' Hospital</i>	<p>Comprehensive critical care for the most complex critically ill patients.</p> <p>This level of care is appropriate for patients:</p> <ul style="list-style-type: none"> • Needing prolonged advanced respiratory support • Needing advanced support and treatment for multiple organ systems • Needing sub-specialist critical care (e.g. neurosurgical, cardiothoracic, liver failure or burns)

7.3 Co-ordination of Critical Care Services

The co-ordination of critical care services between hospitals in the network is vital to the successful implementation of this model. The role of the 'hub' and 'spoke' hospitals in the delivery of critical care is to provide the highest level of critical care to the patient in the most appropriate environment which will provide the best possible patient outcomes.

All hospitals which have a 24/7 accident and emergency service and have a full range of acute medical and surgical inpatient services will have a critical care unit.

All hospitals with critical care units will work together within a network approach. Those hospitals which have a tertiary referral role, which provide subspecialist care or who have a major teaching role, will act as the **'hub'** within the network. These 'hub' hospitals will have the capability to care for the most seriously ill patients and will provide the full range of critical care, (as defined in Figure 13).

The other hospitals within the network which have critical care units, the **'spokes'**, will also provide critical care, as defined in Figure 13. 'Spoke' hospitals will provide for patients requiring short term multi-organ monitoring and support and short term or uncomplicated ventilation. They will not provide care for the most complex patients, for example those requiring multiple organ support for prolonged periods of time. In such circumstances, it will be in the best interest of the patient to transfer to a 'hub' hospital which has more experience in dealing with the most seriously ill critical care patient.

'Local' hospitals will be those that do not have a 24/7 accident and emergency service, or acute medical and surgical inpatient admissions. The 'local' hospital will not have a critical care unit but will have clear stabilise and transfer protocols in place for dealing with any requirement for critical care. The 'local' hospital will access critical care through the Emergency Care Network, through a '999' call, which will allow access to the services of an ambulance and an Advanced Paramedic who will stabilise the patient, assess their critical care requirement, and will transfer them to the appropriate hospital.

Some **specialist** hospitals require access to critical care services from time to time. Examples of these are stand-alone maternity, orthopaedic and psychiatric hospitals. However, policy in relation to these hospitals is moving towards specialist services being situated alongside (or within) general acute adult services and, over the coming years, the expectation is that this will be progressed. Thus, the specialist services, once co-located with acute adult services, will access the critical care facilities located there. In the meantime, it is vital that each specialist hospital ensures that agreements are in place with a nearby 'hub' or 'spoke' hospital for access to critical care services. In addition, if patients are recognised as high risk pre-operatively, they should be transferred to a hospital with appropriate critical care services to support the treatment/procedure.

All critical care services will be required to meet **minimum standards** around their facility and infrastructure. In addition, **best practice critical care work practices** must be standard, and staff competencies for provision of critical care will be defined and monitored, ensuring a high quality service for the patient and their family. These standards will inform the transfer protocols between the 'hub' and 'spoke' hospitals, clarifying each hospital's role and ensuring patients receive the right care in the right place at the right time by the right staff.

7.4 Summary

Figure 14: Overview table defining the critical care provided at different hospitals.

Type of Hospital	Critical Care provided	Transfer / transport
'Local' Hospital	No critical care unit	Ambulance
<p>Services provided</p> <ul style="list-style-type: none"> • Ambulatory and/or non acute inpatient services • Minor injury clinic • No Critical Care Unit 	<p>General ward care. If a patient's condition deteriorates and requires critical care the patient will be transferred to the nearest 'spoke' or 'hub' A&E department:</p> <p>In the intervening time, before the transfer, the 'local' hospital staff will treat the patient as required. Care may include:</p> <ul style="list-style-type: none"> • Airway management • Intravenous peripheral line access • Maintenance of patient safety 	<p>Local ambulance service, supported by Advanced Paramedics will stabilise the patient (if required) and transfer for critical care services to either a 'hub' or 'spoke' hospital depending on acuity.</p> <p>Communication regarding the severity of illness will be between the 'local' hospital Consultant and the Intensive Care Consultant at the 'spoke' hospital</p>
'Spoke' Hospital	Critical care unit	Critical care retrieval
<p>Service provided</p> <ul style="list-style-type: none"> • 24/7 Accident and Emergency Service • Acute medical and surgical inpatient services • Trauma – with the exception of major trauma involving major organ failure or multiple fractures (for which bypass policies are in place to divert to a 'hub' hospital.) • Critical Care Unit 	<p>Patients who require critical care (but not long term complex multi-organ support or sub-specialist care, e.g. neurosurgical, cardiothoracic) including the following:</p> <ul style="list-style-type: none"> • Patients needing short term multi-organ system monitoring and support • Patients needing advanced respiratory support in the form of short term ventilation or longer term uncomplicated ventilation (<i>specific limits must be defined as part of national standards to be developed (See Recommendation 1)</i>) • Patients needing pre-operative optimisation • Patients needing extended post operative care • Patients moving to step-down care (e.g. no longer needing level 3 care) • Patients with major uncorrected physiological abnormalities 	<p>Unit to unit transfer will be available through each Network to transport the patient to the most appropriate 'hub' hospital and return the patient to the 'spoke' hospital, if required, when the acute episode of care is completed</p> <p>Communication between the units will be between the Intensive Care Consultants in the 'hub' and 'spoke' hospitals.</p>
'Hub' Hospital	Critical care unit	Critical care retrieval
<p>Service provided</p> <ul style="list-style-type: none"> • 24/7 Accident and Emergency Service • Full range of acute medical and surgical inpatient services with tertiary referral role and subspecialist care • Major teaching hospital • Major trauma centre (including receiving major trauma via bypass policies) • Critical Care Unit 	<p>As for 'spoke' hospital above and also includes all complex support for multi-organ failure including the following:</p> <ul style="list-style-type: none"> • Patients needing prolonged advanced respiratory support • Patients needing prolonged monitoring and support for two or more organ systems • Patients needing sub-specialist critical care (e.g. neurosurgical, cardiothoracic, liver failure or burns) 	<p>Unit to unit transfer will be available through each Network to transport the patient between the appropriate 'hub' and 'spoke' hospitals</p> <p>Communication between the units will be between the Intensive Care Consultants in the 'hub' and 'spoke' hospitals.</p>

CHAPTER 8
Recommendations

8. Recommendations

- 8.1 Overarching Recommendations
 - Implementation of Critical Care Standards
 - Governance of Critical Care at National and Network Level
- 8.2 Number and Configuration of Beds
- 8.3 Governance of Critical Care at Hospital Level
- 8.4 Work Practices
- 8.5 Staffing, Education and Training
- 8.6 Transport and Transfers
- 8.7 Audit and Accreditation
- 8.8 Physical Infrastructure and Facilities

This section presents our recommendations for the future organisation and delivery of critical care services. These recommendations are based on the network approach to critical care as described in Chapter 7.

Two specific overarching recommendations have been identified as fundamental to the implementation of the future model for critical care and should be actioned immediately. The remaining recommendations are presented under seven distinct themes, as set out in previous chapters. All of the recommendations are built upon the proposed model for the overall delivery of services, international best practice and advice from national and international experts.

8.1 Overarching Recommendations

The organisation of critical care delivery is the most important determinant of patient outcome^{270,271,272}. It is therefore essential to provide a co-ordinated national approach to critical care organisation. Critical care is a high-cost environment that needs a control structure to ensure optimum use of resource both nationally and regionally, using evidence based practice to inform national standards. Networks must have in place a framework for dealing with clinical governance issues. It is also essential to ensure critical care development is aligned with other major service developments nationally. The implementation of strong and well-defined leadership of critical care, at a national and network level, will support the ongoing development of critical care as a key component of the acute hospital system.

In order to implement the model for the delivery of critical care successfully and to ensure that critical care is standardised and has a framework on which to be implemented and further developed, there are two overarching recommendations that must be fulfilled.

- R1 Establish and implement comprehensive critical care standards for the Republic of Ireland.**
- R2 Implement National and Network level critical care governance structures.**

R1 Establish and implement comprehensive national critical care standards for the Republic of Ireland.

The standards should ensure that patient safety and quality of care is in keeping with best international practice. They should address all aspects of critical care delivery including clinical practice, policies and procedures, governance and staffing.

HIQA will guide and oversee the development of the standards but their development and contents must be driven by critical care clinicians (e.g. the joint faculty, the ICSI, the IACCN etc.). Ultimately, the standards will need to be approved by HIQA. The standards must be:

- Evidence based and in line with international practice
- Reflective of national healthcare policy, local practice and the Irish demographic realities
- Developed with direction from clinicians and relevant quality and accreditation bodies

A clear and robust process for implementation and ongoing review of the standards must also be developed.

There are many different examples of critical care standards internationally. Some of the more recent offer best guidance, for example: the Welsh 'Designed for Life: Quality Requirements for Adult Critical Care in Wales' from 2006, the Dutch Guidelines for Adult Critical Care (2006) and the Australasian Joint Faculty of Intensive Care Medicine 'Minimum Standards for Intensive Care Units' (2003).

National critical care standards for Ireland must include detailed guidelines across all areas of critical care, including:

- *Levels of critical care*
- *Staffing requirements*, including medical, nursing, AHP and support staff
- *Operational approach*, including multidisciplinary care, unit governance, management and standardised policies and procedures
- *Unit design*, including space, layout, adjacencies, services, patient and staff accommodation, equipment, etc
- *Clinical governance and audit* both locally and nationally
- *Training and education*
- *Transport and transfer*
- *Outreach and early warning systems*
- *Organ donation*

The model and recommendations within this Review provide, in many cases, specific direction on issues which the standards will need to address in more detail.

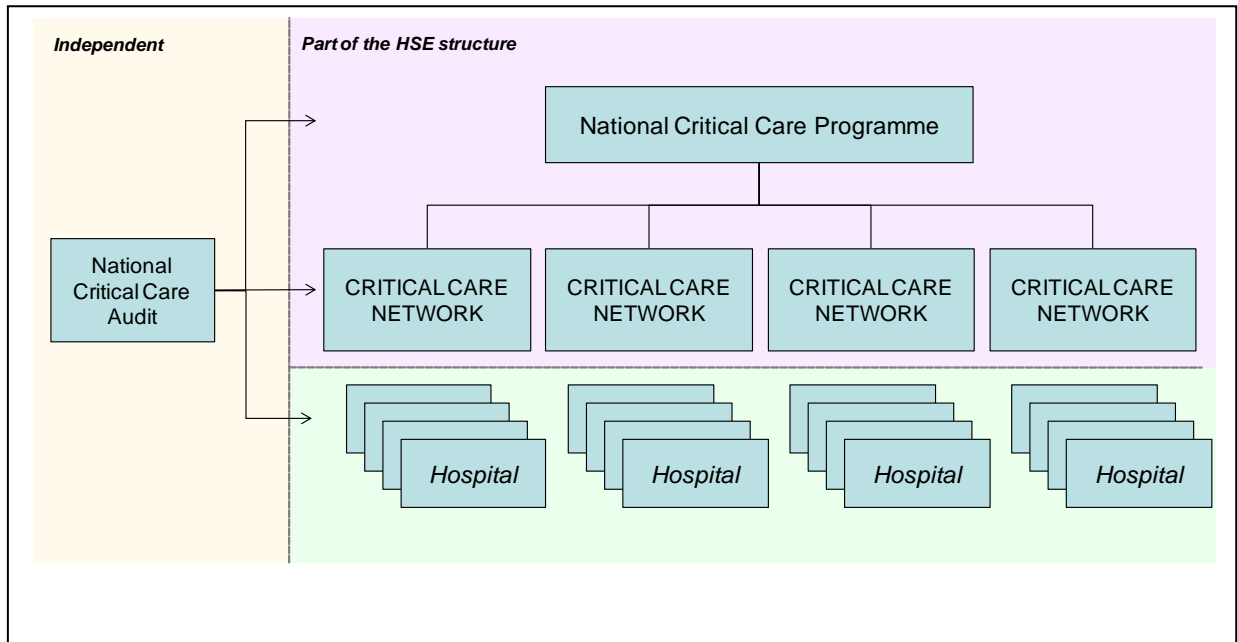
R2 Implement National and Network level critical care governance structures.

In addition to governance structures for critical care at hospital level (Section 8.3), it is essential that appropriate national and regional governance and management structures are implemented to oversee the development of critical care and the implementation of the recommendations of this review.

- I. Establish a ‘National Critical Care Programme’ (The National Programme) within the HSE to drive the development of critical care and the implementation of the standards.
- II. Establish a Critical Care Network Group to drive both strategic and day-to-day issues within each network, under the guidance of the National Programme.

Critical care is one of a small number of specialised functions or services (including others such as diagnostics and Accident and Emergency), that have an impact across the entire acute hospital. Decisions to be made in relation to critical care are likely to have a disproportionate impact on the wider transformation programme for acute hospitals and, as a consequence, a clearly defined leadership structure for the service is essential.

Figure 15: Overview of Critical Care National and Network governance structures



At a National Level

I. Establish a ‘National Critical Care Programme’ (The National Programme) within the HSE to drive the development of critical care and the implementation of standards.

The overall aim of the National Programme is to lead the development of critical care as a key service area and implement the recommendations of this Review. It is clear that significant developments in critical care are required and it will be essential that a dedicated and appropriately experienced group of people are charged with leading this change.

The National Programme should be led by a **National Critical Care Director** who will have a clinical critical care background, can provide leadership, is credible with critical care clinicians and staff, and is accomplished at leading change in service delivery. It is envisaged that this individual would be drawn from the national or international critical care community and would have a number of sessions seconded to the Programme, facilitating his/her role as ‘National Critical Care Director’.

The Clinical Lead from each of the networks, representatives from Nursing, Allied Health Professionals and the HSE’s hospital structure will work with the National Critical Care Director on the National Programme. The National Critical Care Director, and the Programme, will be charged with overseeing:

- The implementation of the recommendations of this Review, including the reconfiguration of the current critical care bedstock into critical care networks, and facilitating the development and implementation of national standards for critical care (which will be approved and formalised by HIQA).
- The ongoing review of the critical care configuration, capacity and standards, and monitoring of critical care outcomes.
- A strategic approach to critical care across Ireland which aligns with, and informs where necessary, other national/HSE initiatives.

The National Programme will be expected to work closely with relevant representative groups to obtain input and expertise in relation to specific areas of critical care, including: the ICSI, the IACCN, the Joint Faculty, An Bord Altranais, and the Centre for Nurse Education.

The National Programme must ensure the ongoing development of critical care includes sufficient emphasis on continuous quality improvement, health informatics and planning, performance management and service regulation, health economics and service transformation.

At a critical care network level

II. Establish a Critical Care Network Group to drive both strategic and day-to-day issues within each network, under the guidance of the National Programme.

Each critical care network will put in place a **Critical Care Network Group** to oversee the management and organisation of critical care across the network. Membership of this group should include the Clinical Lead of Intensive Care from each of the network hospitals, nursing and AHP representatives and other appropriate stakeholders. This group would be expected to meet on a regular basis, at least monthly.

A 'Network Clinical Lead' will be selected, who will have a renewable fixed term of office, and should be assigned a number of sessions dedicated to leadership of the network.

The Critical Care Network Group, led by the Network Clinical Lead, will focus on:

- the strategic direction of critical care for the network
- the cascading of national standards for critical care
- the critical care budget for the network
- co-ordination of bed capacity
- development of clinical guidelines
- audit of clinical outcomes and performance against guidelines and standards and overseeing network-wide initiatives (e.g. training and education).

Each critical care network should have a dedicated resource from within the HSE executive structures, to support the co-ordination and management of the network.

The Critical Care Networks will report to the National Critical Care Programme. Each network will be assigned a budget from the HSE, and will allocate this across the network with approval from the National Programme. The devolution of the budget to network level will allow for greater flexibility across the networks. It will encourage and facilitate a joint approach to best serve the needs of the network's catchment population through the combination of services and skills.

All those involved in critical care, including individual hospitals, networks and the National Critical Care Programme, will be informed by data and analysis from a formal National Critical Care Audit process. This process should be led by an independent body, working with or within HIQA, and will be a key component of how critical care functions nationally. The form of the Critical Care Audit process is addressed in further detail in Section 8.6.

8.2 Number and Configuration of Beds

RECOMMENDATIONS

- R3** The number of critical care beds should be increased by 45% from 289 to 418 beds. This will need to increase sequentially to 579 over the period 2010 to 2020.
- R4** The potential role of cross border relationships should be reviewed further to determine where synergies may be exploited.
- R5** All critical care units should work towards a minimum capacity of eight beds.
- R6** Coronary Care beds should not be located within a critical care environment.

Current Situation Snapshot – Number and Configuration of Beds

- *There are 289 funded, open, critical care beds in Ireland*
- *13% of critical care beds are situated in units which also contain coronary care beds*
- *Both early (unplanned) and delayed discharges are common to most critical care units*
- *In June 2008 278 patients were refused admission to critical care*
- *In June 2008 20% of HDU beds were providing ICU (Level 3) care*

Moving forward

Taking into consideration the current bed stock, the model for the delivery of critical care in the future and the analysis of the data collected, a number of options were explored. Detailed research and in depth consultation with critical care experts informed the most appropriate approach for the classifications of care to include factors such as acuity of illness and type of facility.

A detailed modelling exercise, based on the 28 day activity data collection, extrapolation to one year's data and projected to 2020 was the basis for the recommended bed numbers required. The modelling was carried out based on two levels of critical care, which are defined below, and these levels are also used in setting out the number and type of beds required going forward. (See Chapter 2 for further details on the approach to modelling).

Level 2: Monitoring and support for one organ system dysfunction (excluding gastrointestinal support and advanced respiratory support)

Level 3: Advanced respiratory monitoring or monitoring and support of two or more organ system dysfunctions (excluding gastrointestinal support and/or a combination of basic respiratory and basic cardiovascular support)

It is contended that evolving technology and health care practices may reduce the overall demand for critical care in the future. However, it is also recognised that lifestyle trends (e.g. growing obesity, increased alcoholism) are likely to increase the future demand for critical care. Expert advice sought

on the best approach to factoring these possible trends, for both reduced and increased demand, into the modelling process concluded that the expected reduction in demand and the expected increase in demand may well balance out, and therefore should not be factored into the modelling process for this Review. This assumption should be tested when national audit data for Ireland become available.

The capacity requirements presented in the recommendations below are based on activity from a single month, and do not make any specific allowance for changes to critical care work practices (e.g. potential impact of critical care outreach, changes in technology).

Taking into consideration the fact that the projections have been carried out based on a single month's data, and as we understand that new, more detailed population projections will be developed by the CSO in the near future, it is strongly recommended that **the projection exercise be repeated** as a validation exercise. This should be conducted once a sufficient amount of critical care activity and outcome data (e.g. at least twelve months) has been collected and validated.

Recommendations

R3 The number of critical care beds should be increased by 45% from 289 to 418 beds. This will need to increase sequentially to 579 beds over the period 2010 to 2020.

Figure 16, below, provides an overview of the recommended configuration of the required critical care beds, by HSE area. (See also Appendix L for detailed bed projections). This total configuration is based on a target occupancy rate of 80% and is divided between Level 3 beds and Level 2 beds.

The numbers and proportions of Level 3 and Level 2 beds differ between areas - this is as a result of the modelling being based on current activity, and the fact that there is at present a great deal of movement between areas for specialist (and general) care. It is understood that, in the future, each of the four HSE areas will be self sufficient in terms of providing access to all types of (non-specialist) care and this would result in a more evenly spread configuration of critical care beds, and indeed, a more consistent proportion of Level 2 and 3 beds.

The table below also provides a breakdown of the number of specialty critical care beds required, divided between Level 3 and Level 2 beds. The approach adopted to projecting general critical care demand by HSE area would not be appropriate for establishing the future configuration of specialist critical care beds due to the centralised location of specialist units currently. It is recommended that the National Critical Care Programme reviews this further to determine the precise location of these specialty beds.

It is important to note that the 2009 figures below represent the critical care *requirement* based on the activity data collected for this Review in 2008. The *actual* current critical care bed numbers total 289, broken down as 201 ICU and 88 HDU. 49 of these beds are dedicated to specialties. Thus the estimated gap between current actual capacity (289 in 2008) and the current required beds is 129 beds.

The number of Level 2 beds (117) compared to Level 3 beds (301) required is relatively low. This reflects the fact that the bed requirements are based on activity data for patients either admitted to a critical care unit or referred to a critical care unit and refused admission, but take no account of potential additional requirement for patients that are not referred to critical care. Consequently, the projections may under-represent the true requirement for Level 2 beds. Previous prospective hospital-wide audits of patients requiring critical care, for example that of Lyons et al in Wales²⁷³ have identified significant numbers of patients on general wards potentially requiring Level 2 critical care.

It is recommended that in introducing further critical care capacity the larger, more complex critical care services ('hubs') are prioritised. Equally, it is vital that no critical care capacity is

removed (from smaller units or otherwise) without the service (including beds and staffing) having been transferred to an appropriate alternative location.

Given the ongoing reconfiguration of acute hospital services and structures, it is acknowledged that the additional bed capacity presented below can be implemented through a combination of new additional critical care beds, reallocation of existing critical care resources, and a redesignation and reconfiguration of existing overall acute bed stock. The fact that a number of critical care beds are currently closed (46 in total) must also be factored in.

Figure 16: Required adult critical care beds 2009-2020 by HSE area, specialty and level

Required configuration of general critical care beds 2009 – 2020 by HSE area and level								
HSE Area	Level	2009	2010	2012	2014	2016	2018	2020
HSE West (Currently 66 beds ICU: 40, HDU: 25)	Level 3	55	58	61	63	66	70	73
	Level 2	25	27	28	30	31	33	35
HSE South (Currently 47 beds ICU: 40, HDU: 6)	Level 3	48	51	54	56	59	63	66
	Level 2	26	28	29	31	33	35	36
HSE Dublin Mid Leinster (Currently 62 beds ICU: 46, HDU: 18)	Level 3	64	67	71	76	80	86	91
	Level 2	17	18	20	21	22	24	25
HSE Dublin North East (Currently 65 beds ICU: 46, HDU: 19)	Level 3	63	67	71	76	81	87	92
	Level 2	26	27	29	30	32	34	36
Total General Beds (Currently 240 beds ICU: 172, HDU: 68)	Level 3	230	243	257	271	286	306	322
	Level 2	94	100	106	112	118	126	132
	All	324	343	363	383	404	432	454
Required configuration of adult specialty critical care beds 2009 – 2020 by level (nationally)								
Specialty Type	Level	2009	2010	2012	2014	2016	2018	2020
Neurosciences (Currently 10 beds ICU: 10, HDU: 0)	Level 3	46	48	50	52	55	57	60
	Level 2	7	7	8	8	8	9	9
Cardiothoracic (Currently 31 beds ICU: 15, HDU: 16)	Level 3	18	19	20	21	22	24	25
	Level 2	14	15	15	16	17	18	19
Liver (Currently 4 beds ICU: 0, HDU: 4)	Level 3	4	4	5	5	5	5	5
	Level 2	1	2	2	2	2	2	2
Burns (Currently 4 beds ICU: 4, HDU: 0)	Level 3	3	3	3	3	3	4	4
	Level 2	1	1	1	1	1	1	1
Total Specialty Beds (Currently 49 beds ICU: 29, HDU: 20)	Level 3	71	74	78	81	85	90	94
	Level 2	23	25	26	27	28	30	31
	All	94	99	104	108	113	120	125
Total Critical Care Beds (Currently 289 beds ICU: 201, HDU: 88)	Level 3	301	317	335	352	371	396	416
	Level 2	117	125	132	139	146	156	163
	All	418	442	467	491	517	552	579

R4 The potential role of cross border relationships should be reviewed further to determine where synergies may be exploited.

Discussions should be undertaken to explore the potential mutual advantages that may be gained by co-operation between acute hospital services in the Republic of Ireland and Northern Ireland. Currently, a stabilise and transfer approach is undertaken between hospitals within close proximity of the border when treating patients from the two jurisdictions. Advancing cross border relationships would offer the opportunity to increase efficiencies and patient safety.

R5 All critical care units should work towards a minimum capacity of eight beds.

It is recommended that all critical care units work towards a minimum size of eight beds in order to maximise efficiencies.

Although there is no prescriptive literature or evidence in relation to ideal unit size, in the view of the experts advising this Review, a unit size of between 8 and 12 beds will ensure that economies of scale are achieved which will enable greater efficiencies and competencies to be attained in all aspects of critical care delivery. In particular, with a requirement for all critical care units to have dedicated intensive care consultant (see R15), in a unit of less than 8 critical care beds, the consultant would be underutilised, resulting in an inefficient use of a valuable resource.

According to our expert clinical advisors 8 beds is generally regarded as the minimum number of beds required per unit for economy of scale and critical mass to ensure maintenance of skills and adequate training. If one assumes 80% occupancy for 365 days a year and a 50:50 split of level 2 and 3 patients then there are sufficient numbers of ventilated patient days to justify 24/7 Consultant and Specialist trainee cover (e.g. Critical Care fellows on a training programme).

If one assumes 24/7 Consultant and SpR medical cover working a 48hr week (EWTD) for 40 weeks per annum then 4.56 WTE are needed at each grade per unit. Larger units (e.g. 16 beds or greater) bring greater efficiencies as one Consultant can reasonably care for 12-14 level 2/3 patients in detail (80% of 16 beds) and cover larger numbers (e.g. 24-28) on-call provided there is adequate cover by specialist registrars/ fellows and senior nurses.

Our recommendations stress that manpower should be planned based on the needs of the patient rather than the needs of the bed. Minimal staffing levels should be provided, with the support of 'bank' staff, and staffing should not be retrospective but rather should be built on time and forward planning.

R6 Coronary Care beds should not be located within a critical care environment.

Many critical care units in Ireland currently include coronary care beds. Traditionally this has developed due to pressure on bed capacity. However, critical care units are not an appropriate environment for coronary care patients. Critical care and coronary care patients have different requirements. In particular, the coronary care patient requires a quiet environment which is not always possible in a critical care environment. Having joint critical care and coronary care units also raises infection control concerns that would better be managed if critical care was delivered in dedicated units. Providing critical care and coronary care in a single unit is an inefficient use of resources and may have a detrimental effect on a coronary care patient's recovery.

8.3 Governance of Critical Care at Hospital Level

RECOMMENDATIONS

- R7 A multidisciplinary ‘Critical Care Delivery Group’ should be established in every hospital with critical care services.**
- R8 Every critical care unit should be led by a dedicated intensivist and have a dedicated senior nurse manager.**
- R9 In the case of a hospital which has multiple critical care units (non specialist), the same dedicated intensivist and senior nurse manager should lead all units.**

Current Situation Snapshot – Governance of Critical Care at Hospital Level

- *Only 53% of units have a named consultant responsible for critical care and, of these 18 ‘critical care directors’, only 4 have any dedicated sessions assigned to the role.*
- *Decisions on admission and discharge to and from the critical care unit are made jointly by the primary physician or surgeon and the consultant anaesthetist/intensivist in 53% of units. In 27% of units admission and discharge decisions are made by the primary physician or surgeon alone.*
- *Nursing management structures vary, but almost all (94%) units have a CNM 2 or 3 with responsibility for the day-to-day running of the unit.*

Moving forward

These recommendations are in relation to the governance of critical care within hospitals and are intended to sit alongside the broader National and Network governance structures (R2). Reflecting best practice, the proposed governance model for Irish critical care units is built around a dedicated intensive care consultant lead, dedicated supernumerary nursing management and a strong multidisciplinary approach. In particular, strong communication and co-operation between the intensive care consultant and the primary consultant (physician or surgeon) is vital for optimal continuity of care.

Recommendations

- R7 A multidisciplinary ‘Critical Care Delivery Group’ should be established in every hospital with critical care services.**

This group would be chaired by the Clinical Lead of Intensive Care and would include representatives from all critical care stakeholders, including critical care nursing, the clinical lead from any specialist critical care units (if not led by the Clinical Lead of Intensive Care), clinical microbiology staff, allied health professionals working within critical care and surgeons/physicians who use the critical care service. This group should meet at least quarterly, and should cover operational, policy and strategic issues, including discussion and

update of unit policy and procedures and formal outcome reviews. This group will deliver the defined standards for critical care as set out nationally within their specific hospital.

R8 Every critical care unit should be led by a dedicated intensivist and have a dedicated senior nurse manager.

In both ‘hub’ and ‘spoke’ critical care units there must be an intensivist lead who does not have any other duties or responsibilities while leading the critical care unit. Where there is just one critical care unit in the hospital, the intensivist lead should also hold the position of Clinical Lead of Intensive Care. A senior clinical nursing lead will work closely with the intensivist and must have the appropriate management and leadership competencies. The nursing grade within the clinical lead structure should be determined by the size of the unit, the acuity of the patients, specialisation, etc. . The role should be clearly defined and reflect the competencies required for the particular critical care unit.

The lead intensivist (or Clinical Lead of Intensive Care) is responsible for both clinical and non-clinical matters within the critical care unit(s). The role must include:

- Leading critical care services across the hospital, including steering critical care policy, strategy and operational activities
- Leading the critical care team(s) in the care of patients in the unit(s)
- Over-seeing the supervision, training and ongoing education of medical staff
- Providing overall (non-clinical) management and leadership to the unit(s)
- Participating in the Critical Care Network Group
- Oversight of all aspects of the critical care unit, with appropriate delegation and support for non-clinical matters.

The senior nurse manager in charge of the critical care unit is responsible for managing service delivery and organisation of patient care. The role must include:

- A defined management role and function
- Leading the nursing team in the provision of care to patients in the unit
- Overseeing the supervision, training and ongoing education of the nursing team
- Leading the clinical direction of the unit in conjunction with the lead consultant and other members of the multidisciplinary team
- Participating in the Critical Care Network

R9 In the case of a hospital which has multiple critical care units (non specialist), the same dedicated intensivist and senior nurse manager should lead all units.

Having the same individuals leading multiple critical care units in a single facility will ensure greater continuity of care in relation to patients moving between units, will encourage uniformity in the application of standards and procedures and will support the best use of the available beds and staff.

Where specialist critical care units exist they may be led by the intensivist from the general unit(s), or may have separate leadership depending on the specific requirements of the unit and the hospital. For example, a cardiothoracic critical care unit could be led by a consultant cardiothoracic surgeon. If leadership is separate, the clinical lead of the specialist unit must sit on the ‘Critical Care Delivery Group’ and must be bound by the national standards for critical care as implemented within their hospital.

8.4 Work Practices

RECOMMENDATIONS

- R10 24 hour patient care should be led by intensive care consultants and delivered in an integrated manner by a multidisciplinary team with an emphasis on effective communication.**
- R11 National critical care standards, including critical care specific policies and procedures, should be localised and implemented in all critical care units.**
- R12 A model for critical care outreach including the use of early warning systems should be developed and implemented with the relevant staffing provision.**
- R13 The National Major Incident Plan must be reviewed in light of the updated structures for critical care.**

Current Situation Snapshot – Work Practices

- *Critical care specific policies are not widely in place*
- *Work practices vary significantly from unit to unit and sometimes vary within the same unit (for example in a mixed ICU/CCU)*
- *56% of hospitals stated that they provide some form of outreach from critical care, but only 9% of units are resourced to provide any form of critical care outreach service*
- *There is minimal evidence of formalised multidisciplinary team working*

Moving forward

Developing and implementing standardised and appropriate work practices that are in line with the unit activity and staffing will support excellence in the delivery of critical care and provide a more positive working environment for all staff. It is very important, in looking at all work practices, that they are regularly reviewed and updated.

Moving forward it will also be important that standard work practices reflect, and make best use of, the technology available to critical care and advances in certain areas, for example monitoring systems, point-of-care testing, and process automation. As technologies evolve it is envisaged they will become a standard part of critical care unit infrastructure within the national standards for critical care.

Some work practices may need to have a broader focus than just in a unit or hospital, and may need to reach across networks or regions. For example, the current delivery/availability of **continuous renal replacement therapy (CRRT)** is well established in order to provide regional access to the service, and it is imperative that this accessibility is maintained. It is vital, also, that the availability of CRRT services are reviewed in light of the reconfiguration of critical care services as a result of this Review, to ensure appropriate accessibility and capacity.

Recommendations

R10 24-hour patient care should be led by intensive care consultants and delivered in an integrated manner by a multidisciplinary team with an emphasis on effective communication.

The multidisciplinary team approach will be supported by the existence of the 'Critical Care Delivery Group' (R7) which will be a forum for multidisciplinary communication, for discussions on optimal ways of working and for patient outcome review from a medical, nursing and allied health perspective. In addition it will be important that an appropriate method of multidisciplinary working is put in place within individual critical care settings. This is likely to include joint ward rounds and case conferencing but will vary depending on the size and type of unit.

From a medical perspective, specific relationships will be of particular importance to the delivery of the highest quality critical care. This includes, for example, the close working relationship between the intensivist and specialist physicians or surgeons to treat the patient in an integrated manner. Again, the input from the respiratory and/or nephrology specialists will be vital in the case of many critical care patients.

R11 National critical care standards, including critical care specific policies and procedures, should be localised and implemented in all critical care units.

These standards must be comprehensive and appropriate for localisation for all types of critical care. Based on the current reality in critical care units, there are a number of areas that must be prioritised:

- *Admission and discharge policies*

These should include in particular, consultant intensivist responsibility for decision making, specific criteria for prioritising patients, bed management procedures, process for patient handover on discharge, practice for communicating with patients' family and friends and procedures for audit.

- *Transfer policies*

These should include, in particular, process for transfer for tertiary specialties and transfer for patients no longer requiring the full range of critical care but requiring specific supports e.g. renal dialysis.

- *Therapeutic policies*

These should include standards and procedures for insertion of drains, continuous infusions (e.g. inotropes), and prescribing (which should be developed in conjunction with the drugs and therapeutics committee).

- *Investigational policies*

These should include policies for routine investigations, e.g. 24 hour urine collection, biochemistry, transfusion, process for laboratory samples, and emergency pathology requirements.

- *Integrated patient pathways*

Critical care specific care pathways should be developed and implemented, to include clear documentation of care, identification of patient needs, goal setting, involvement of relatives and recording of variances for audit purposes.

Certain patient groups are cared for in specialist settings (e.g. paediatric, obstetric) but at times, caring for these patient groups in a general critical care setting will be unavoidable. Therefore it is vital that best practice patient pathways are developed for these patient types.

In addition, it will be important to develop a standard care pathway for the adolescent patient in the adult critical care unit. Although the physiological care provided will be the same as for adult patients and adolescents should be provided for in the adult setting, the policy must take into account the psychosocial needs of the adolescent and provide the appropriate support provided.

- *Equipment policies*

To include selection, purchasing, storage, sterilisation and servicing of mechanical equipment as well as defined processes for purchase, storage and disposal of consumables.

- *Service level agreements*

Relationships between critical care and key clinical services (e.g. pathology, radiology) must clearly define the working relationship, addressing issues such as priority of access, turnaround times, and communication lines. These must be proactively managed and regularly reviewed.

- *Organ donation procedures*

It is important that critical care units ensure that appropriate procedures and supports are in place in relation to organ donation. This will include guidance on managing the clinical and interpersonal aspects of organ donation in line with broader hospital and national policy. These procedures should reflect national guidance from the HSE.

R12 A model for critical care outreach including the use of early warning systems should be developed and implemented with the relevant staffing provision.

The exact outreach model should be determined by individual hospitals or units but should have four essential objectives:

- To enable more timely admission to a critical care unit to ensure best patient outcomes
- To avert admissions by identifying patients who are deteriorating and helping to prevent admissions or identifying those who are inappropriate for admission
- To enable discharges by supporting the continuing recovery of patients discharged from critical care
- To share critical care knowledge and skills with staff on wards

Early recognition of the potential and actual deterioration in the patient's condition is essential, accompanied by an appropriate response for early intervention. The use of an 'early warning scoring system' appears to be a useful adjunct in supporting ward based nurses in the early recognition of critical illness. This enables early referral for specialist assessment and intervention by other members of the clinical team.

Outreach programmes can also support the delivery of non-invasive ventilation outside of the critical care units.

The leadership and staffing of outreach activity may vary depending on the particular hospital, the critical care provided and the expertise of different staff. It may be appropriate for Critical Care Outreach to be led by an advanced nurse practitioner.

R13 The National Major Incident Plan should be reviewed in light of the updated structures for critical care.

It is envisaged that the critical care networks, under the leadership of the National Critical Care Programme, would review the arrangements already in place for major incidents. The desired output would be the embedding of the new national critical care system and infrastructure in a major incident plan which predicts and offers solutions to major incidents and disasters. It will be important that each hospital with critical care services ensures that they have the structures and systems in place to respond to both a local incident and/or a larger more widespread event as part of the national plan.

8.5 Staffing, Education and Training

RECOMMENDATIONS

Recruitment and retention

R14 Recruitment and retention programmes aimed at all critical care staff should be developed and implemented.

Medical - Staffing arrangements

R15 Every critical care unit should have 24/7 cover by a dedicated consultant with an agreed minimum level of intensive care training and accreditation.

R16 Medical staffing levels should be appropriate for the number and level of beds within a unit.

R17 Out of hours medical staffing of a critical care unit must be provided, at a minimum, by an appropriately experienced Registrar appointed to the critical care team.

R18 Every critical care unit must have on-site access to a consultant microbiologist.

R19 In all critical care units, the consultant in charge should not change on a daily or sessional basis.

Medical - Education and training

R20 The establishment of a Faculty of Intensive Care Medicine of Ireland should be finalised.

R21 Intensive care medicine should be recognised as a specialty division on the Register of Medical Specialists and as a division on the Medical Council's Register.

R22 A recognised standalone SpR intensive care programme should be introduced.

R23 An appropriate continuing medical education programme/structure should be established to maintain clinical competencies in line with the national critical care standards.

RECOMMENDATIONS *(continued)*

Nursing - Staffing arrangements

- R24** The HSE should undertake a review of nursing work practices to develop an appropriate staffing skill mix for Critical Care Units.
- R25** Nurse:patient ratios reflecting the clinical need and complexity of the patients should be implemented and supported with a flexible approach to the workforce.

Nursing - Education and training

- R26** The HSE should review all critical care educational programmes to ensure a standardised approach to the acquisition of appropriate specialised clinical skills and competencies for critical care.
- R27** A National 'Introduction to Critical Care' Module should be developed and completed by all nursing staff in Critical Care.
- R28** Every critical care service should have a dedicated Nursing Clinical Facilitator.

Health Care Assistants

- R29** As an outcome of the review of nursing work practices and skill mix (R24) the role of the health care assistant in critical care should be further developed.
- R30** A Health Care Assistant module, appropriate to critical care unit needs, should be established, working with SKILLS Project.

Support Staff

- R31** Appropriate non-clinical support staff to support administrative, cleaning, portering, housekeeping and audit-related duties in the critical care environment, should be put in place.
- R32** Appropriate critical care specific training for non-clinical support staff should be implemented.

Allied Health Professionals

- R33** Appropriately trained and experienced Allied Health Professionals should be available as a dedicated resource to critical care with staffing levels in line with best practice and standards.
- R35** Dedicated, ward-based pharmacists in all critical care units should be put in place.

Staffing for the delivery of high quality critical care encompasses a number of different types of staff including: medical, nursing, health care assistants, support staff and allied health professionals. In this section the staff groupings are addressed separately and, for each, the staffing arrangements and education and training requirements are considered in turn.

Increasingly, the health system is demanding innovation in work practice and there is a growing requirement for the efficient use of skills. Traditional healthcare roles and professional boundaries need to be reviewed. The recommendations within this section on Staffing, Education and Training, are built upon the recognition that critical care units require a broad skill mix, with a combination of staff types. It is also recognised that specific and appropriate training for all staff working in a critical care environment must be provided. The recommendations presented, taken together, aim to facilitate this **optimal skill mix** and provide for the **relevant training programmes** to ensure the availability of the required staff.

It is not considered appropriate to prescribe staff to patient ratios for the staff groupings until the skill mix for critical care has been reviewed and defined. This will be possible following the implementation of a number of the recommendations below and should be overseen by the National Critical Care Programme. There are many existing ratios and guidelines internationally which have been presented in Chapter 5. These may be used as a starting point for the definition of Irish staffing standards.

As is common across the healthcare sector, **recruitment and retention** is a key issue. It is envisaged that, when taken in totality, the recommendations both in this section and in the wider review will contribute to much improved critical care working conditions and therefore impact positively on recruitment and retention.

R14 Recruitment and retention programmes aimed at all critical care staff should be developed and implemented.

In addition to the implementation of the staffing and training recommendations within this section, it is specifically recommended that the National Critical Care Programme and the Critical Care Networks should work with the HSE and relevant professional bodies to implement specific programmes to address recruitment and retention of all critical care staff.

In particular, recruitment and retention will be enhanced through a variety of means:

- Adequate staff numbers will allow staff to provide a higher level of service, to avoid forced overtime, to lessen burnout and to provide a stronger multidisciplinary service.
- A strong framework for education and training for all staff, including structured, protected development time with appropriate resources and standardised qualifications and credits will be attractive to staff and will support more clearly defined career pathways.
- Improved governance structures and clear standards and protocols will enhance the management of critical care services, including decision making, leadership, and communication, and therefore, facilitate a more structured and less stressful working environment for all staff.
- Ensuring appropriate non-clinical support for critical care services, including IT and clerical support, will create a better working environment and allow for clinical staff to most appropriately use their qualifications and expertise.

- Flexible working arrangements should continue to be considered, so as to attract and retain a broad profile of staff members. Improvements to physical infrastructure, including unit layout, staff facilities and in-hospital adjacencies, will create a working environment which is more pleasant and efficient.

8.5.1 Medical Staff

Current Situation Snapshot – Medical Staff

- *Only 17% of critical care units have dedicated 24/7 cover by a consultant anaesthetist/intensivist*
- *The specialty of Intensive Care Medicine is not recognised as a division on the register of medical specialists*

Moving forward

Enhancing medical staffing structures in critical care will be vital to the improvement of the service. Initially (and immediately) it will be very important to deal with units where 24/7 consultant cover is not in place currently.

The new national standards for critical care must specify medical staffing requirements for ‘hub’ and ‘spoke’ critical care services. These should provide for the unit governance recommendations above, as well as ensuring that there is appropriate medical expertise available to provide the highest quality of critical care. It is recommended that the standards set would be based upon a combination of standards already in existence (e.g. ICS, Australia and New Zealand Joint Faculty of Intensive Care Medicine) and the current situation in Ireland, including the availability of suitably qualified medical staff, and the existence of suitable training programmes.

The development of academic and training structures to support intensive care medicine as a specialty will be essential to ensure the availability of appropriately trained and experienced doctors for our critical care services. This will range from university level education, to specialist training and continuing professional education. The recognition of intensive care medicine as a specialty will be a key driver of all intensive care training. Intensivist training will be vital so as to ensure enough qualified intensivists for the structures proposed. Further, ensuring the specialty focus of junior medical staff will support greater quality and continuity of care. Academic Teaching Hospitals will play a key role in delivering much of the specialist training, and the appropriate support (including funding) must be put in place to enable hospitals to support their academic and training role.

Recommendations

Staffing arrangements

R15 Every critical care unit should have 24/7 cover by a dedicated consultant with an agreed minimum level of intensive care training and accreditation.

Medical cover in all critical care units must be provided by a consultant with no other concurrent commitments. That consultant should be trained to a level that allows accreditation by the Irish Board of Intensive Care Medicine (IBICM). Consultants must be available by phone at any time and be able to be present at the unit within an agreed maximum time if required.

Ultimately all consultants working in intensive care should be fully trained and qualified intensivists. In the shorter-term it will be difficult to ensure the required number and coverage of intensivists so it will be essential that a minimum level of intensive care experience is defined. This experience may be in the form of a qualification (e.g. the Diploma), or may be as a result of significant years of experience in an appropriate unit.

R16 Medical staffing levels should be appropriate for the number and level of beds within a unit.

Staffing levels for medical staff within the critical care environment will need to be reviewed and defined in the context of medical staffing as a whole. The medical team must be considered as a group and the role of the SpR will be a vital part of that group. Standards will need to include minimum staffing for day-time and night-time, seven days per week, appropriate to the type of care being provided and the type of unit in which it is provided. Standards will need to specify dedicated staffing levels for critical care.

R17 Out of hours medical staffing of a critical care unit must be provided, at a minimum, by an appropriately experienced Registrar appointed to the critical care team.

In the area of critical care, specialist knowledge, experience and judgement are essential and, out of hours, when consultant staff are not necessarily on-site, it is important that the critical care service has appropriately trained medical staff on duty. The national standards must define the required experience level for Registrars covering 'hub' and 'spoke' hospitals. This recommendation will also be supported by the recommendation for the establishment of a recognised SpR intensive care programme (R22). It is also vital that the Registrar covering the unit does not have any concurrent responsibilities, and that on-call accommodation is provided within or appropriately close to the unit.

R18 Every critical care unit must have on-site access to a consultant microbiologist.

The consultant microbiologist plays a vital role in infection control and the minimum standard in place must include them being involved in ward rounds at least weekly and available for consultation by phone at all times. Large units will require daily interaction with a consultant microbiologist. The consultant microbiologist should also be involved in the 'Critical Care Delivery Group' as outlined under critical care governance (R2). Specific standards for access to microbiology services should be included in the national standards for critical care; these should be in line with the recommendations of the Irish Society of Clinical Microbiologists, the Health Protection Surveillance Centre (HPSC), and the Strategy for the control of Antimicrobial Resistance in Ireland (SARI).

R19 In all critical care units, the consultant in charge should not change on a daily or sessional basis.

The rotas of lead consultants will be organised to maximise continuity of patient care. The exact rota arrangements may vary between units depending on the number of consultants, the number of junior staff, length of shifts, cover arrangements, etc. Staffing should be adjusted to provide for blocks of critical care unit time for each consultant on the rota (at least 3-4 days at a time).

Education and training

R20 The establishment of a Faculty of Intensive Care Medicine of Ireland should be finalised.

The process of the establishment of the Joint Faculty is well underway, but it is crucial that it is finalised in order to progress medical education for critical care. The Joint Faculty will play a number of very important roles, including:

- Leading the ongoing evolution of education and training in Intensive Care Medicine, including ensuring appropriate accredited training hospitals and specialist programmes so as to provide sufficiently experienced candidates for the proposed critical care medical staffing arrangements.
- Supporting and developing research initiatives and programmes both nationally and internationally.
- Contributing expertise and input to the implementation of the recommendations of this Review, including the development of the standards.
- Participating in national and international programmes and initiatives to further develop intensive care medicine as a specialty and, in particular, to embed critical care as a fundamental element of the acute healthcare system in Ireland.

R21 Intensive care medicine should be recognised as a specialty division on the Register of Medical Specialists and as a division on the Medical Council's Register.

It is essential that intensive care medicine is recognised as a specialist division as early as possible in order to support the introduction of specialist posts and the implementation of training programmes.

R22 A recognised stand-alone SpR intensive care programme should be introduced.

Specialist training at registrar level will support the advancement of intensive care medicine as a whole. It will also support unit staffing, allowing for more experienced non-consultant hospital doctors to be included in critical care staffing.

Advanced critical care training should be mandated for those intending to specialise in critical care medicine as intensivists. Such training should require complementary specialty training in anaesthesia and/or acute medicine. It should be noted that a standalone SpR programme will allow doctors from any specialty to pursue a career in intensive care medicine, as opposed to the current situation which favours those following anaesthesia programmes.

R23 An appropriate continuing medical education programme/structure should be established to maintain clinical competencies in line with the national critical care standards.

The new national standards for critical care must define competencies required for medical staff, both for 'hub' and 'spoke' critical care services. They should then be linked with a continuing medical education programme which would identify relevant intensive care training and development for the upkeep of these competencies.

8.5.2 Nursing Staff

Current Situation Snapshot – Nursing Staff

- *The role of the critical care nurse is poorly defined, and many nurses are carrying out a large amount of unskilled and inappropriate functions*
- *There is no standardised introductory or foundation programme for critical care nursing*
- *Units stated that average unscheduled nursing leave per unit, including maternity, sick, and parental leave accounts for 123 hours weekly.*
- *The role of Advanced Nurse Practitioner exists in only one critical care unit*

Moving forward

Nurses currently play a very **broad and varied role** in the delivery of critical care services. Their specific activities and competencies vary depending on their training, the hospital in which they work and the complexity of care carried out in their critical care unit. One of the focuses for moving forward needs to be around a clearly defined framework for critical care nursing. This framework should build upon the following:

- Information gathered for this Review on critical care staffing /skill mix
- The role the critical care nurse currently undertakes, including non-value added activities.

The framework should include a review of skill mix, the role of the critical care nurse, the development of training, education and a career pathway. The framework should also include development of competencies that are supported by standardised post-registration education at both Hospital and Higher Education Institute level that are accredited. All educational programmes should relate to, and feed into, Post Graduate Diplomas and Master's programmes. This will support the development of a clinical career pathway for critical care nurses at the identified three levels of development:

- Registered nurse with specialist knowledge
- Clinical Nurse Specialist
- Advanced Nurse Practitioner

The framework should also act as a magnet to attract nurses to work in critical care. Retention relates directly to recognition of expertise, working conditions and opportunities for personal and professional development.

Critical care nursing is demanding and requires a higher **level of expertise** than that of a general nurse. Critically ill patients require access to a registered nurse with specialist training in intensive care nursing who will provide the lead and co-ordinate the treatment plan.

To promote the retention of critical care nurses in the current specialist nursing shortage, a number of steps will be required. These include the following:

- **Education and development:** the development of a learning culture which includes access by all staff to standardised, modular, competency based clinical education and training programmes is vital. These programmes are well established in some units, primarily large teaching hospitals. It is therefore important to build upon the programmes already established and make them uniform and accessible to all critical care staff. This competency based programme should be provided in modules with associated credits which will lead ultimately to a Post Graduate Diploma in Critical Care Nursing. It is important that the HSE in conjunction with the acute hospitals who provide critical care services demonstrate strong support, both financial and otherwise, for education and development of critical care nursing staff. Critical care nurses should have access to appropriate support in the areas of. Information and Communication Technology, equipment and training.
- **Skill-mix and patient dependency:** in optimising the role of the nurse in critical care, focus must be given to what responsibilities nursing staff are currently undertaking that are not appropriate or resourced. It is important to ensure the appropriate number of nursing staff to fulfil the defined role and support the level of care provided by that hospital.

Staffing should reflect the needs and dependency of the patient rather than be expressed as a rigid ratio. This includes all aspects of care: physical, psychological and social. A number of tools have been published to attempt to account for the time associated with these needs but are only really useful in retrospect and cannot be used predictively. Ideally, staffing should be flexible with sufficient staff to allow variation in the capacity of the unit without stretching the staff to beyond what is safe.

- **Further expand the role of the nurse:** critical care nurses already work in extended and expanded roles, but it is important to develop the role of the critical care nurse further and develop the role of clinical nurse specialist and advanced practitioner based on service need and identified improved patient outcomes.

Suggested roles and functions for specialist/advanced practice in critical care include expanding location of practice to include care, assessment and support to high dependency patients in ward areas (as an outreach service), acting as both an educator and consultant to ward nurses²⁷⁴. Another area where specialist/advanced nurse practice could play a vital role is in the area of stabilisation and transfer of patients.

Recommendations

Staffing arrangements

R24 The HSE should undertake a review of nursing work practices to develop an appropriate staffing skill mix for Critical Care Units.

In the light of predicted demographic challenges, for example, an ageing population with increased healthcare needs and the reduction of availability of international nurses, it is vital that critical care nursing roles are reviewed, with a focus on the effective and appropriate

utilisation of the skills of the nurse. This exercise should be completed in the context of the competency requirements, defined by An Bord Altranais. Much of the background work for this task has been completed already, including the information gathered as part of this Review and the staffing details gathered via the nursing data set collated as part of the DOHC's Towards Workforce Planning report²⁷⁵ in 2002.

It is envisaged that the review process will take place at a high level, bringing together a group of appropriately experienced nurses to define the core duties which the critical care nurse currently fulfils, and to identify duties which would more appropriately be completed by others. The group should consider in particular:

- The role of the nurse within critical care and the work which he/she carries out currently
- The type and amount of non-nursing duties being carried out by nursing staff
- The requirement for clerical (and other) support
- The potential need for the development of the role of the clinical nurse specialists and advanced nurse practitioner with particular reference to critical care outreach
- The role of the Clinical Facilitator
- The role of the Clinical Nurse Manager, at Levels 1, 2 and 3.
- The role of other supporting staff, including administration, cleaning, housekeeping, etc. and their training programme

As an outcome of this review, a workforce strategy for critical care nursing should be developed to include:

- A defined role for the nurse in critical care
- Clear career pathways for critical care nursing staff incorporating clinical, educational, managerial and research components (this should be aligned to competency levels and required post registration education)
- The role and function of the Clinical Facilitator in supporting education and continuing professional development
- The support required by critical care nursing (e.g. health care assistant, clerical, etc)

R25 Nurse:patient ratios reflecting the clinical need and complexity of the patients should be implemented and supported with a flexible approach to the workforce.

Due to the complexity and variability of each critical care patient's needs, fixed nurse:patient ratios cannot be specified prospectively on an individual patient basis. Nurse:patient ratios will vary between different types of units and patients; they should be based on:

- Patient acuity, stability and dependency
- Nursing competency and the degree of support available to reduce non-nursing duties (The Royal College of Nursing's 2003 Guidance for nurse staffing in critical care may be a useful starting point)
- Unit environment (layout and design)

An average complement of staff for the unit can be determined based on the average dependency level of patients seen in the critical care unit, but this must be flexible in order to meet the needs of patients on a day to day basis and to ensure safe and effective care.

Nurse:patient ratios are varied throughout the country currently. However, it is important that in the future, the ratios identified are used as a minimum standard in relation to patient acuity and dependency.

Use of a workforce planning tool in order to specify the average staffing requirement will require ongoing collection of acuity and casemix data (such as APACHE and TISS), that can be used by nursing managers to review nursing requirements for the 'hub' and 'spoke' (as well as specialist) components of the service. The review of nursing work practices and skill mix (R 24) will support the establishment of these ratios.

Education and training

R26 The HSE should review all critical care educational programmes to ensure a standardised approach to the acquisition of appropriate specialised clinical skills and competencies for critical care.

It is vital that all critical care nursing education is **underpinned by a number of principles**: standardisation, fitness for purpose, service driven, equity of access, flexible models of delivery, quality, clinically appropriate to patient need and sustainable, and is carried out in partnership with clinical services, centres for nursing and midwifery education (CNMEs) and higher education institutions (HEIs).

Education and training for critical care nurses should be **incremental, modular and competency based**.

Flexible learning options (e.g. e-learning programmes, evening and day time programmes) should be established in order to facilitate all nurses, regardless of geographical location in achieving and retaining competency levels.

Nurses working in critical care also require access to and support for relevant **ongoing education and clinical skills development**.

The programme for critical care nursing education must include the following:

- The development of a recognised and accredited 'introduction to critical care' module, which will be standardised, with defined content, duration, learning outcomes, and achievement of specific competencies.
- The standardised 'post graduate diploma in critical care nursing' and the 'masters in critical care nursing'.

In conjunction with the standardisation of the programmes, the HSE (in partnership with CNMEs, HEIs) should establish a **process for credit accumulation and transfer**. It should prioritise:

- Implementation of a system for educational accreditation of prior learning and experience based on appropriate demonstration of a range of experience-based skills and knowledge.
- A system for the awarding of credits recognising participation in critical care education and training, including study days as a component of retaining competence should be established. It is important that the credits allocated to courses and study days are standardised and relevant to their content and duration.

R27 A National ‘Introduction to Critical Care’ Module should be developed and completed by all nursing staff in Critical Care.

There must be a minimum standard and competency established for nurses delivering critical care. This must be done in partnership with An Board Altranais It is therefore essential that a National Critical Care Module be developed and completed by all nursing staff working in Critical Care within an agreed timeframe (minimum of approx 3-6 months). This Introduction to Critical Care module will be designed to provide a baseline for all nursing staff working in critical care.

R28 Every critical care service should have a dedicated Nursing Clinical Facilitator.

The ongoing training and education of critical care nurses must be supported by a trained Clinical Facilitator. The Clinical Facilitator will be responsible for education and continuing professional development of the critical care nursing staff, which will be developed in conjunction with the Continuous Nursing and Midwifery Education and Practice Development. He/She will co-ordinate the Critical Care Programmes and be the link person between the Higher Education Institutes and the clinical learning environment.

8.5.3 Health Care Assistants

Current Situation Snapshot – Health Care Assistants

- *The role of the health care assistant in critical care is underdeveloped*

Moving forward

In other jurisdictions health care assistants are well established members of the healthcare team and have skilled roles usually within a discrete area of practice. Irish healthcare is following international trends and the Department of Health and Children (2002) recommended the introduction of the grade of HCA to assist and support the nursing function²⁷⁶. Health care assistants are used extensively and successfully in many areas of acute hospital services but their involvement in critical care units varies.

A training programme for healthcare assistants is now widely available and delivered at FETAC Level 5 Healthcare Support Certificate. However, this programme does not have a specific module for critical care.

Improved skill mix and mainstreaming of the HCA role has been a key component of the modern agenda in Sustaining Progress (Government of Ireland, 2003). It is timely to consider expanding and changing the role of the HCA working in the critical care unit, ensuring appropriate training and competencies and appropriate structures for supervision and direction.

Recommendations

R29 As an outcome of the review of nursing work practices and skill mix (R24) the role of the health care assistant in critical care should be further developed.

The health care assistant can potentially play a significant role in the critical care unit. They can support the nursing staff in specific limited areas, helping to lessen the workload that is currently placed upon the nursing staff, particularly, around non-clinical duties but also around a number of duties requiring more than one nurse. It is important that the role of the HCA is built upon the work already done by the DoHC on 'Effective Utilisation of Professional Skills for Nurses' 2001.

R30 A Health Care Assistant module, appropriate to critical care unit needs, should be established, working with SKILLS Project.

Depending on the outcome of the review of critical care nursing practice and skill mix, the defined role of the health care assistant and the outcome of the pilot programme, an appropriate FETAC module should be developed and implemented so as to support the development of the required competencies for healthcare assistants.

A target for the number of health care assistants who will complete the FETAC module should be put in place, and progress reviewed regularly.

8.5.4 Support Staff

Current Situation Snapshot – Support Staff

- *Highly trained nurses are carrying out large amounts of administrative work within critical care units.*

Moving forward

It is appropriate that standard non-clinical support resources would be suggested for critical care units based on their size, activity, etc. In addition, it will be essential that any new structures or activities introduced (e.g. new ICT, clinical audit) must be adequately resourced and staffed.

Recommendations

R31 Appropriate non-clinical support staff to support administrative, cleaning, portering, housekeeping and audit-related duties in the critical care environment, should be put in place.

The outcome of the review of nursing work practices and skill mix (R24) will identify specific non-clinical support duties that would best be carried out by other staff. This will likely include general administration, secretarial support, data collection, research, domestic duties, etc. Non-clinical support staff should be appointed depending on the unit size and the staff mix within the unit, and the aim must be to maximise and most appropriately use nursing and non-clinical support staff skills. In many cases it may be appropriate to redeploy existing administrative staff from other areas of the hospital to have dedicated time for the critical care unit.

R32 Appropriate critical care specific training for non-clinical support staff should be implemented.

For specific non-clinical support roles, some training will be required. This will be particularly important for staff who do not work permanently in the critical care environment (e.g. contract cleaners, etc). The type of training provided should be appropriate to the specific role of the support staff member.

8.5.5 Allied Health Professionals**Current Situation Snapshot – Allied Health Professionals**

- *The majority of AHP's consulted were concerned that the support which they are providing to critical care patients is often at a 'general' or 'high' level - if more dedicated time was allowed, AHP staff could work more closely with the medical and nursing staff and provide a more in depth service to the unit and its patients.*

Moving forward

Allied Health Professionals provide a vital service to critical care and it is essential that they are supported appropriately, ensuring that time for critical care patients is protected, skills and competencies for the critical care service are learned and maintained, and crucially, that the AHP team are fully integrated members of the multidisciplinary critical care team. Increasing the number of AHPs in the acute hospital setting is a challenge across the country, and as a result it is likely there will be competition for AHP time and input. The national critical care standards must define minimum standards for AHP input and involvement in critical care, based on best international practice.

R33 Appropriately trained and experienced allied health professionals should be available as a dedicated resource to critical care with staffing levels in line with best practice and standards.

The national critical care standards must define minimum staffing levels for AHP support to critical care services, in line with the level of service being provided. Dedicated support must be available to critical care from:

- Pharmacy
- Nutrition and dietetics
- Physiotherapy
- Speech and language therapy
- Occupational therapy
- Clinical/biomedical engineering

Once the standards have been defined, the National Critical Care Programme should work with the relevant professional bodies to ensure the relevant required critical care training is in place for each allied health profession. Depending on the type and extent of the training required, it may be delivered through formal education or incorporated into on-the-job training.

R34 Dedicated, ward-based pharmacists in all critical care units should be put in place.

The critical care pharmacist plays an important role in the critical care unit, supporting improvements to medication management, streamlining of processes, supporting nursing and medical staff and lowering drug costs. The role description should include: monitoring and evaluating medication prescription, reviewing medication errors and taking corrective action, audit, etc. The role must then be implemented with priority given to the tertiary referral and subspecialist critical care units.

8.6 Transport and Transfers

RECOMMENDATIONS

R35 A dedicated, specialist critical care retrieval service should be implemented.

R36 The potential benefits of using air-transport should be periodically re-evaluated.

Current Situation Snapshot – Transport and Transfers

- *All aspects of inter-hospital transfers present significant challenges*
- *MICAS is an extremely limited service at present and difficult for most units to access*
- *'999'/emergency calls take priority over inter-hospital transfers, regardless of the situation or the acuity of the critical care patient*
- *Local services are often put under pressure as a result of staff having to accompany patients being transferred.*

Moving forward

In considering the transfer of critically ill patients, in the context of the model, it is important to look at both pre-hospital emergency care (primary transport) and inter-hospital (secondary) transport. Each plays a significant role in the care journey of the critically ill patient. However, it should be noted that the role of pre-hospital emergency care system extends further than critical care, so the recommendations made below are solely in relation to the critical care element of that system.

In relation to **secondary, inter-hospital critical care transfers** the overarching requirement is the availability of an appropriate system for transferring critically ill patients on a 24/7 basis, that includes dedicated staffing and appropriate equipment, supported by the relevant standards and procedures to provide optimum levels of care and a safe transfer. It should be noted that the vehicle and equipment appropriate for critical care transfers can be provided via a number of different models, and all of these should be considered. Options might range, for example, from specific dedicated critical care vehicles, such as the current MICAS, to flexible options where portable trolleys and equipment for the critically ill patient can be used in any standard ambulance vehicle, as is used

currently in the Northern Ireland Critical Care Transfer Service. Flexibility of vehicles should also be considered for example, the potential (if it exists) to use a specially configured critical care vehicle for both paediatric and adult critical care retrieval.

In planning for critical care transfers, both pre-hospital and inter-hospital, it is vital that all of the relevant stakeholders work together. In particular, this includes the critical care clinicians, the ambulance services and the policy makers. This is essential in order to develop and implement a system which meets clinical needs, can be delivered in an efficient manner, and builds on the current structures and facilities.

The transport solution put in place must be underpinned by a number of fundamental principles, including:

- **Personnel:** the availability of appropriately skilled and experienced personnel to support and escort the critical care transfer is the most important requirement.
- **Communication:** the communication between referring and receiving hospitals/units is essential, both in preparation for and during transfer. This should be at a senior level.
- **Clear guidelines:** detailed and transparent procedures and standards will support standardised levels of care and will minimise any confusion around setting up and carrying out transfers. These guidelines should cover all areas of the transfer including, for example, respective responsibilities of referring, transferring and receiving teams, the process for arranging transfers, competencies required of transferring personnel, cases in which transfers should be 'brought' (as opposed to retrieved), etc.
- **Training and equipment:** having access to the appropriate equipment and the competency to use it are central to the safe transfer. Specific training may be necessary at a number of levels: medical, nursing, paramedic, etc.

In the **immediate future**, when the retrieval service for inter-hospital transfers is being designed, and reconfiguration is underway, it is essential that **clear standards and protocols for inter-hospital (secondary) transfers within the current system are defined and implemented**. This should include the development of an operational specification for critical care transfers, agreed by all parties. The standards and protocols must define the following for all inter-hospital transfers involving critically-ill adult patients:

- The requirements for escort which provides appropriate personnel and skills to support a critically-ill patient during transfer.
- The equipment/monitoring required during transfer.
- The type/grade of vehicle required and maximum time to availability. This will require an agreement with the ambulance services that inter-hospital transfers are no-longer viewed as routine, with agreement specifically on how calls are prioritised and a system for giving advance notice for planned transfers. This would mean a new category of priority, e.g. 'urgent', to sit between routine and emergency categories.

There should also be agreed standards to ensure the following:

- Communication that is detailed and unambiguous, e.g. standard information sheet and checklists. The receiving consultant anaesthetist/intensivist should be able to feel confident that all relevant information is communicated by the referring consultant

anaesthetist/intensivist. The intention is to ensure clarity on the condition of the patient and to facilitate optimum decision-making regarding future treatment and support.

- Transfer groupings arranged so that smaller centres have dedicated contacts in the hospitals to which they would most often transfer, reflecting the hub/spoke system. Should a referring hospital need to request beds outside its transfer grouping, the ‘hubs’ which they contact should be aware of the bed situation within their own critical care unit and the equivalent units in their ‘spokes’.

It should be noted that the 2006 ‘Inter-hospital transfer of the critically-ill patient in the Republic of Ireland, Guidelines for Anaesthetists in referring units’ document, published by The Association of Anaesthetists of Great Britain and Ireland, is a useful resource and should be used as a starting point for planning for critical care transfers.

Pre-hospital Emergency Care refers to the standard ambulance services, whose main activity is responding to emergency (999) calls. Obviously, in some cases, the patients being transported will be in a critical condition and it is imperative that these are provided with appropriate care both pre-transport and en-route and brought to the most appropriate unit in a timely manner. The pre-hospital emergency care network plays a vital role in the transfer of patients from a ‘local’ hospital (with no critical care services) to a ‘hub’ or ‘spoke’ hospital when critical care is required. The ‘local’ hospital will stabilise the patient, and request the emergency transfer through the 999 system. In both of these cases, the role of the advanced paramedic is key – and minimum competencies in all areas of stabilisation and transfer of the critically ill patient (including intubation and ventilation) is essential.

Within the Pre-hospital Emergency Care structures and systems, **hospital by-pass protocols are essential**. Protocols must be in place nationally to ensure that patients are assessed and brought to a facility which is appropriate for their needs. The location of trauma centres, sub specialist services and of course, critical care services will influence the choice of hospitals to which the protocols direct certain types of patient.

Recommendations

R35 A dedicated, specialist critical care retrieval service should be implemented.

A specialist retrieval service should be accessible to all critical care networks. The following will be required to ensure the successful co-ordinated operation of such a service.

- Dedicated (supernumerary) intensive care staff who have experience in transporting critically ill patients and can provide appropriate personnel and skills to support a critically-ill patient during transfer (e.g. senior intensive care trainee and intensive care nurse with training in inter-hospital transfer). Dedicated transfer teams will need to be appropriately located geographically to serve each of the critical care networks.
- Defined priority for inter-hospital transfers with a maximum response time for ambulance availability, e.g. 1 hour. It is expected that the majority of transfers could be notified and planned in advance to help the ambulance services to satisfy such a standard.
- An adequate number of appropriately configured vehicles which are compatible with required equipment (e.g. trolleys, etc).

- A centralised (e.g. network level) bed management service which creates one point of contact with access to bed availability information to help referring hospitals to locate an appropriate bed.
- Agreement on potential exceptions to this retrieval based model for situations which are time critical (e.g. some severe head injuries, some causes of uncontrollable haemorrhage). In such cases staff from the referral site would accompany the patient using, as far as possible, the same operational arrangements as the retrieval service.
- Define and implement the standards for the development of critical care transfer in Ireland, including competency based training programmes, modes of transport and quality assurance.

R36 The potential benefits of using air-transport should be periodically re-evaluated.

At the current time we consider that such a strategy is expensive, has limited capacity and would require considerable infrastructural changes on many hospital sites. With these factors in mind, the option is not seen as an immediate priority but should be re-evaluated periodically, in the light of evolving acute sector reconfiguration and demand for critical care services.

8.7 Audit and Accreditation

RECOMMENDATIONS

Audit

R37 The collection of a national, standard clinical dataset on the case mix, outcome and activity of adult critical care on all admissions to all adult critical care units should be developed and implemented

R38 A national audit system to foster improvements in the organisation and practice of critical care through national benchmarking, reviewing trends and continuous comparative audit, should be implemented.

Accreditation

R39 The National Critical Care Programme should work with HIQA to implement a system for critical care unit licensing based on the national standards.

Snapshot – Audit and Accreditation

- *No national datasets for critical care are available*
- *The majority of units do not have the systems in place to collect data*

Moving forward

This Review has amassed a large amount of useful and relevant data in relation to critical care activity nationally. It is necessary that data gathered are used proactively and that mechanisms are put in place for further data gathering to build on the progress made. Information collection exercises such as those carried out as part of this Review are costly.

Regular and accurate information on clinical activities and outcomes is vital for the ongoing development of critical care as a service. In addition, data collection and analysis will allow for the implementation of recommendations from this Review to be monitored and reviewed by the National Critical Care Programme.

It is important that critical care data collection initiatives are not developed and implemented in isolation of other health sector and hospital information systems. The system and process should be developed in conjunction with the ongoing development of HSE/HIPE systems, including electronic patient record systems, so as to reduce duplication and allow for as much overall data usability as possible. However, it should be recognised that due to the level of detail and clinical emphasis of critical care service and outcome data, it is required that the data is collected at unit-level by specially trained and experienced staff.

Recommendations

Audit

R37 The collection of a national, standard clinical dataset on the case mix, outcome and activity of adult critical care on all admissions to all adult critical care units should be developed and implemented.

Additional resources must be provided in the critical care units to support such data collection, data entry and data validation. Data collected should be used internally for local clinical audit, both outcome and process audit, feeding into continuous improvement for the service. The national, standard dataset should initially include data to permit case mix, outcome and activity data sufficient to record and review: clinical outcomes, infection surveillance and transfers. [Note: data collection for staffing and governance would be cross-sectional i.e. at a specific time point not in an ongoing fashion as for case mix, outcome, activity etc.]

The use of a standard clinical dataset that can be compared between units both nationally and internationally will be necessary to allow Ireland to compare itself to other similar countries in terms of critical care performance. It is recommended that the standard clinical dataset be agreed by the National Critical Care Programme. It is suggested that the UK Case Mix Programme dataset should be used as a starting point. An overview of this dataset, in the form of summary data flows are provided in Appendix N.

The development of the dataset should include consultation with HIPE to ensure an appropriate minimum dataset (a subset of the full standard dataset) is included that will be fed into the HIPE system. This minimum dataset will focus on high level activity, acuity and volume information. In addition, data to inform resource allocation could be included within this minimum dataset. It will be collected at unit level, as part of the broader critical care activity audit, and will be exported to HIPE for incorporation and analysis within their programme. It is

recommended that the UK Minimum Dataset be used as a basis for consulting with HIPE regarding the desired minimum dataset for Ireland. (See UK Department of Health Minimum Dataset in Appendix O).

R38 A national audit system to foster improvements in the organisation and practice of critical care, through national benchmarking, reviewing trends and continuous comparative audit, should be implemented.

National audit is vital for assessing success and progress across critical care services. It is important that this role is undertaken by an independent, external entity in accordance with best practice in audit, with overall accountability to HIQA. It is envisaged that this function would be contracted out to an organisation with the relevant skills and experience. In the development of the National critical care audit system, it will be important that the relationship with HIPE and HIPE data are fully explored. As stated above (R37), it is envisaged that the national critical care audit system/programme, will provide the minimum critical care data set to HIPE, in a suitable format, to be agreed by both parties.

Accreditation

R39 The National Critical Care Programme should work with HIQA to implement a system for critical care unit licensing based on the national standards.

In accordance with the outcomes of the Commission on Patient Safety and Quality Assurance (the Madden Report), it is envisaged that a formalised licensing system for critical care as a service area will be initiated. The National Critical Care Programme should work with HIQA to ensure that the national standards specific to critical care inform the licensing process. Ultimately, the cascading of the national standards to network and local level will support continuous improvement in the delivery of critical care nationally and locally, and will fulfil licensing requirements.

8.8 Physical Infrastructure and Facilities

RECOMMENDATIONS

R40 All new-build critical care units must adhere to facility specifications as set out in the national standards for critical care.

R41 Interim infrastructure and facility standards should be developed for existing critical care units and plans should be put in place to prioritise the upgrade.

R42 All critical care units should meet national infection control policies and guidelines in accordance with guidance from HIQA and the HSE.

R43 All critical care units should have access to modern, fit for purpose, equipment for the delivery of critical care, and should have access to the full range of diagnostics, consistent with the new national standards for critical care.

Current Situation Snapshot – Physical Infrastructure and Facilities

- *Facilities and infrastructure for infection control are inadequate*
- *In June 2008 34% of critical care patients could not access isolation rooms when required*
- *23% of units do not have a designated dirty utility room*
- *Family facilities, staff facilities, offices and common areas are lacking*

Moving forward

National infection control and risk management standards, implemented by HIQA, are already in place for all acute hospital settings. Critical care unit compliance with these is vital, and should be prioritised. Compliance with the 2007 European Directive for Reusable Medical Devices for all reusable medical products should also be ensured. Critical care units will need to guarantee that unit-specific policies and procedures are in place to support the ongoing compliance with these standards.

Ultimately, Ireland's critical care services must work towards meeting a specific set of environmental standards, for example: as defined in the UK Department of Health's standards for facilities 'Health Building Notes' for critical care: HBN 57. However, the current physical layout of each critical care unit is different and some units will be able to meet these standards more easily than others. For this reason, recommendations have been provided below in relation to new build units. Regarding existing units, it is essential that, in the process of developing national standards for critical care, a baseline standard is set immediately. Timeframes should then be put in place for meeting that standard and capital funding made available in line with the agreed phasing.

Advances in technology have prompted changes in most healthcare settings over recent years, with critical care no exception. Improvements to communications technology have resulted in the ability to respond faster than ever before, access to computers in units have allowed for the most up to date clinical and pharmacological information to be available at the touch of a switch, and new diagnostic and monitoring techniques and equipment have improved the patient experience, the speed of results and in some cases offered quality and safety improvements. Technological advancements will undoubtedly continue over the coming years, and it is essential that they are built into critical care unit design and practice as efficiently as possible. In particular, technology for patient monitoring, the administering of drugs, record keeping, process automation and methods of communication between units or departments may be aspects which can be standardised through unit infrastructure and facilities standards.

Recommendations**R40 All new-build critical care units should adhere to facility specifications as set out in the national standards for critical care.**

The national standards must specify minimum facility standards for new critical care developments, which all new-build units must meet. The standards set may be the HBN standards (which are currently accepted guidelines for facility planning and development) but may be further developed if desired.

R41 Interim infrastructure and facility standards should be developed for existing critical care units and plans should be put in place to prioritise the upgrade.

The national standards for critical care must include the development of interim infrastructure and facility standards (working towards compliance with the national standards). The interim standards should prioritise areas which are high-risk and/or have been highlighted as areas of specific need (for example: isolation facilities, appropriate storage space, facilities for families and friends, etc). In relation to the implementation of these national (interim) standards, a timeframe should be implemented with clear phasing and milestones. Additionally, capital funding must be put in place to support the upgrades to meet the baseline standards within a set timeframe.

R42 All critical care units should meet national infection control policies and guidelines in accordance with guidance from HIQA and the HSE.

It is likely that compliance with national standards will soon be linked to hospital (and indeed critical care unit) licensing, so the cascading of standards to the local (unit) level is essential. These standards will apply to physical elements but work practices and behaviours will be equally important.

R43 All critical care units should have access to modern, fit for purpose equipment for the delivery of critical care, and should have access to the full range of diagnostics, consistent with the new national standards for critical care.

There must be a defined minimum standard for equipment and diagnostics that should be set in the national standards. If necessary, interim standards could be implemented to allow for units to upgrade their current equipment.

CHAPTER 9
Patient Pathways

9. Patient Pathways

9.1 Key Features of Critical Care Patient Pathways

9.2 Patient Pathway Scenarios

In the following section, seven pathways are outlined to demonstrate key features of the patient journey in a number of different situations. These reflect the patient journey through a number of services within the critical care model.

9.1 Key Features of Critical Care Patient Pathways

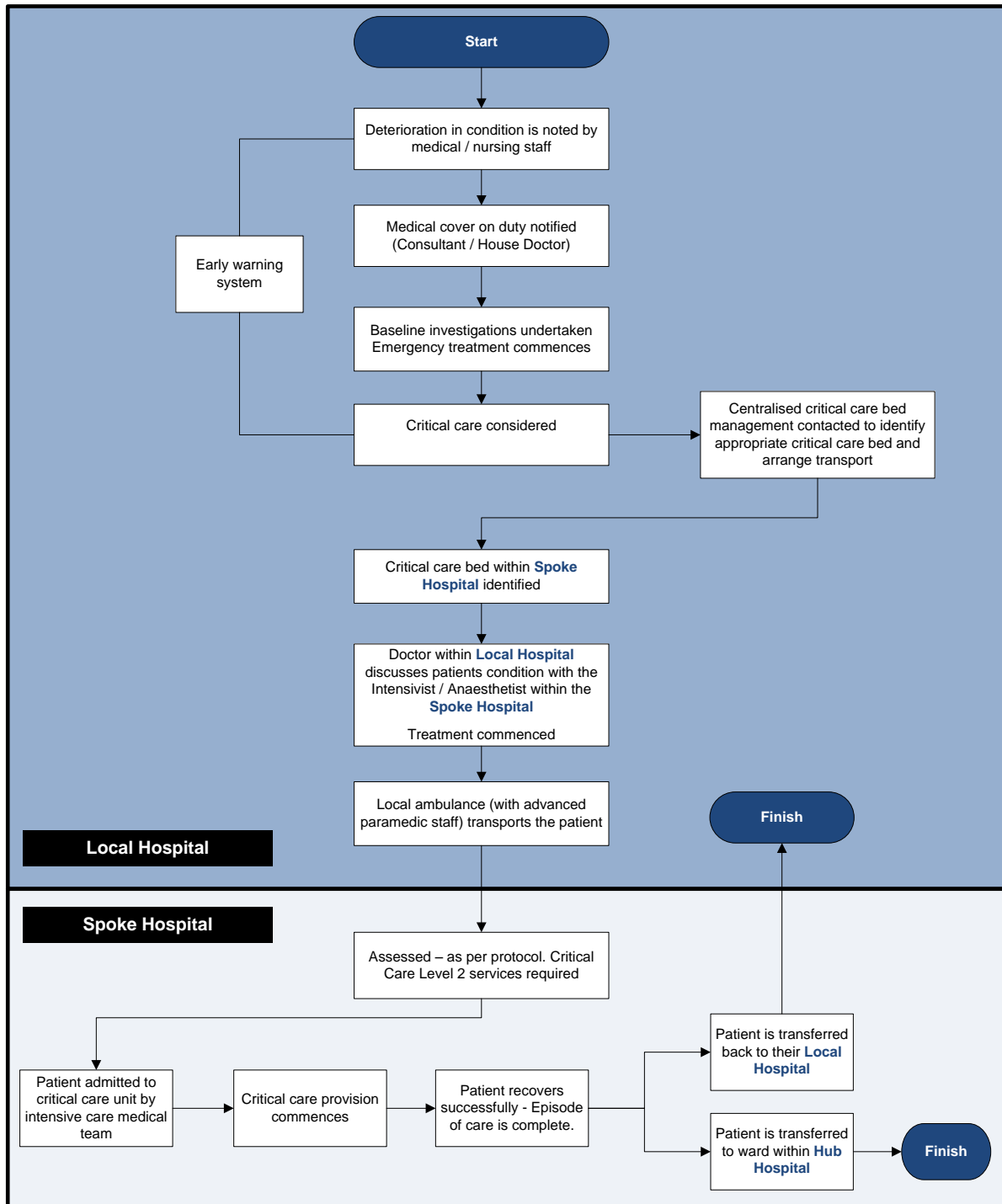
Key features common to the patient pathway through critical care include the following:

- **Communication and information sharing** is vital within networks in order to provide integrated seamless care to the patient. Inter hospital communication, both written and verbal, including advice and direction on the patient pathway is key to successful patient outcomes. The transfer of all relevant patient records, notes, test results and imaging is important in order to provide continuity of care. There must be open communication between hospitals in the networks, and medical staff should be encouraged to consult with their colleagues for opinions and support. When patients are transferring between critical care units (or between critical care and a 'local' hospital) their consultants must have a 'handover' discussion to ensure that the patient's case is appropriately transferred.
- **Advanced Paramedics** will support patients at the scene of trauma (at home, in a public place, or in a 'local' hospital). The Advanced Paramedic will have the skills and competencies to make an assessment of a patient's condition regarding acuity and can stabilise, resuscitate and intubate as required. They can facilitate the transfer to an appropriate hospital and will also play a role in supporting the transfer of acutely ill patients from 'local' hospitals to 'hub' or 'spoke' hospitals.
- **Retro-transfer** is a key component of the system. When a patient who is receiving critical care in a specialist or 'hub' unit and no longer requires support from such a unit they should be transferred back to their 'spoke' or 'hub' hospital. This maintains patient flows in the larger more specialist centres and also allows for patients to be cared for as close to their home and family as possible.
- All transfers will be co-ordinated by an **integrated ambulance service** with a centralised bed management service (e.g. at network level). Once the clinical decision on the type of critical care bed required has been confirmed the bed management service will locate the most appropriate bed for the patient using real-time access to the bed availability information. The service can then initiate the most appropriate transport.
- The use of **early warning signs** to identify deterioration in a patient's condition is important in order to alert staff of pending deterioration of the patient condition. It can also be used to plan for a pending transfer.

9.2 Patient Pathway Scenarios

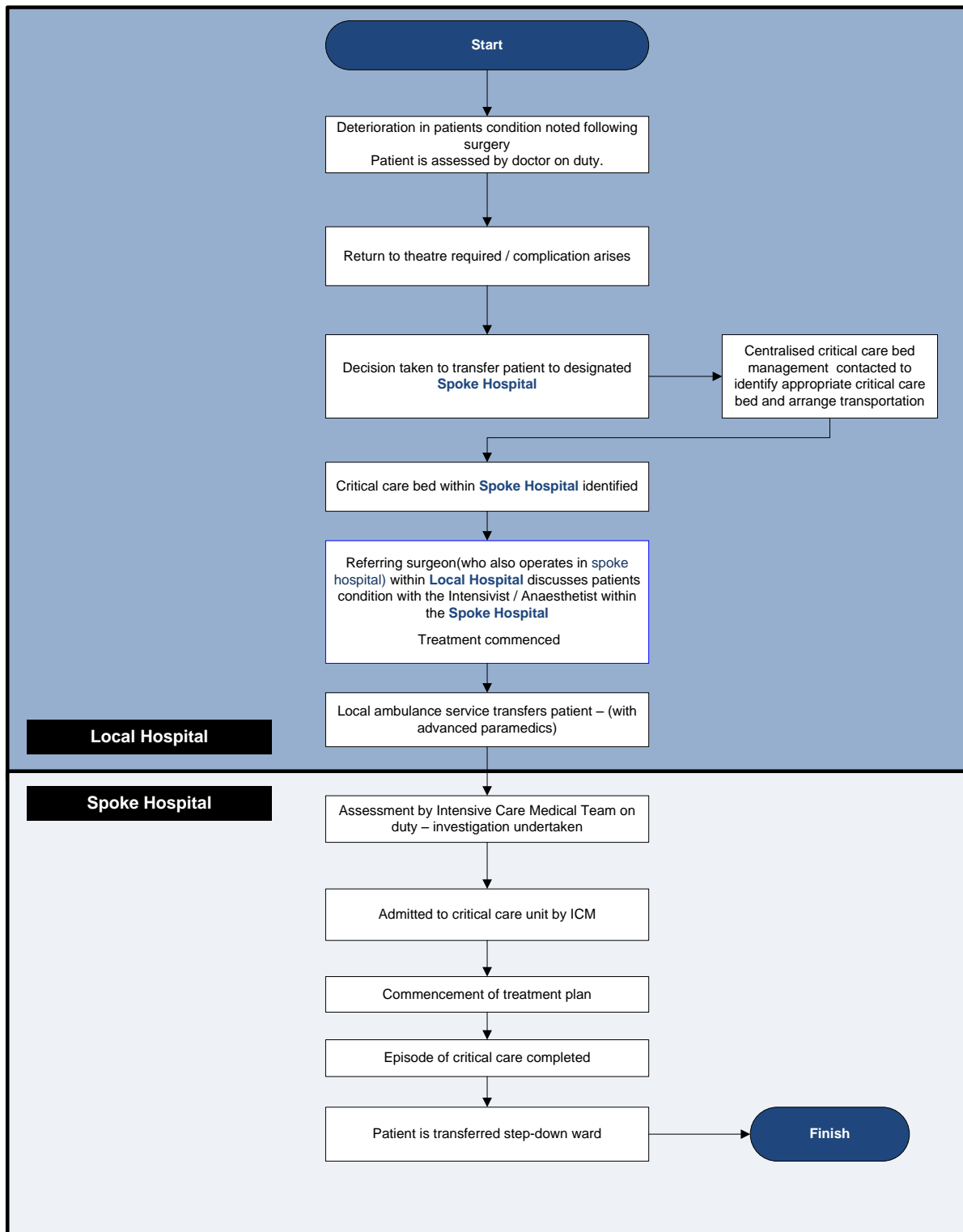
Scenario 1.

Medical patient is receiving care in a **Local Hospital** following routine admission. The patient's condition deteriorates and a need for critical care services is considered.



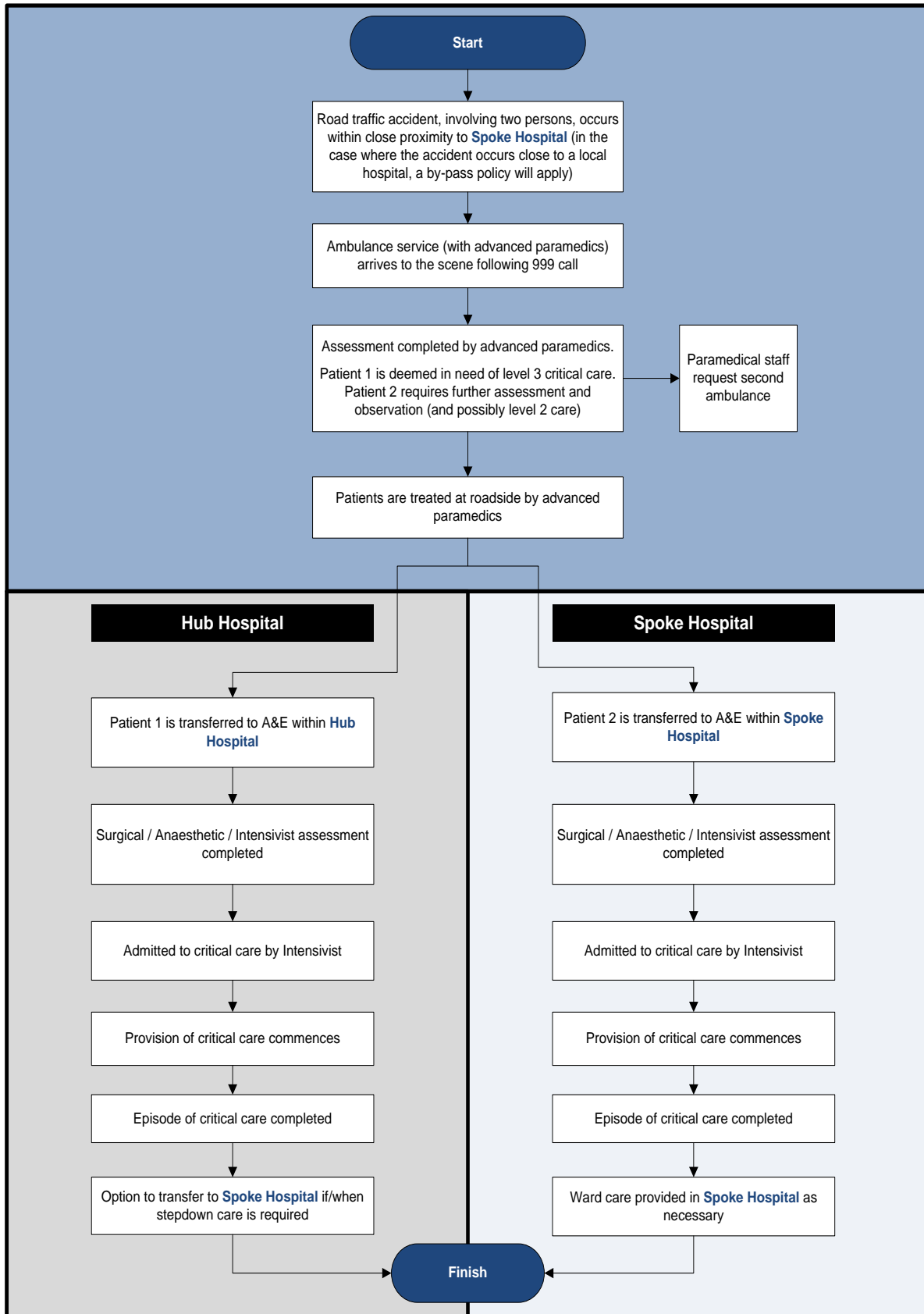
Scenario 2.

Day surgery patient, post laparoscopic hernia repair in a **Local Hospital**, suffers a suspected perforation or haemorrhage and following return to theatre the patient requires transfer to a critical care unit



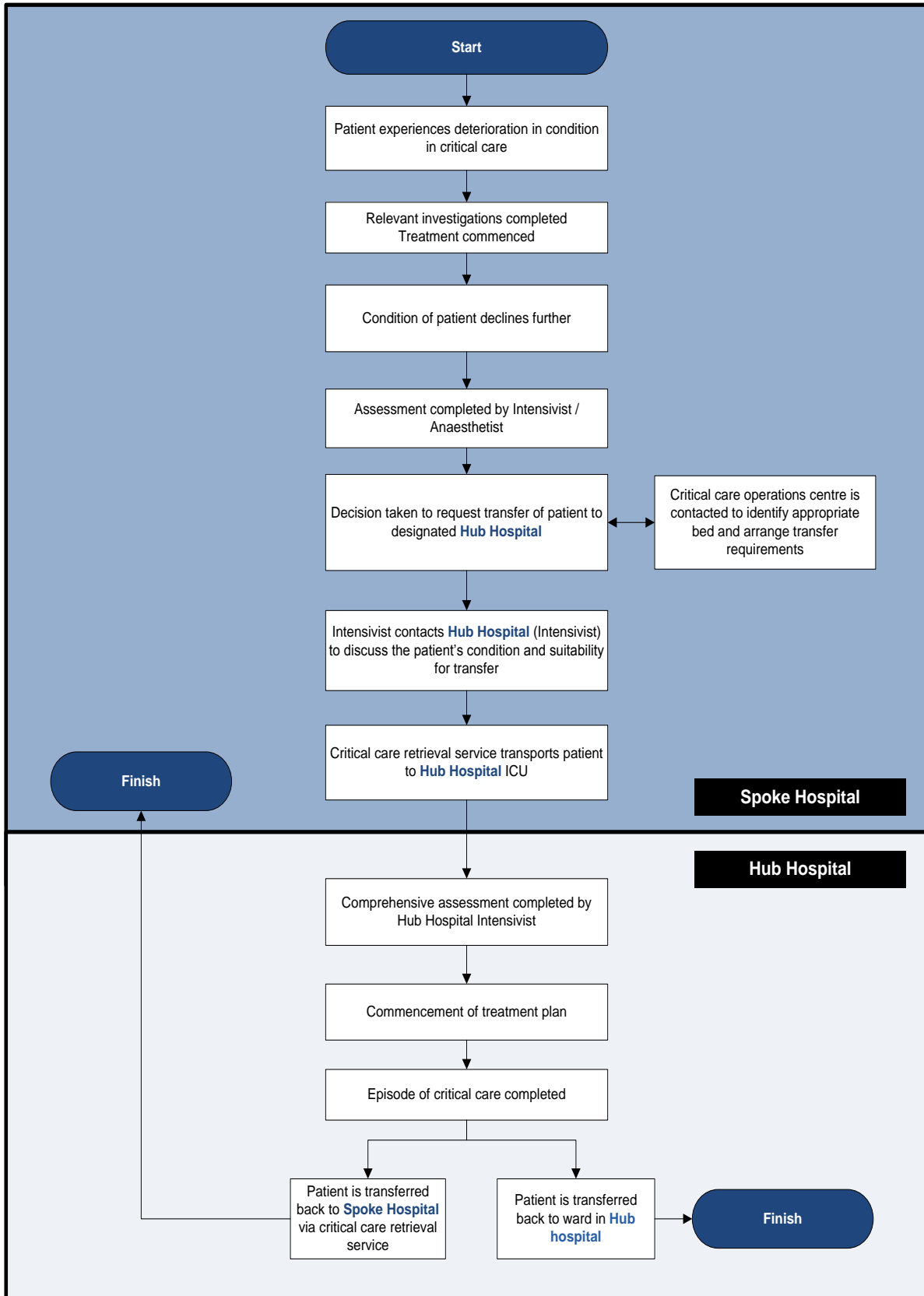
Scenario 3.

Patient is involved in a major road traffic accident and appears to require critical care based on preliminary investigation.



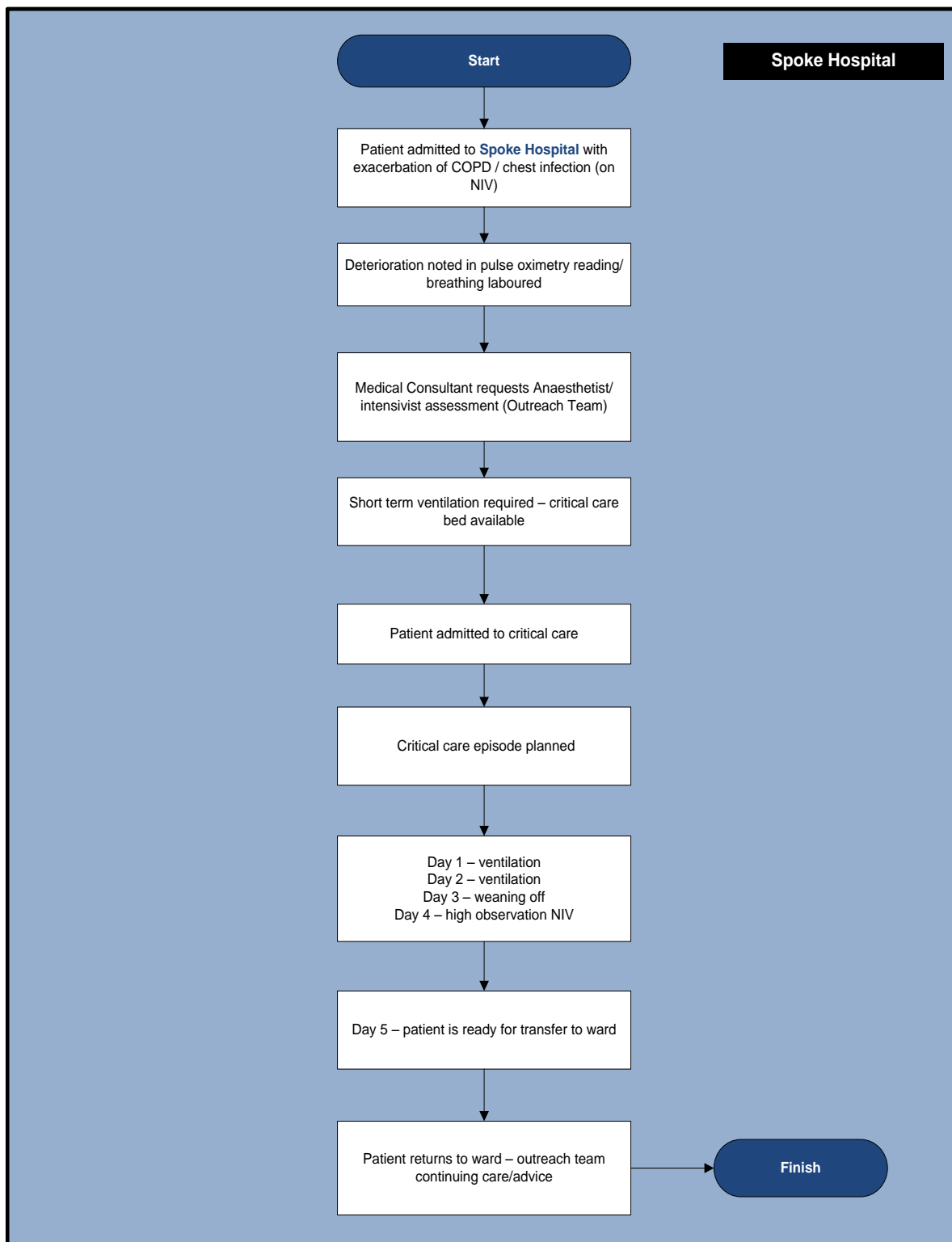
Scenario 4.

Patient is currently receiving care in a **Spoke Hospital** when their condition deteriorates. It is decided to transfer the patient to their designated **Hub Hospital** for more specialist services.



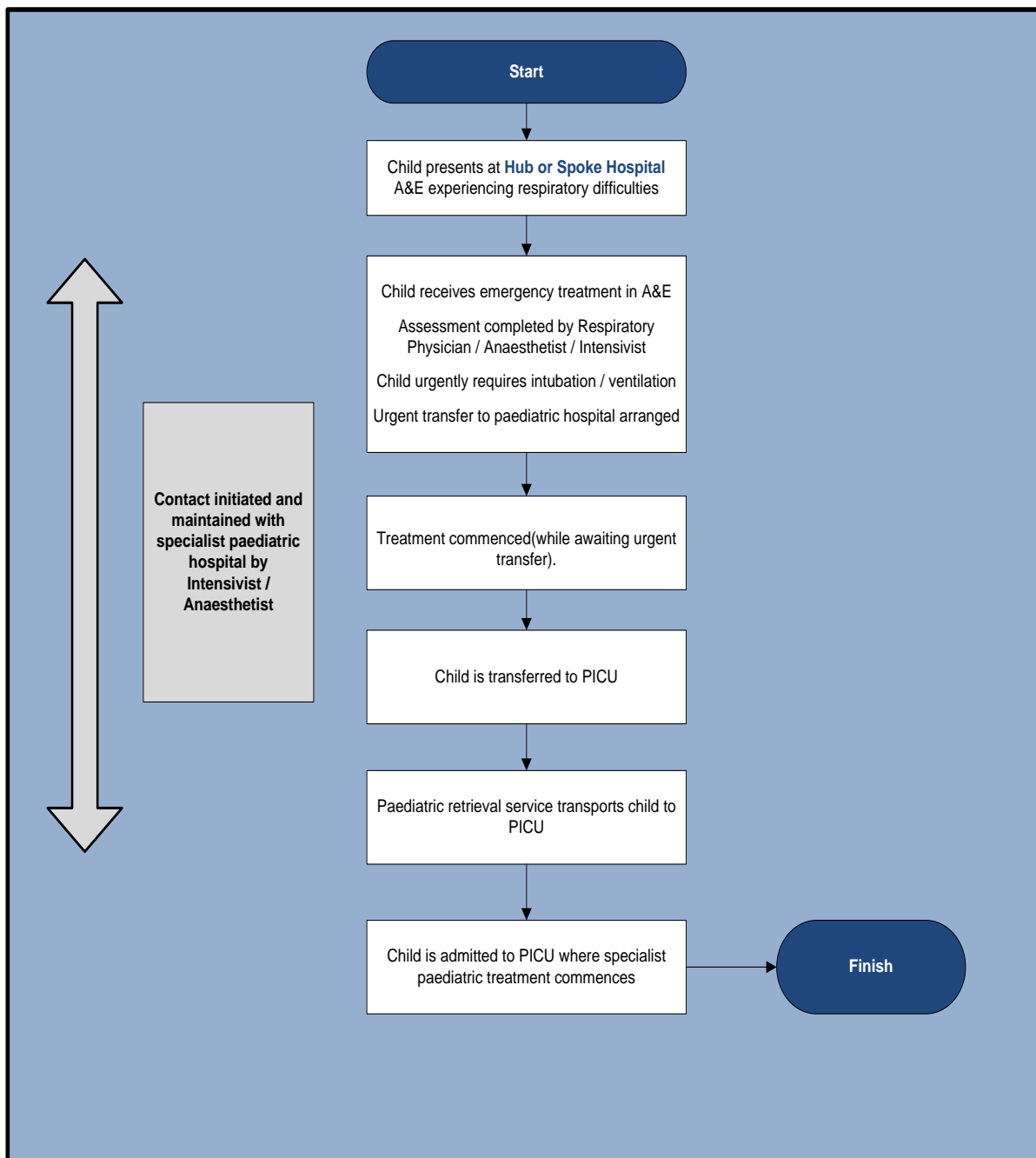
Scenario 5.

Seasonal COPD Patient with infective exacerbation of COPD requires short term intubation and ventilation



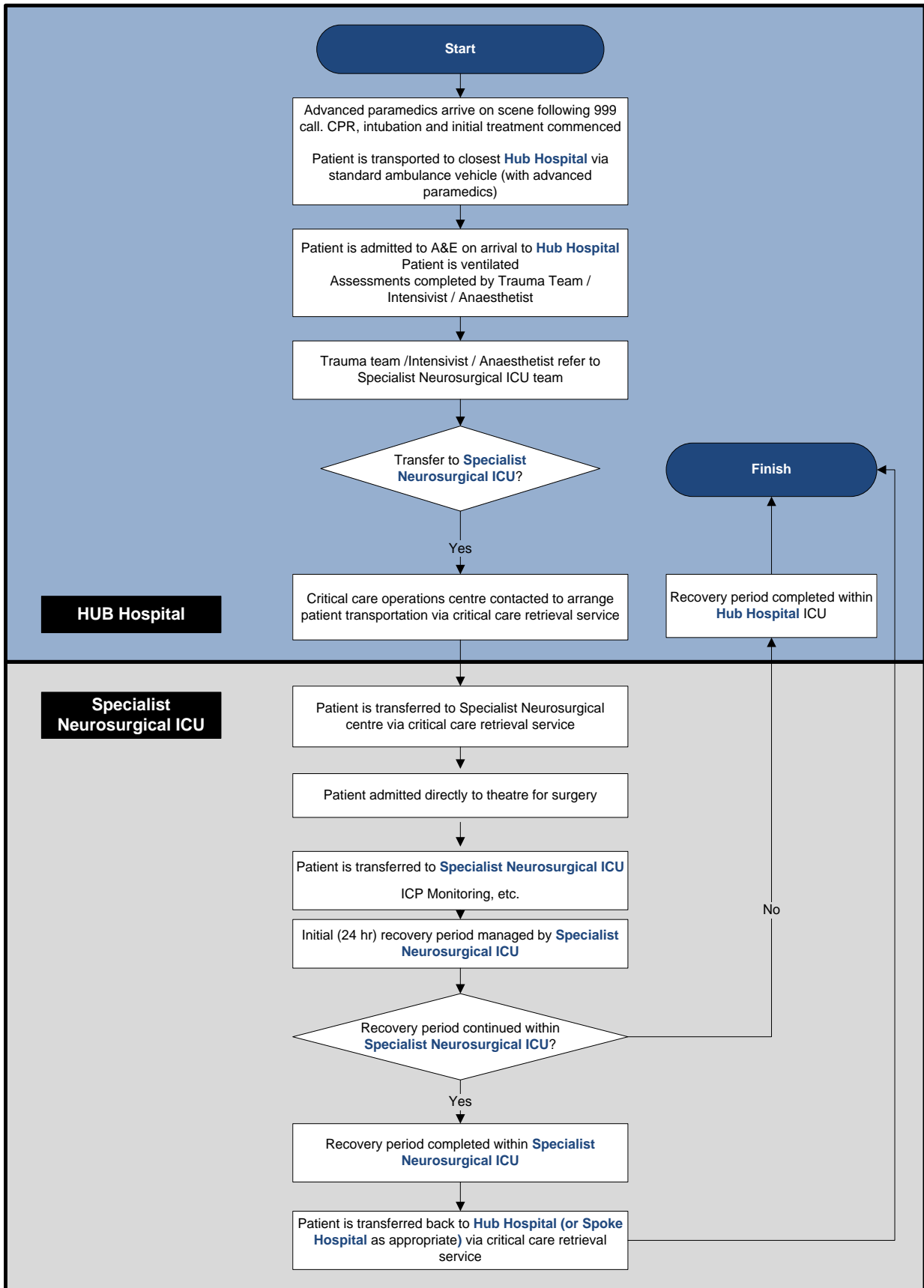
Scenario 6.

Child with severe pneumonia requiring intubation and ventilation presents to an adult ICU requiring transfer to a PICU



Scenario 7.

Patient is involved in a road traffic accident and suffers a severe traumatic brain injury



CHAPTER 10
Implementation

10. Implementation

10.1 Actions and Interdependencies

10.2 Prioritisation and Phasing

10.3 Critical Success Factors

10.1 Actions and Interdependencies

The recommendations outlined in Chapter 8 are ambitious but necessary in order to develop a world-class critical care service. In order to implement these developments and ensure a safe, high quality critical care service for the people of the Republic of Ireland, a **continued programme of redistribution of resources, significant additional capital and revenue funding and commitment to the model and recommendations will be essential.**

We recognise that the environment in which this model is being implemented is a financially challenging one. Therefore it is vital that the implementation of the model and recommendations focuses on redistribution of existing resources where possible and, where new resources are required, they must be used as efficiently as possible.

Many different aspects of critical care services are addressed by the recommendations. By their very nature and significance, some will need to be completed before others, and indeed some will take longer to implement than others. In order to assist the implementation process, this chapter sets out the key actions, interdependencies, and suggests initial prioritisation.

It is essential that critical care capacity must not reduce at any stage. The total critical care capacity is already well below the required level, and therefore it is essential that total capacity is increased overall. Of course, on a regional level, where units are being reconfigured or closed, it is vital that critical care capacity is increased in the relevant larger or 'hub' units in advance. Furthermore, it should be reiterated that access to on-site critical care services is necessary for all hospitals with unrestricted acute intake. Therefore, the reconfiguration of critical care will need to be planned alongside the wider reconfiguration of acute services. That said, local decision making around the specific details of implementation will be of primary importance, under the strong direction of a clear national framework.

The actions along with their main interdependencies are presented in four separate categories:

- Actions which are **fundamental to the implementation of the overall model** and recommendations from this Review.
- Actions which **can be implemented within the current critical care environment** and health system as they currently exist, regardless of changes to structures or governance systems.
- Actions which will **be a part of, or inform**, the development of the national critical care standards
- Actions which can **only be implemented once the national critical care standards have been developed.**

Each action is given a suggested implementation timeframe using three categories: immediate (1-2 years), medium term (3-4 years) and longer term (5+ years). Where appropriate each action is followed by the relevant recommendations referenced in brackets. The key actions and timings are summarised in a diagram under Section 10.2 Prioritisation and Phasing .

Actions which are fundamental to the implementation of the model and recommendations from this Review.

Actions	Interdependencies	Timing
Establish the National Critical Care Programme, including agreed membership, accountability, reporting structures and workplan (R2,I)	<ul style="list-style-type: none"> Requires suitable candidate with relevant experience for the National Critical Care Director and for a specified number of their sessions to be assigned to the Programme. Programme will need to fit with evolving HSE organisation structures 	Immediate
Develop and implement comprehensive critical care standards for Ireland (R1)	<ul style="list-style-type: none"> National Critical Care Programme should be in place to oversee and support the development of the standards Need for an appropriate group to be established to lead the development of the national standards (e.g. an Expert Group including oversight from HIQA) under leadership of Programme Need extensive input from clinical experts (e.g. ICSI, IACCN) Implementation of the standards will rely on network and hospital critical care organisation structures, and will require strong leadership at network and hospital level (R2,II, R7, R8, R9). 	Immediate
Define and implement the exact critical care networks, to include: geographical boundaries, assigned ‘hub’, ‘spoke’ and ‘local’ hospitals, and formal linkages between hospitals (R2,II)	<ul style="list-style-type: none"> Decisions required around future configuration of A&E services, trauma services and surgical services, to ensure appropriate alignment of critical care services at hospital level Trauma services in particular need to be reviewed and their future organisation needs to be defined. 	Immediate
Begin reconfiguration of critical care services into networks of ‘hub’, ‘spoke’ and ‘local’ hospitals	<ul style="list-style-type: none"> Need for critical care capacity to be retained and increased. Units cannot be closed without necessary capacity provided elsewhere. Priority should be the scaling up of critical care capacity in ‘hub’ hospitals 	Immediate
Establish the Critical Care Network Group within each network and agree membership, terms of reference, and workplan (R2,II)	<ul style="list-style-type: none"> Agreement on networks locations is required Network Clinical Lead to be selected for each critical care network Clinical Leads of Intensive Care for each hospital to be identified 	Immediate

Actions which can be implemented within the current critical care environment and health system as they currently exist, regardless of changes to structures or governance systems.

Actions	Interdependencies	Timing
Establish a multidisciplinary Critical Care Delivery Group in every hospital providing critical care services (R7)	<ul style="list-style-type: none"> Needs an identified Clinical Lead of Intensive Care (R7), to lead its establishment and chair the group Needs to oversee the implementation of national standards in their hospital, so will have a much stronger and better defined role once national standards are in place. In the mean time, plays a strong role in developing critical care systems and structures within the hospital 	Immediate
Obtain recognition of Intensive Care Medicine on the Register of Medical Specialists (R21) & establish Joint Faculty of Intensive Care Medicine (R20)	<ul style="list-style-type: none"> ICSI to pursue submission to Medical Council for recognition 	Immediate
Define and implement clear standards for critical care transport (R35)	<ul style="list-style-type: none"> Requires a working group to devise changes and updates. Working Group must include appropriate clinical and ambulance services representation Need for transfer arrangements/formal linkages to be set up (i.e. defined links between smaller hospitals and hospitals to which they should routinely transfer) 	Immediate
Implement standardised information system in each critical care unit to collect information across the agreed national dataset (R37)	<ul style="list-style-type: none"> Agree national dataset for critical care Capital and revenue funding will be required, including staffing allocation (for example Data Clerks) Should be considered in conjunction with other IT initiatives already in place, or being planned 	Immediate
Implement a national audit system for critical care (R38)	<ul style="list-style-type: none"> Capital and revenue funding required Independent body responsible for National Critical Care Audit to be identified/established Need for appropriate information systems to be in place within hospitals (R37) Need for accountability, communication and reporting structures to be developed, to include consideration of relationship with critical care units, with HSE (the National Critical Care Programme), with HIQA, and with any other relevant professional or academic bodies. 	Immediate
Ensure on-site access to a clinical microbiologist (R18)	<ul style="list-style-type: none"> Staffing levels and arrangements must allow for appropriate on-call and on-site clinical microbiologist cover. Additional numbers or changes to working arrangements may be required. Each hospital must ensure that the working relationship with clinical microbiology is clear and unambiguous. 	Immediate
Explore the potential role of cross-border relationships for critical care	<ul style="list-style-type: none"> Part of a programme of broader cross-border health initiatives driven by the HSE 	Longer term

Actions which will be a part of, or inform, the development of the national critical care standards

Actions	Interdependencies	Timing
Define standards for medical staffing (R16) which are based on agreed leadership arrangements (R7, R8, R9), standards for cover (R15, R17) and standards for rotation (R19)	<ul style="list-style-type: none"> • Mix of medical staff will depend on training programmes in place (e.g. SpR intensive care programme R22) • Consultant Contract will inform standards • Will rely on relevant training and education programmes being in place to generate the required staff (number and type) 	Immediate
Define requirements for critical care nursing, including leadership (R8, R9), the specific role and competencies of the nurse in critical care (R24), and the resulting staffing numbers and levels (R25), as well as the role of the healthcare assistant (R29)	<ul style="list-style-type: none"> • Review of role and skill mix for nursing staff is required to clarify nursing (and support) staff requirements. (R24) • Will rely on relevant training and education programmes being in place to generate the required staff (number and type) 	Immediate
Define requirements for Allied Health Professional dedicated time to critical care services (R33)	<ul style="list-style-type: none"> • Any increase in AHP support may face difficulties due to a national shortage of many AHPs. • Will rely on relevant training and education programmes being in place to generate the required staff (number and type) 	Immediate
Define requirements for non-clinical support staffing (R31)	<ul style="list-style-type: none"> • Depends on the defined role of the nurse and healthcare assistant (R24 and R29) • May need to align with other hospital non-clinical structures (e.g. arrangements for cleaning, housekeeping, administration) 	Immediate
Define interim infrastructure and facility standards for critical care units (R40)	<ul style="list-style-type: none"> • Facilities need to be reviewed to establish status against interim standards • Development plans must be put in place for prioritising most urgent upgrades. 	Immediate

Actions which can only be implemented once the national critical care standards have been developed.

Actions	Interdependencies	Timing
Localisation of national critical care standards in each hospital (R11)	<ul style="list-style-type: none"> National critical care standards developed Agreement on local level leadership of critical care, and who holds responsibility for localising and implementing standards (R8) 	Medium term
Implementation of staffing levels as defined in standards (R16, R25, R31, R33)	<ul style="list-style-type: none"> Availability of appropriately skilled and trained candidates Approval of headcount and resourcing 	Medium term
Standardisation of nursing education and development of appropriate systems for recognition of experience and implementation of minimum qualifications (R26, R27)	<ul style="list-style-type: none"> Clarity around the role of the nurse and the specific competencies required (from review of nursing work practice and skill mix - R24) Need for clinical facilitators in critical care units (R28) 	Immediate
Develop the role of the HCA in critical care, with associated training (R29, R30)	<ul style="list-style-type: none"> Review of nursing work practice and skill mix – including role specification of HCA (R24, R29) Engagement with FETAC regarding training (R30) 	Immediate
Ensure all new-build critical care units adhere to the national standards (R40)	<ul style="list-style-type: none"> National Critical Care Programme to set national standard for new critical care facilities Capital funding for new critical care units will be required 	Immediate
All critical care units must meet national infection control policies and guidelines (R42)	<ul style="list-style-type: none"> National (HSE / HIQA / SARI) standards and timeframes Commit capital funding for unit upgrades 	Immediate
All critical care units should have access to fit-for-purpose equipment as defined by standards (R40) and should meet the minimum standards defined (R42)	<ul style="list-style-type: none"> Specific equipment requirements must be detailed in standards (R1) Capital funding required Unit upgrade requirements to be prioritised 	Medium term
Design and implement a dedicated critical care retrieval service (R35)	<ul style="list-style-type: none"> Will require significant capital and revenue investment Establishment of a representative working group, including clinicians and ambulance services Will link with staffing requirements for units Ultimately will require the 'centralised critical care bed management service' to be in place but can be developed to operate with unit to unit communications in the interim. 	Medium term
Review of National Major Incident Plan in light of new critical care structures (R13)	<ul style="list-style-type: none"> Will require individual networks and units to put in place their own customised plan Ongoing communication and co-operation with any HSE/NHO reviews to national major incident plan 	Immediate

As is clear from the tables above, these actions vary in terms of their complexity and their reliance on the completion of other actions and recommendations. It should also be noted that the majority are defined as ‘immediate’ requirements, this relates to the urgency of the item, and the importance of initiating the action in a timely manner. It is understood that they may not necessarily all be complete within a 1-2 year timeframe.

10.2 Prioritisation and Phasing

The chart below summarises high level phasing and prioritisation for implementation of the key recommendations.

	National Level	Local Level
Immediate 1-2 Years	Overarching recommendations <ul style="list-style-type: none"> - Establish National Critical Care Programme - Develop standards (infrastructure, staffing transport etc.) - Identify geographic boundaries of networks - Establish national level audit by independent organisation - Agree reconfiguration into ‘hub’, ‘spoke’ & local structure, and begin to implement 	Address current services <ul style="list-style-type: none"> - Critical Care Delivery Group - Urgent unit upgrades - Hospital critical care audit - Transport protocols - Develop ‘hub’, ‘spoke’ & ‘local’ relationships
Medium term 3-4 Years	National initiatives <ul style="list-style-type: none"> - Implement reconfiguration in ‘hub’ & ‘spoke’ structure - Design critical care retrieval services - Embed national critical care audit 	Implement standards <ul style="list-style-type: none"> - Localise and implement in units - Develop staff numbers & mix - Upgrade physical infrastructure to meet interim standards
Longer term 5 + Years	Continue to develop structures <ul style="list-style-type: none"> - Completion of reconfiguration - Cross-border agreements - Streamline critical care retrieval services 	Continue to implement standards <ul style="list-style-type: none"> - Implement training & education - Meet recommended staffing - Meet full physical requirements as in national standards

10.3 Critical Success Factors

This Review outlines a large-scale plan for the development of adult critical care services in Ireland. In order for the findings of the Review to be effectively implemented a number of critical success factors have been identified as follows:

- **Resources**

The redistribution of existing resources and additional resources will be required in order to develop and deliver on the model of care outlined within this report. Certain recommendations will require considerable funding (both capital and revenue) to ensure that services are delivered by appropriately skilled and experienced staff within suitable surroundings and with access to all the required equipment and technology. The model of care outlined will deliver a safer, higher quality and more efficient service provided the necessary resources are invested.

- **Reconfiguration**

The future model for the delivery of critical care services will result in a number of critical care units currently in existence closing as the hospitals within which they are situated become 'Local' hospitals, and will require capacity in a number of current critical care units to be further developed. It is vital that capacity is reconfigured in a manner which does not reduce critical care capacity for any period. Before any critical care capacity is removed from the system an increase in capacity must occur in order to ensure that the patient cohort can be catered for.

- **Leadership**

Given the scale of development being proposed for critical care services in this Review, leadership at national level, network level and hospital level will be necessary for the successful implementation of recommendations. As alluded to earlier in this report, critical care has endured something of an *orphan service* reputation within the wider acute hospital system. The importance of a National Critical Care Programme and the Critical Care Network Groups cannot be over-emphasised as a result. It is envisaged that critical care services will continue to evolve at a very fast pace both internationally and within the Republic of Ireland. The necessary structures must be in place and adequately resourced in order to ensure that we have a service that is capable of maintaining pace with national and international developments.

- **Governance**

Effective governance structures will be vital for the successful implementation of these recommendations. The National Critical Care Programme must be suitably positioned within the Health Service Executive to guarantee the necessary focus for the service's development. Two-way communication must be facilitated between the National Programme and the Critical Care Network Groups. In addition, Critical Care Delivery Groups within each hospital must have defined access to and a strong relationship with their respective Network Groups.

- **Monitoring Progress**

The National Critical Care Programme should have ultimate responsibility for implementation of the recommendations included within this report and will monitor progress. The implementation plan categorised all recommendations within one of three timeframes. It is envisaged that the Programme will develop a detailed action plan on an annual basis to ensure progress is maintained towards the full implementation of these recommendations. Progress towards the completion of all actions and outputs should be measured on a regular basis with updates provided to the Health Service Executive as appropriate.

Conclusion

The overriding message of this Review is the need for significant reconfiguration of critical care services, in tandem with an immediate 45% increase in critical care capacity. The current lack of core critical care capacity is made worse by widespread inappropriate use of the existing beds available. These instances of inappropriate use of some current capacity need to be addressed. But doing so will not avoid the need to reconfigure the service or to provide additional core capacity.

The audit carried out by us as part of our Review also pointed to a significant degree of unmet need for critical care service, as evidenced by early discharges, patient refusals, and delayed discharges.

In addition to increasing capacity, the reconfiguration of critical care in the Republic of Ireland must prioritise patient safety and ensure that critical care units have sufficient throughput to maintain staff competencies. This will require the closure of a number of smaller critical care services.

In implementing the reconfiguration of critical care services it is vital that total capacity is not decreased at any stage of the reconfiguration process. It is desirable that the larger more complex critical care services are prioritised for increased capacity before any critical care services are decreased or removed. Of course, it will be necessary for critical care capacity to be increased over time to meet the requirements of a growing population. We have factored in population growth assumptions into our projections.

The model of care we have proposed, together with our other recommendations, is key to the future success of critical care services in this country. The overall model, with its network of care approach, has to be underpinned by effective national and regional governance structures. The system as a whole then has to be subject to rigorous and sustained evaluation based on national standards.

Critical care services are, in turn, at the heart of what a modern acute hospital system is able to do for the most seriously ill patients in our health service. We consider that the lack of focus and investment over the years in critical care has led to a service where patients may be put at risk. It is important therefore that these recommendations are met with the same degree of commitment as shown during this Review by all its stakeholders. The National Programme should be established immediately to progress their implementation.

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