The Faculty of
Intensive Care Medicine

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GUIDELINES FOR THE PROVISION OF INTENSIVE CARE SERVICES

Edition 2
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SUPPORTING ORGANISATIONS

Royal Pharmaceutical Society

FOREWORD

On behalf of the Faculty of Intensive Care Medicine (FICM) and the Intensive Care Society (ICS), welcome to the second edition of *Guidelines for the Provision of Intensive Care Services (*GPICS). The first edition of GPICS (2015) was a landmark publication that built on the earlier *Core Standards for Intensive Care Units* (2013). GPICS has become the definitive reference source for the planning, commissioning and delivery of Adult Critical Care Services in the UK. Many units have found the standards and recommendations within GPICS invaluable in developing successful business cases to enhance their local services and improve patient care. GPICS has also been used as the benchmark by which local services are peer reviewed and assessed by healthcare regulators, such as the Care Quality Commission (CQC).

One of the challenges with producing a document such as GPICS can be the lack of a hard evidence base for some of the standards and recommendations that may be, by necessity, based on professional opinion and established practice. It is therefore essential that standards and recommendations are subject to regular review and revision, as new evidence becomes available and practice changes. In undertaking this significant review and revision to GPICS, the FICM and ICS consulted widely, both with the key stakeholder organisations and through an open public survey. One of the criticisms of the first edition was the underrepresentation of authors from smaller units and the devolved nations; we have addressed this in the second edition, recognising that the majority of critical care is not delivered in large tertiary centres.

Each chapter has been written by at least two authors with expertise in the area who are, where possible, from geographically separate units. All chapters have been subject to extensive peer review and collaboration between FICM, and ICS and stakeholder organisations. The open public consultation that followed resulted in a considerable amount of constructive feedback, which has been incorporated into the final version.

The standards from the first edition have not been changed unless there has been new evidence presented, or widespread professional views expressed, to justify modification. The second edition focuses on service delivery, quality and safety with less emphasis on specific clinical practice guidelines. Individual chapters relating to the provision of support for each of the main organ systems have replaced the previous clinical sections. Any relevant, high quality, evidence based guidelines produced by other professional bodies are signposted within these chapters. A number of new chapters relating to service delivery, including capacity management, focussed ultrasound and serious infection outbreak have been added.

Terminology describing our specialty has not been standardised with terms ‘critical care’, ‘intensive care’ and ‘high dependency care’ often being used interchangeably. Within this document we have attempted to standardise and used the term critical care when describing units and services and intensive care when referring to our specialty.

The role of a document such as GPICS, is to improve the standards of care that critically ill patients receive and to reduce geographical variation. Standards are **’musts’,** and are the key elements that should be used to make commissioning priorities for UK critical care units. Recommendations are statements that the authors feel **should** be routine practice in UK Intensive Care Medicine and which are endorsed by both the FICM, ICS and stakeholder organisations. GPICS is written to assist and support units in developing their services in order that patient care is of the highest quality. For every unit, there will be some aspects of GPICS that are not currently met and we hope that units

will use these gaps as a driver and focus of where to develop and enhance their local service for the benefit of patient care.

Peter Macnaughton
Chair
FICM Professional Affairs and Safety Committee

Stephen Webb
Chair
ICS Standards and Guidelines Committee

Cover photograph courtesy of ICCU, City Hospital Sunderland NHSFT

Section One

Critical Care Services: Structure

1.1 Levels of Critical Care

Authors: Gary Masterson & Anna Batchelor

INTRODUCTION

The Intensive Care Society 2009 Levels of Care classification describes the levels of care required by critically ill patients in hospital according to their clinical needs, regardless of patient location. The definitions were originally published in 2002[1], after the publication of *Comprehensive Critical Care*[2] in 2000, and latterly revised to reflect the Critical Care Minimum Dataset[3] (CCMDS), which has been mandated since April 2006.

STANDARDS

1. All patients admitted to a critical care unit must be included in a national clinical audit programme in which Levels of Care data are collected.

2. Level of Care classification must not be used in isolation to decide upon a patient's staffing requirements.

RECOMMENDATIONS

No recommendations.

BACKGROUND

Level 0	Patients whose needs can be met through normal ward care in an acute hospital.
Level 1	Patients at risk of their condition deteriorating, or those recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from the critical care team.
Level 2	Patients requiring more detailed observation or intervention including support for a single failing organ system or post-operative care or those 'stepping down' from Level 3 care.
Level 3	Patients requiring advanced respiratory support alone, or basic respiratory support together with support of at least two organ systems. This level includes all complex patients requiring support for multi-organ failure.

Clinical judgement should be used to determine which level of care would be most appropriate based on the criteria in the table above. Although a lower level of care will usually require a lower

nurse-to-patient ratio or reduced critical care support, this may not apply in all circumstances, and the aim should be flexibility in the provision of staff resources to meet the needs of the patient. The level of care assigned to a patient will influence, but not determine, staffing requirements.

It is important to note that Levels of Care classification (particularly for Level 2) is wider than the presence or absence of organ failure per se.

There is ongoing work into the development of enhanced care[4] in the UK and this work may lead to the modification of the levels of care in the future.

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1.2 Outcomes

Authors: Julian Bion, Dan Harvey & Nazir Lone

INTRODUCTION

Critical care units admit increasingly co-morbid, older patients, many of whom have high-predicted short- and medium-term mortalities with or without these therapies. Such admissions are frequently undertaken in the pursuit of patient-centred outcomes other than mortality; for example, reduction in pain or other distressing symptoms caused by surgical intervention, or a 'time-limited treatment trial of intensive care[1]', in which both the scope and duration of therapies are limited not to restrict their benefits, but to reduce their harm. In such circumstances, the success of medical endeavour is not the prevention of death at any cost, but the provision of care in which burdens and benefits are balanced for the individual patient[2]. An exclusive focus on mortality outcomes will teach us little of the value of such admissions[3]. It may be important to differentiate between intensive care outcome metrics designed specifically to guide such decision making, from those designed to facilitate research, benchmarking, peer review and quality assurance[4].

STANDARDS

1. Critical care units must hold multi-professional clinical governance meetings, including analysis of mortality and morbidity.

2. The unit must participate in a National Audit Programme for Adult Critical Care.

3. Critical care units must participate in a mortality review programme using appropriate methodology to maximise learning and improvements in care[5,6].

4. Critical care units should participate in a programme of hospital-acquired infection surveillance to monitor and benchmark rates of catheter-related bloodstream infections, antimicrobial use, and frequency of multi-resistant infections.

RECOMMENDATIONS

1. The UK intensive care community should encourage and develop a validated methodology to review referrals to intensive care and evaluate decision making and subsequent outcomes relating to intensive care admission and refusal.

2. Units should develop a consistent approach to patient-centred decision making, evaluating burdens and benefits of admission to intensive care, and be able to demonstrate this through the audit of pre-admission consultation, agreed ceilings of therapy, and time-limited treatment trials.

3. Longer-term mortality should be collected on all patients admitted to critical care.

4. The UK intensive care community should encourage and develop validated measures of longer-term patient- and family-centred outcomes beyond mortality, including measures of functional ability, socioeconomic consequences, and carer burden.

5. The UK intensive care community should encourage and develop validated measures of quality of care relating to end of life and bereavement.

6. Critical care units should consider systematic assessment of patient and family experiences and demonstrate how these are used to guide improvement.

BACKGROUND

Mortality rates in intensive care have been falling for two decades. However, one in five patients admitted to critical care units dies during their hospital admission. Benchmarking of mortality through the reporting of standardised mortality ratios (SMRs) remains an important focus for outcome measurement. The link between SMRs and quality of care however, remains elusive[7]. Furthermore, patients referred to, but not admitted to intensive care, are not currently captured in ICU (Intensive Care Unit) databases.

However, SMRs may direct attention to opportunities for improvement, provided that low SMRs are not regarded with complacency. By contrast, process of care measures, patient experience, research activity, and long-term outcomes provide information which can be directly incorporated to improve practice, and which is therefore empowering to the staff. Crucially, the development of validated and reliable functional outcome metrics after critical care will facilitate patient-centred, individualised decision making by patients, families and clinicians[8]. This will be of critical value for an increasingly ageing and co-morbid population[9]. Such outcomes may indeed lead to the prioritisation of interventions, which maximise function, even at the expense of mortality[4], as has occurred in other specialties with perhaps a longer experience of treating co-morbid populations.

Process of care measures include audits of the reliability of delivery of best practice (for example, lung-protective ventilation, adherence to sedation policies, consistency of weaning plans) and adverse event monitoring (ICU-acquired infection rates, unplanned extubation, and out of hours discharge from the ICU). Established national audits, such as the Intensive Care National Audit and Research Centre Case Mix Programme and the Scottish Intensive Care Society Audit Group, can be usefully supplemented by newly established specific programmes, such as the Infection in Critical Care Quality Improvement Programme (ICCQIP)[10.]

Experiential measures include patient and family satisfaction surveys, which provide an important opportunity for organisational reflective learning and important insights into the quality of care in critical care units. Setting up and maintaining satisfaction surveys require investment in staff resources and tools for survey distribution, collation and analysis[11]. They may usefully be supplemented by staff and medical trainee surveys. Feedback of results and monitoring of actions taken require ownership by senior members of staff and a regular forum for dissemination. Combining this with the establishment of a patient and family group for the critical care unit provides an important vehicle for constructive change.

Research and audit activity are important indicators of an aspirational and self-critical environment. Engagement in research generally improves healthcare performance. Participation in a research group is associated with lower burnout rates amongst intensive care nursing staff. The research environment for intensive care has been improved substantially by co-ordinated professional organisations.

Longer-term outcomes include post-intensive care and in-hospital stay through to the years following hospital discharge. Evaluating the post-intensive care period in hospital may provide insights into the quality of intensive care rehabilitation, the timeliness and appropriateness of intensive care discharge, the quality of care on the wards and of end of life care decision making. In the last decade, a growing body of research has revealed the profound burden that survival from critical illness can impose on the patient and family[12]. Emerging evidence also suggests that bereaved relatives of ICU patients may experience long-lasting, high levels of complicated grief, post-traumatic stress symptomatology and depression[13]. Long-term, post-hospital follow-up requires a funded infrastructure, with delivery models usually centred around an intensive care follow-up clinic, although the ideal mechanism is uncertain[14]. As western societies age and the proportion of frail elderly patients presenting with acute illness increases, we will need to develop information and risk-prediction strategies which will allow informed decision making about the benefits and burdens of intensive care. The focus of intensive care will shift more towards preservation and restoration of physiological reserve[14.]

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1.3 Level 2 and 3 Physical Facilities

Authors: Christopher Scott & Nicola Freeman-Fielding

INTRODUCTION

The NHS *Estates Health Building Note (HBN) 04-02 for Critical Care Units*[1] sets out 'best practice' guidance on the design and planning of new healthcare buildings and on the adaption and/or extension of existing facilities.

A critical care unit is a specially staffed and equipped area of a hospital dedicated to the care of patients with life-threatening conditions. It encompasses areas that provide Level 2 (high dependency) and/or Level 3 (intensive) care as defined by the Intensive Care Society[2].

STANDARDS

1. Critical care facilities must comply with national standards[1].

3. All new build units must comply with HBN 04-02.

3. Medicines and fluid storage must comply with HBN 00-03[3].

RECOMMENDATIONS

1. Existing units that do not comply should have a timeline to establish when national standards will be met.

2. Depending upon the designated level, function, size and case-mix of the hospital and/or region that it serves, a critical care unit may range from 4 to over 50 beds. Large units should be divided into smaller units (e.g. 8-10 beds) to facilitate clinical care[4].

3. The unit should have enough beds and resources to obviate the need to transfer patients to other critical care units for non-clinical reasons[5].

4. When planning or redeveloping a critical care area, Document HBN 04-02 should be considered with the following key stakeholders[6,7]:
   a. Planning and design teams.
   b. Executive directors and senior managers of provider organisations, including estates directors and their staff.
   c. Clinicians from every profession working in, or in partnership with, the Critical Care area
   d. Infection control teams (see Chapter 3.4, Infection Control).
   e. All support staff employed within the critical care unit.
   f. Representatives of patients and their families.
   g. Manufacturers of information technology (IT), clinical and support equipment and furnishings.
   h. The medical engineering industry.

5. Critical care units should incorporate sufficient storage for medicines (including refrigerated and controlled drugs), IV fluids (including renal replacement) and enteral feeds. Storage areas/rooms should be secure and appropriately temperature controlled for all medicines. ICU designs also need to account for how selected medicines, including patient's own drugs, will be securely stored and readily accessible near the patient's bedside[8].

6. It is recommended that critical care areas that have undergone recent new unit planning and building are contacted by those embarking on a new build to share experiences and learning. The FICM and the ICS offer some guidance on 'what worked well' and 'what would you do differently' within their Critical Care New Builds guidance[7].

7. Additional factors that should be considered include potential noise[9] and natural light levels[10], colour and decoration schemes, privacy and dignity needs, and staff and visitor areas. Consideration should also be given to the patient's recovery and rehabilitation needs, including the potential for long-stay patients to spend periods outside.

8. Critical care units should be inspected as part of the peer-review process, including the review of the building and facilities. Feedback should include any concerns or highlight any slippage to timeframes.

9. Failure to follow HBN 04-02 guidance should be questioned by both the Operational Delivery Network and commissioners.

BACKGROUND

Innovative and imaginative architecture and design are essential for the development of an environment that enables the safe and effective management of critical care delivery. The national guidance relating to the physical facilities of critical care units has not changed since GPICS V1; however as more units are being built, common challenges continue to relate to:

- Managing patient safety; particularly ensuring good visibility/'line of sight' of patients, and alarm/monitoring capabilities.
- Staff safety in side rooms and how staff can summon help.
- Optimising infection prevention and control; considering the ratio of side rooms to open areas airflow and negative and positive pressure airflow systems.
- Adequate storage space.
- Provision of natural light.

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1.4 Clinical Information Systems

Authors: Mark Dunn, Michael Lympany & Tamas Szakmany

INTRODUCTION

Clinical Information Systems (CISs) can record, manage and process massive amounts of high-resolution data, allowing time and activity efficiency for physicians, nurses and all intensive care staff. Examples of CIS installations have shown reduction in medical error rates, improvement in compliance with unit standards of care and better clinical notes recording, as well as improved reporting data. The challenge for the future of CISs is to add value to healthcare delivery.

STANDARDS

1. The CIS must comply with the set of common specifications, frameworks and implementation guides that support interoperability as specified within the NHS Interoperability Toolkit. (https://digital.nhs.uk/services/interoperability-toolkit).

2. CIS procurements and customisation must involve a multidisciplinary collaboration of all stakeholders who would typically use, maintain and develop the system. This must include input from end users (including representatives of all clinical staff groups), procurement officers, clinical engineering, the CCIO (Chief Clinical Information Officer) and ICT (information and communication technology) specialists.

3. The CIS must have a rigorous business continuity access (BCA) plan and resilience system so that critical patient information remains available and system downtime must not compromise patient safety in any way. There must be a process to ensure that sufficient staff trained in BCA contingency measures are available 24/7.

4. Where patient data management systems (PDMS) or electronic health record (EHR) systems are used, there must be access to a dedicated workstation computer at each bed space. An appropriate number of both mobile and fixed workstations must be available to facilitate timely patient care by medical, nursing and allied staff on ward rounds and on an *ad hoc* basis.

5. The CIS must have robust implementation and ongoing training programmes to support all staff in its clinical and management use. These should be provided by the NHS organisation in partnership with the vendor company. Due consideration should be given to how this training will be provided to new starters and locum staff. There should be a mechanism by which any specialty involved in the patient's care while on the critical care unit has access to all pertinent information and is able to document in such a way as to facilitate care. This is particularly important when critical care and hospital documentation systems are distinct.

RECOMMENDATIONS

1. Critical care units should consider using a CIS.

2. CISs should be part of an electronic health record. The specification should include high-resolution data capture from patient monitoring, infusion devices, ventilators, cardiac output measurement, temperature management devices, intra-aortic balloon pumps, extra-corporeal life support (ECLS) devices, blood gas analysers and renal replacement therapy (RRT) devices. A CIS should be capable of customisable display of this information along with clinical notes.

3. The CIS should be connected to the hospital's patient information system for demographic and admission/discharge data, to laboratories for results, to radiology for reports and to other key software, e.g. National Critical Care Audit Systems and Hospital Electronic Prescribing and Medication Administration (HEPMA) for electronic data sharing. The CIS should be able to collect and share electronically Critical Care Minimum Data Sets (CCMDS) and national audit data to facilitate electronic generation of reports and audit. In the event of replacing an existing CIS, it must be possible to access archived patient records in a user-friendly format.

4. Investigation ordering should be fully integrated and recorded, and include electronic prescribing of drugs and fluids and ordering of laboratory and radiology services.

5. Daily summary plans should capture electronically activity data from the rest of the CIS, with the addition of free-hand text for healthcare professionals treating and visiting the patients.

6. The CIS should be capable of forming worklists for individual members of the critical care team to allow patient- and staff-based lists of tasks to be completed. The CIS should include the ability to alert when tasks are near due, due and overdue, and record and audit performance.

7. There should be a functionality within the database to alert, within a short timeframe, lack of compliance with care bundles and specifically for physiological abnormalities that are undesirable or life threatening. These alerts should be via dashboards displayed clearly within the unit and also via text or email to smartphones or notepad-type devices carried by healthcare staff.

8. The CIS should include a customisable transfer/discharge summary, pulling key information from diagnoses, intensive care management, clinical notes, labs and medication.

9. Flexibility through accessing care records online or through mobile devices should be possible.

10. The CIS should handle authentication and authorisation through Single Sign On, including the use of RFID/smart cards/biometrics.

11. The system should provide a capacity to evolve sophisticated electronic decision support systems, to facilitate patient safety and quality. The CIS should be capable of feeding data to other tele-health solutions for remote monitoring and advice on patient management.

BACKGROUND

In a world of ever-increasing data, a focus for the future must include: how to reduce information overload; improvement of efficiency and quality; and reduction of medical error. There is an evolving evidence base around the use of CISs to improve patient safety and quality[1]. The introduction of a CIS has been proven to reduce length of stay[2], errors in decision making[3,4] and errors in drug prescribing[5]. Using CISs has proven to be time efficient[4].

The functions of a CIS that make it an invaluable tool include the capture of complex high-resolution physiological recordings, data from devices used during the patient care process, fluid and medication prescription and administration, staff activities and decisions in critical care units, together with administrative data for commissioning. Hospitals may opt for a specialised CIS or one that forms part of a wider Electronic Health Record (EHR). If a CIS is a component of an EHR, these clinically focused systems integrate a wide variety of applications within a monolithic architecture. Long-term sustainability and modernisation of CISs should be factored in.

A patient in the critical care unit may require over 200 clinician-led, evidence-based decisions a day. The potential for error is real. A well-designed integrated customised CIS can reliably standardise and reduce variation in this decision-making process and deliver a more consistent experience for all patients[6]. Evidence is well established for the superiority of CISs in care bundle compliance[5] and in alerting for specific patterns of disease, e.g. early detection of sepsis[7] and ARDS[8]. CISs help improve the delivery of evidence-based strategies to achieve high rates of compliance, e.g. low tidal volume ventilation[6] and central line care bundle delivery[9].

Translation of real-time data into alerts or summary intelligence about performance of individuals, teams and clinical services, with instant feedback via dashboards and automated alerts to mobile devices modifies decision-making practices and improves the clinical effectiveness of clinicians as well as enhancing patient safety and quality[7,8]. Moving onto a digital platform can provide unique opportunities to collate and mine large sets of granular data, leading to better prediction of outcome and potentially allocation of resources[10]. It also enables an introduction of tele-health services, which could form part of the solution to the workforce constraints experienced in intensive care.

If one consistent message has emerged from the literature on improving quality and safety in healthcare, it is that high-quality intelligence is indispensable[5]. Intensive care as a specialty must now embrace more formal processes to balance rising costs, complexity of care and patient safety. Application of systems engineering principles to CISs in the intensive environment will further enhance the safety and quality of care of our patients.

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1.5 Clinical Equipment

Authors: Ari Ercole & Paul Dean

INTRODUCTION

The modern critical care unit is inevitably a high-technology area with diverse clinical equipment requirements for diagnosis, monitoring and delivering treatment. Such equipment must be provisioned on a 24/7 and emergent basis, although the precise requirements will be determined by the characteristics of the anticipated patient population. At the same time, the safe use of a wide variety of patient-facing technology requires the staff to be both adequately trained and retain their skills and knowledge. Guidance has been published by the Intensive Care Society[1].

Clinical equipment typically involves high capital items and is procured on the basis of an assessment of the potential harm that may be incurred if it is not purchased. Similar considerations pertain to equipment replacement. Patient, institutional and staffing considerations should all be taken into account when deciding on exactly what equipment should be purchased. Clinical needs will dictate equipment specification, but competitive tender will be required for sums greater than a set institutional threshold, which is often low compared to the typical costs involved in clinical equipment, and the institution's purchasing department must be involved. The existence of a robust training and skills assurance process is of paramount importance.

STANDARDS

1. All equipment must conform to the relevant safety standards, and must be regularly serviced and maintained in accordance with the manufacturer's guidance. Equipment must be checked immediately before use.

2. Uninterruptable power supply adequate to provide at least one hour of continuity of any critical equipment without battery back-up must be provided.

3. There must be a programme in place for the routine replacement of capital equipment.

4. All staff must be appropriately trained in and competent and familiar with the use of equipment. Up-to-date training records must be maintained to demonstrate that all staff (medical, nursing, AHP (Allied Health Professionals) and support staff) have complied with this provision.

5. There must be an individual designated equipment clinical lead for intensive care whose responsibilities will include the assessment, procurement, use and replacement of equipment on the critical care unit in collaboration with the electro-biomedical engineering (EBME) provider and the organisation's overarching equipment governance framework.

6. EBME support must be available either in-house or on a contracted basis to ensure equipment is appropriately serviced. Regardless of the model of support, EBME personnel must have the appropriate skills and equipment to service the equipment used.

7. Equipment must be uniquely identified and listed on an appropriate asset register along with details of its life cycle and service history/requirements to facilitate planned maintenance and replacement.

8. There must be documented procedures for decontamination (cleaning, disinfection and sterilisation as appropriate, depending on equipment risk category and sensitivity of devices[1]). Appropriate sterile services must be provisioned so that national standards are followed for the re-sterilisation of endoscopes and reusable[2,3].

9. Critical care units must have appropriate systems in place to ensure an adequate supply of consumables.

10. There must be a robust mechanism for reporting adverse incidents resulting from the use of clinical equipment[4]. Serious incidents involving clinical equipment may also need to be reported to the Medicines and Healthcare Products Regulatory Agency (MHRA)[5].

11. The MHRA[6] may issue safety alerts pertaining to medical devices, as may device manufacturers from time to time. There must be a designated role and robust mechanism for ensuring that such alerts are cascaded to staff and acted upon as appropriate.

12. Sufficient equipment must be available to meet the service demand to enable treatment provision (basic and specialist monitoring, ventilation, renal replacement therapy, information technology facilities, etc.) in an appropriate timescale to meet patient need. Consideration must be given to the need to provide additional capacity in times of surge demand.

13. Magnetic resonance imaging (MRI) compatible equipment must be provided for use where mechanically ventilated patients are to undergo MRI investigation. These must be clearly labelled and staff must be adequately trained.

14. Where advanced monitoring techniques are used (e.g. diagnostic electroencephalography, cardiac output monitors, intracranial pressure/other invasive neuromonitoring), there must be provision of appropriately trained staff to adequately interpret the results in a timely manner and to deal with likely complications of their use where appropriate.

15. Immediate access to point of care blood gas analysis and glucose/ketone analysis on a 24/7 basis must be provided.

16. Where equipment is to be trialled on a loan basis for evaluation purposes, it is essential that adequate indemnity and governance arrangements are in place in case of injury to either patients or staff from potentially unfamiliar equipment, and the supplier should provide adequate training to ensure correct use. The EBME provider should facilitate this process by testing the equipment for safety as well as evaluating servicing and maintenance implications.

RECOMMENDATIONS

1. Standardisation of equipment should be encouraged both within the critical care unit and in other areas where intensive care may need to be delivered.

2. The provision of diagnostic ultrasound equipment should be guided by the likely patient population and staff expertise. At very least, there must be immediate access to sufficient

ultrasound equipment to ensure that intravascular catheters can be placed safely and in a timely manner, even in emergent circumstances.

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1.6 Cardiothoracic Critical Care

Authors: Alain Vuylsteke & Simon Gardner

INTRODUCTION

In the UK, there are a different unit models for delivery of cardiothoracic surgery; large standalone tertiary centres with supra-regional services, units in large multi-specialty university centres and smaller units in a large general hospital setting[1]. Most units also offer interventional cardiology. Complex interventions are offered to patients with multiple co-morbidities[2].

The cardiothoracic critical care unit has changed considerably over time and now serves a unique patient population with a high burden of cardiovascular and thoracic critical illness.

Quality improvement programmes in cardiothoracic critical care units improve patient outcomes[3]. Staffing needs vary between cardiothoracic critical care units, according to the level of acuity of patients admitted.

The cardiothoracic critical care team has a central role to play in ensuring the adoption of strategies to maintain evidence-based practice and improve outcomes[4,5].

Cardiothoracic intensive care provides an important area of training in the management of patients with severe heart and lung disease, essential for the multidisciplinary team whatever their future area of practice.

STANDARDS

1. Consultant, nursing, resident medical, healthcare professional and pharmacy staffing must adhere to the standards outlined in the relevant staffing chapters of GPICS.

2. Each cardiothoracic critical care unit must have a designated lead consultant with training in cardiothoracic intensive care. This should be recognised in their job plan and they should be involved in multidisciplinary service planning and governance within the unit.

3. Each cardiothoracic critical care unit must have an identified lead nurse who is formally recognised with overall responsibility for the nursing elements of the service.

4. There must be a resident doctor or ACCP (Advanced Critical Care Practitioner) and a resident cardiac surgeon. There must be on-site 24/7 access to a doctor or ACCP with advanced airway skills. The resident team must be trained in Cardiac Surgery Advanced Life Support (CALS) and be capable of emergency chest re-opening 24/7[1,6].

5. Postoperative care pathways must be guided by appropriate protocols and delivered by trained personnel in a Level 3 clinical environment that complies with national standards. There should be a clear escalation pathway from post-operative care to intensive care[7].

6. The care of patients falling outside the protocolised care pathways must be reviewed by a multidisciplinary team led by a consultant trained in cardiac Intensive Care Medicine. Care of

these patients must be guided by a management plan set during a structured bedside ward round. The consultant should not be covering a second specialty while undertaking this task. This consultant needs to receive an appropriate amount of information to make decisions. This requires the presence or input of other professionals to facilitate this process. This includes 7/7 input from nursing, microbiology, pharmacy and physiotherapy.

7. Ventilated patients must have a registered nurse/patient ratio of a minimum 1:1 to deliver direct care. A greater ratio than 1:1 may be required to safely meet the needs of some critically ill patients, such as unstable patients requiring various simultaneous nursing activities and complex therapies used in supporting multiple organ failure. A lower ratio is justified for the low acuity post-operative extubated patient.

8. Physiotherapy staffing must be adequate to provide the respiratory management and rehabilitation components of care.

9. There must be a critical care pharmacist for every cardiothoracic critical care unit, supported by sufficient pharmacy technical staff.

10. All cardiothoracic critical care units must participate in local and national audit[2]. For example, for units in England, Wales and Northern Ireland, this is participation in the ICNARC ARCtIC (Assessment of Risk in Cardiothoracic Intensive Care) programme – the national clinical audit for cardiothoracic critical care units [8].

11. Transthoracic and transoesophageal echocardiography must be immediately available[1].

RECOMMENDATIONS

1. The patient monitoring and physical support requirements in a cardiothoracic critical care unit should be no less than the requirements of patients cared for in a general (Level 3) critical care unit.

2. It is preferable that all cardiac and thoracic surgery and post-operative care be carried out in a dedicated environment with each component located in close proximity[1,3].

3. The cardiothoracic critical care unit should have in place agreed clinical criteria for the appropriate case-mix and arrangements for escalation to a general critical care facility as required[1].

4. ACCPs, with adequate training and appropriate support, can provide a safe, sustainable alternative to medical staff in the cardiothoracic critical care unit[9].

5. Each day, a consultant in charge of the cardiothoracic critical care unit should coordinate input from members of the various teams in the immediate post-operative period.

6. Perfusion services should be readily available[1].

7. Cardiothoracic anaesthetists and cardiothoracic surgeons should be integrated into the multidisciplinary nature of each cardiothoracic critical care unit and take an active part in shaping services and analysing quality. Patient mortality audit is currently in the public domain

for each unit and each member of the MDT (multidisciplinary team) should have an understanding of how their own role contributes to patient outcomes[1].

BACKGROUND

Many units care for selected cardiothoracic surgical patients in the immediate post-operative period, in facilities other than designated critical care units. These are variously referred to as the high dependency unit, cardiac recovery, cardiac fast-track or by another similar name. They have in common the aim of selecting patients, minimising or abolishing the period of mechanical ventilation in the post-operative period and preventing complications.

Many patients will progress from Level 3 to Level 1 status in a few hours, while others will remain at Level 2 or 3 for longer. Arrangements should be in place for escalation to a Level 3 facility as required, and these should meet the same staffing and monitoring requirements of a general critical care unit[1], and suitably experienced anaesthetic and surgical staff should be immediately available.

Multidisciplinary teams have recognised the need to deliver the care to these patients in accordance to published guidance and reported the benefits of bespoke pathways and protocolised care[1,10]. Inter-professional rounds led by a consultant in Intensive Care Medicine have been shown to be associated with lower risk-adjusted mortality compared with the critical care units staffed by non-consultants in Intensive Care Medicine[11,12], but the link between medical staffing and patient outcome may not be as strong as previously thought[5,13-18].

Hybrid models of staffing[19,20] have been successfully developed, with a mix of non-medical practitioners, trainee doctors and consultants from various specialties involved in the management of the patient and providing ongoing cover.

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1.7 Neurocritical Care

Authors: Roger Lightfoot, Thearina de Beer, Matthew Wiles & Elfyn Thomas

INTRODUCTION

Neurocritical care is the care of the critically ill patient who has a neurosurgical or neurological disorder, including trauma. Its provision in specialist centres has been shown to reduce mortality, improve quality of life and be cost-effective[1].

The consultant-led multidisciplinary team requires understanding of the individual neurological condition along with full general intensive care expertise. Optimisation of the neurological system, along with protection of other systems' function, is necessary in ensuring the best possible outcome.

Early integration of rehabilitation is vital. In addition to in-hospital mortality, long-term function is a key outcome metric. Best-interests may be challenging due to a possible prolonged loss of capacity or devastating brain injury.

STANDARDS

1. Consultant, nursing, resident medical, healthcare professional and pharmacy staffing numbers and work patterns must adhere to the same standards outlined in the relevant chapters of GPICS.

2. Neurocritical care units should have access to investigation facilities and appropriate clinical expertise for the following:
   a. diagnostic radiology (24-hour access to CT; access to MRI for ventilated subjects, and diagnostic angiography)
   b. access to biochemistry and microbiology services to analyse cerebrospinal fluid (CSF)
   c. neurophysiology (including electroencephalography [EEG] and evoked-response diagnosis and monitoring). Access to continuous 24-hour EEG monitoring is highly desirable.

3. All cases requiring immediate lifesaving neurosurgery must be admitted to the local neurosurgical centre irrespective of the initial availability of neurocritical care beds[2].

4. Patients with a Glasgow Coma Scale (GCS) score of ≤ 8 following a head injury at any time must have access to specialist treatment from a neuroscience unit[3].

5. As per NICE QS74, eligible patients must have assessment for in-patient rehabilitation if new cognitive, emotional, behavioural or physical difficulties persist for more than 72 hours[3].

6. In addition to general rehabilitation, neurologically impaired patients must have access to specialist neuro-rehabilitation services[4].

7. Neurocritical care must have resources to support mechanical thrombectomy in line with NICE IPG 548[5].

8. Neurocritical care must have resources to support regional networks for the safe and timely management of patients with subarachnoid haemorrhage[6].

9. Patients must be cared for by a multi-professional intensive care team with specialist expertise and experience in managing critically ill neurological patients using agreed protocols based on the best evidence available[7].

10. Care of critically ill neurological patients must fully integrate involvement of admitting specialties (neurology, neurosurgery, spinal surgery), and diagnostic/interventional specialties (neuroradiology and neurophysiology).

11. When calculating cerebral perfusion pressure in the management of traumatic brain injury, the arterial transducer should be placed (levelled) at the tragus[8].

RECOMMENDATIONS

1. Consultants providing out of hours care and advice should have regular timetabled sessions in neurocritical care.

2. Both the patient and family of the patient on neurocritical care should be offered support and guidance in the disease process and longer-term outcomes using specialist nurses and psychologists.

3. Multimodal monitoring of patients with neurological injury should be consistent with international consensus recommendations[7].

4. Early and formal involvement of the neurorehabilitation team as part of the multidisciplinary team should be sought to optimise outcomes and facilitate transitions of care[4].

5. Specialist equipment needs to be freely available to facilitate the acute rehabilitative needs of all brain and spinal injured patients while on neurocritical care[4].

6. Neurocritical care units must be part of a regional network of care, with agreed rational transfer and repatriation protocols that ensure rapid acceptance of patients for specialist care, and transfer back to referring hospitals or onwards for further specialist long-term care when the need for specialist neuroscience care no longer exists.

7. Follow up and audit of outcomes from neurocritical care should include a measure of functional recovery at a minimum of six months.

8. Regular neurocritical care morbidity and mortality meetings should be undertaken involving all members of the multidisciplinary team, including the admitting specialties, allowing structured judgement case review.

9. Patients requiring intensive care for acute neurosurgical and neurological diseases in non-specialist centres should have direct communication to expertise in specialist neuroscience centres.

BACKGROUND

Since the publication of GPICS in 2015, the specialist area of neurocritical care has evolved, influenced by developing patient care pathways, coroner's recommendations, Specialist Society guidelines and research outcomes.

In trauma, the demographic of the patient is changing, leading to older patients presenting from lower velocity injuries, and with a higher Glasgow Coma Scale for the same level of injury on imaging. This poses the challenge of dealing with the associated co-morbidities in the older patient alongside the neurological injury. Major Trauma Networks have shown a reduction in mortality but this has led to the neurocritical care team dealing with more patients with an increase in Injury Severity Score due to multi-system injury. Consequently, this has led to more complex decision making. This is highlighted in difficulties in dealing with best interest decisions for potentially devastating brain injuries. The decision making is still unclear but recent guidelines have been developed to facilitate the process[9].

Since 2015, research has shown a reduction in long-term mortality for patients who are offered mechanical thrombectomy in anterior circulation stroke[10]. Organisation of stroke pathways for mechanical thrombectomy has started to develop to offer more readily available access to patients in regional referring pathways. In some areas of the UK this has become a 24/7 service. There is uncertainty as to the impact on neurocritical care resources in the regional centres in the immediate management of the patient who has successfully undertaken thrombectomy, but also in the complex pathways following the procedure.

The Courts and Tribunals Judiciary in January 2017 published *Coroners' Regulation 28: Report to reduce further deaths*[2]. The recommendation was that patients requiring life-saving neurosurgery must be admitted to the local neurosurgical unit irrespective of the availability of neurocritical care beds. This will increase pressure on resources for all neurocritical care units in the UK.

Large, multi-centre, multidisciplinary, collaborative research studies, such as CENTER-TBI, have finished recruiting and are starting to give an insight into the variation in structure, pathways, personnel and decision making in the UK and Europe. Early publications suggest that these studies will influence not only the future clinical care of patients, but also how future research is conducted[11].

Comparison of outcomes and benchmarking of standards of care between similar-sized neurocritical care units is not widespread. The multidisciplinary agreement of simple standards, such as a reference point for mean arterial pressure measurement for calculation of cerebral perfusion pressure, is the start of this process[8].

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USEFUL CLINICAL RESOURCES

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Section Two

Critical Care Services: Workforce

2.1 Medical Staffing

Authors: Alison Pittard & Jack Parry-Jones

INTRODUCTION

GPICS 2 builds on the medical staffing standards originally published in *Core Standards for Intensive Care* and GPICS 1, while acknowledging that some units have had difficulty meeting these standards. Patients should be able to receive the same standard of intensive care wherever they are admitted in the UK. The key standards, which should be achievable over time by all critical care units, for all patients, are detailed below. Adoption of this strategy nationally will, over time, have a beneficial impact on both quality of care and safety for patients.

STANDARDS

1. Patients' care must be led by a consultant in Intensive Care Medicine, who is defined as a consultant who is a Fellow/Associate Fellow or eligible to become a Fellow/Associate Fellow of the Faculty of Intensive Care Medicine. A consultant in Intensive Care Medicine will have daytime Direct Clinical Care Programmed Activities in Intensive Care Medicine identified in their job plan. These programmed activities will be exclusively in ICM and the Consultant will not be responsible for a second speciality at the same time.

2. Consultant work patterns must deliver continuity of care[1,2,3].

3. The daytime consultant to patient ratio must not normally exceed a range between 1:8 and 1:12. This ratio is complex and needs to be cognisant of the seniority and competency of junior staff, the reason for admission (e.g. standard post-operative care pathway) and the number and complexity of emergency admissions. The night-time ratio cannot be defined.

4. The daytime intensive care resident to patient ratio should not normally exceed 1:8. The ratio may be need to be reduced if local arrangements dictate that the intensive care resident is expected to provide emergency care outside of the critical care unit (e.g. wards and emergency department). The night-time resident to patient ratio should not normally exceed 1:8.

5. All staff that contribute to the resident rota must have basic airway skills. All critical care units must have immediate 24/7 on-site access to a doctor or ACCP with advanced airway skills.

6. There must be a designated Clinical Director and/or Lead Consultant for Intensive Care Medicine[4].

7. A consultant in Intensive Care Medicine must be immediately available 24/7. The consultant responsible for intensive care out of hours must be able to attend within 30 minutes.

8. A small number of units that remain staffed overnight by an anaesthetic consultant without daytime ICM sessions, by a necessity dictated by the unit's size and remoteness, must also have a consultant in Intensive Care Medicine available for advice 24/7, either by local agreement or from within the Critical Care Network.

9. A consultant in Intensive Care Medicine must undertake ward rounds twice a day[2] seven days a week.

10. The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy and regular input from dietetics, speech and language therapy, occupational therapy and clinical psychology to assist decision making. The nurse in charge should be present in person for the ward round.

11. Rotas for consultants and resident staff must be cognisant of fatigue and the risk of burnout.

RECOMMENDATIONS

1. The consultant rota should seek to avoid excessive periods (> 24 hours) of direct patient consultant responsibility. A consultant rota with fewer than eight participants is likely, with the frequency of nights and weekends, to be too burdensome over a career.

2. The resident rota should be compliant with working time directives (i.e. Working Time Directive 2003).

BACKGROUND

GPICS V1 (July 2015) set out the expected Core Standards for Medical Staffing. Small units struggle to meet the standard of providing consistent consultant in Intensive Care Medicine cover for nights, weekends and national holidays. Consultant rotas are often part covered by consultant anaesthetists without job planned daytime weekday intensive care sessions. A key standard in GPICS V2 is that the care of all critically ill patients must be directed during the daytime by a consultant in Intensive Care Medicine seven days a week. It is expected that, where possible, all units should evolve over time to have 24/7 consultant in Intensive Care Medicine cover.

Large units struggle to consistently meet the consultant-to-patient ratios but, more especially struggle to meet the resident-to-patient ratio at night and weekends. *A key standard in GPICS V2 is that the resident to patient ratio for resident staff must not exceed 1:8 during daytime and should not exceed 1:8 at night and weekends.* The intensive care resident tier may include SAS doctors and trained Advanced Critical Care Practitioners (ACCPs). These resident-to-patient ratios are achievable over time by using ACCPs and trainee medical staff with basic airway skills. All units however must have immediate access at all times to someone with advanced airway skills.

Specialty and Associate Specialist (SAS) doctors are non-training grades where the doctor has at least four years of postgraduate training, two of those being in a relevant specialty. SAS doctors have a wide variety of skills and experience and are usually more focused on meeting NHS service requirements compared to trainee or consultant roles. Since 2008, entry to this grade has been closed and all new appointments are known as Specialty Doctors. There is a separate contract setting out pay and conditions but it is very similar to the consultant contract. As they are most likely to be permanent members of staff, they have the potential to be a huge asset to the intensive care team in terms of patient care and continuity of service. Their level of experience will govern the exact role within the multidisciplinary team, but over time this could be developed to meet both theirs and service requirements.

Table 1. The number of general adult critical care units and their declared bed capacity in England and Wales (excludes specialist units for cardiac and neuro critical care) in 2018.

Number of beds on unit	Number of units of that bed number in England and Wales	Resident tiers required to meet 1:8 patient ratio
0-4	6	6
5-8	51	51
9-16	108	216
17-25	32	96
>25	17	68
Total	214	437

These data derive from the Case Mix Programme Database. The Case Mix Programme is the national, comparative audit of patient outcomes from adult critical care coordinated by the Intensive Care National Audit & Research Centre (ICNARC). For more information on the representativeness and quality of these data, please contact ICNARC.

Resident medical staffing of units remains largely reliant on anaesthesia as the total number of tiers required is more than 437, equating to more than a combined total of 4,000 trainees, SAS, and ACCPs. There are currently less than 600 registered FICM Fellows registered for training in the UK. As such, registered FICM trainees could only staff around 60 tiers (ten required for each tier to meet their hour requirements, etc.). The long-standing reliance in the UK on anaesthesia trainees will fall as more ACCPs are trained and other specialties' trainees, in particular general medicine and surgery, realise the increasing importance of intensive care skills and competencies as part of their general training.

Closed units, where clinical decision making includes patient admission and discharge being directed by a dedicated consultant in Intensive Care Medicine, are the optimum configuration to delivering intensive care[1]. A meta-analysis showed that these are consistently associated with reduced intensive care and hospital mortality and length of stay[2]. Where this model is applied, the addition of a resident consultant in Intensive Care Medicine at night does not consistently further improve outcomes. This is provided that there is a dedicated resident junior[5,6,7]. Some units may wish, with local agreement, to utilise resident consultants in Intensive Care Medicine, especially where they struggle to employ sufficiently experienced trainees with the required competencies to staff a senior resident rota[8].

The best UK evidence to date on patient to consultant in Intensive Care Medicine ratio (Patient Intensivist Ratio, PIR) related outcome is by Gershengorn et al[9]. This utilises UK data from the Intensive Care National Audit and Research Centre (ICNARC) dataset. It demonstrated a U-shaped distribution of PIR ratio outcomes with an optimum ratio of 7.5 patients per consultant in Intensive Care Medicine between the hours of 0800 and 1600. Lower ratios and higher ratios of up to 12 patients per intensivist were associated with an increased mortality, after which mortality flattened off. This lends weight to the current division of large units into manageable 'pods'. The evidence suggests that eight patients per pod is optimum, but this number could be higher, provided it doesn't include the interruption of acute admissions.

There is no evidence that a consultant doing seven-day working has any additional patient benefit compared with five-day working[3]. However, blocks of daytime working with separate night-time cover are recommended. Patient and relative satisfaction supports continuity of care. Good handover of patient care from consultant to consultant is essential and should be timetabled in consultant job plans.

High levels of stress over long periods of time have variable effects on all staff. Once established, burnout is difficult to manage, may contribute to depressive illness, and comes at significant cost to the individual and the NHS. A good work-life balance and supportive working environment offer some protection and therefore it is recommended that departments consider a variable job plan that reflects the changing nature of stressful situations by time and individual.

We believe that unit leadership, culture, education, working practices, cohesiveness and the ethos of the actual critical care team are vitally important determinants of patient outcome and staff well-being.

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Recommended reading:

Factsheet: ICU Physician Staffing. Leapfrog hospital survey. Last Revision: 4/1/2018.
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[Accessed 29 Jan 2019].

2.2 Registered Nursing Staff

Authors: Andrea Berry, Sarah Clarke & Claire Horsfield

INTRODUCTION

Registered nurse staffing standards published within the *Core Standards for Intensive Care Units*[1] and in the proposed Adult Critical Care Clinical Reference Group (ACC CRG) Service Specification[2] aim to produce a positive impact on both quality of care and safety for critically ill patients.

The standards have been developed and agreed by Critical Care professional nursing organisations representatives who are collectively the UK Critical Care Nursing Alliance (UKCCNA)*.

Where robust evidence is limited in relation to nurse staffing in critical care, professional consensus has been used to develop the standards.

STANDARDS

1. Level 3 patients must have a registered nurse/patient ratio of a minimum 1:1 to deliver direct care[3,4,5].

2. Level 2 patients must have a registered nurse/patient ratio of a minimum of 1:2 to deliver direct care[5].

3. Each designated critical care unit must have an identified lead nurse who has overall responsibility for the nursing elements of the service[5] e.g. a senior nurse band 8a or above.

4. There must be a supernumerary (i.e. not rostered to deliver direct patient care to a specific patient) senior registered nurse who provides the supervisory clinical coordinator role on duty 24/7 in critical care units[6]. Units with fewer than six beds may consider having a supernumerary clinical coordinator to provide the supervisory role during peak activity periods, e.g. early shifts.

5. Units with greater than ten beds must have additional supernumerary senior registered nursing staff over and above the supervisory clinical coordinator to enable the delivery of safe care (i.e. 11-20 beds +1, 21-30 beds +2, etc.). The number of additional staff per shift will be incremental depending on the size and layout of the unit (e.g. multiple pods/bays, single rooms). Consideration for the need of additional staff also needs to be given during events such as infection outbreak.

6. Each critical care unit must have a dedicated Clinical Nurse Educator responsible for coordinating the education, training and CPD (Continuing Professional Development) framework for intensive care nursing staff and pre-registration student allocation[3]. This should equate to a minimum of 1.0 WTE (Whole Time Equivalent) per 75 nursing staff.

7. All nursing staff appointed to intensive care must be allocated a period of supernumerary practice[3] to enable achievement of basic specialist competence.

8. A minimum of 50% of registered nursing staff must be in possession of a post-registration academic programme in Critical Care Nursing[7,8].

9. Units must not utilise greater than 20% of registered nurse from bank/agency on any one shift when they are NOT their own staff[1,9].

10. Where direct care is augmented using support staff (including unregistered nursing roles), appropriate training and competence assessment of those staff is required[10,11].

11. In addition to leadership competencies the lead nurse/matron/senior nurse band 8a or above (terms are synonymous for this purpose) for the critical care unit must meet, as a minimum, the same specialist critical care nurse educational standards as the staff caring for Level 3 patients.

RECOMMENDATIONS

1. Step 1 of National Competencies for Adult Critical Care Nurses[7] should commence when a nurse with no previous experience of the specialty begins working in Intensive Care Medicine.

2. Steps 2 and 3 of National Competencies for Adult Critical Care Nurses[7] should be incorporated into academic intensive care programmes.

3. Post-registration adult intensive care nursing courses should be awarded a minimum of 60 credits at Level 6. To meet the requisite standard, courses must adopt the core curriculum described in the National Standards for Critical Care Nurse Education (2016)[8].

4. Additional Clinical Nurse Educators will be required for larger units, i.e. 1.0 WTE for approximately 75 staff[1,2]. Clinical Nurse Educators should be senior intensive care nurses who have attained Step 3 competence, have completed a post-registration intensive care academic programme and be in possession of a post-registration teaching qualification.

5. Registered nurses supplied through an agency to work in intensive care should provide evidence of appropriate experience and competence to care for critically ill patients[8].

6. The Best Practice Principles to Apply When Considering Moving Critical Care Nursing Staff to a Different and Unfamiliar Clinical Care Area[12] should be followed at all times to enable staff to achieve and maintain competence in intensive care nursing. The potential adverse effects on staff morale, recruitment and retention should be considered, particularly when this is recurrent. Executive Directors of Nursing should take requisite steps to minimise this.

7. Supernumerary clinical coordinators should have completed Step 4 competencies[13] in addition to their post-registration academic programme in intensive care nursing.

BACKGROUND

The nature and delivery of intensive care services are evolving with great speed. This is seen both in the increased complexity of treatments being delivered and in the types of facilities to accommodate changes in service delivery. These standards take into account differing needs created by varied service models. For example, large units with multiple single rooms require additional registered nurses to provide safe levels of care 24/7. Whatever the service model, the registered

nurse-staffing standards have been developed to provide a framework to support the safe delivery of high-quality care for all.

The Francis Inquiry[6] identified a number of key areas for the nursing profession to address, including the need to determine safe staffing levels and the provision of solid nursing leadership. This message was reinforced by the Berwick Report[14], which highlighted the need for healthcare organisations to ensure that they have staff present in appropriate numbers at all times to provide safe care and to ensure that staff are well supported. For this purpose, the intensive care registered nursing standards provide a sound framework to inform skill mix, educational standards, numbers, support and nursing leadership.

It is widely acknowledged that the intensive care workforce is costly; however, previous attempts to reconfigure this workforce in order to reduce staffing budgets have resulted in negative patient outcomes[5].

A number of systematic literature reviews have revealed evidence to suggest there are links between the nursing resources and patient outcomes and safety[15]. Furthermore, correlation has been established between nurse staffing levels in intensive care and the incidence of adverse events[15,16]. Most recently, West et al.[16] have linked higher numbers of nurses per bed with higher survival rates. In their study, they were also able to demonstrate that the number of nurses had the greatest impact on patients at high risk of death. Initial analysis of the recent CC3N (Critical Care Networks National Nurse Leads) workforce survey[17] demonstrated the influence that standards have on nursing provision within critical care areas, with 100% of units achieving one nurse to one Level 3 patient and 99.5% of units achieving one nurse to two Level 2 patients. The nursing workforce continues to evolve. As such, research into models of allocating nurse staffing in critical care units is underway with an anticipated completion date of 2019.

Appropriate preparation, through post-registration education and training of specialist intensive care nurses, is a vital component in providing high-quality care to patients and their families. This preparation should include formal education programmes in line with National Standards for Critical Care Nurse Education[8], alongside the completion of the National Competency Framework for Critical Care Nurses[7], which together address the knowledge, skills and attitudes necessary to underpin quality intensive care nursing practice.

Nurse leaders are required to play a key role in shaping the profession's responsiveness to our changing healthcare system. Sound nursing leadership from the Board to the point of care will influence how high-quality, safe and effective intensive care services are delivered. Nurse leaders are well placed to take charge of factors known to affect outcomes, which include teamwork, inter-professional communication, standardised care processes and process compliance[18]. The Kings Fund[19] suggests that nowhere is leadership more crucial to improving care quality than on the front line, and that for this reason, the role of the clinical leaders – those responsible for co-ordinating shifts – are critical to successful leadership.

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* The UKCCNA (UK Critical Care Nurse Alliance) consists of representatives (chairs/co-chairs) of the following organisations:

- British Association of Critical Care Nurses (BACCN),
- Critical Care Networks -National Nurse Leads (CC3N),
- Royal College of Nursing (RCN) Critical Care & In-flight Forum
- Intensive Care Society (ICS) Nurses and Allied Health Professionals Committee (NAHP)
- Paediatric Intensive Care Society (PICS)
- National Outreach Forum (NoRF)

2.3 Workforce, Induction & Training of Medical and Nursing Staff

Authors: Tom Gallacher, Samantha Cook & Julie Platten

INTRODUCTION

The requirements for the provision of a suitable education environment for nursing and medical staff working in intensive care are defined in a number of publications. These include the General Medical Council in their publication *Promoting excellence: standards for medical education and training*[1] and the Critical Care National Network Nurse Leads (CC3N) in a number of publications[2,3,4,5], as well as the FICM in *Guidance for Training Units in Intensive Care Medicine*[6].

STANDARDS

1. Each critical care unit must have a dedicated supernumerary Clinical Nurse Educator (1 WTE per approximately 75 staff), responsible for coordinating the education and training and CPD framework for intensive care nursing staff and pre-registration students[7].

2. All nursing staff appointed to intensive care must be allocated a period of supernumerary practice to allow adequate time for registered nurses to develop basic skills and competencies assessed to ensure they can safely care for a critically ill patient[2].

3. All registered nurses commencing in intensive care must be working towards Step 1 of the National Competency Framework for Adult Nurses in Critical Care[2].

4. A minimum of 50% of registered nursing staff must be in possession of a post-registration academic programme in intensive care nursing[2].

5. Where direct care is augmented using non-registered support staff, appropriate training and competence assessment must be provided[8].

6. All non-consultant medical staff commencing a post in the critical care unit must have a consultant-led departmental induction to the unit with a formal published programme[1]. This must take place prior to commencing any clinical duties, and must include, but is not limited to:
   a. Instructions on how to raise patient safety concerns.
   b. Instructions on how to raise issues of bullying and undermining.
   c. Introduction to key members of medical, nursing, allied professional and operational support staff.
   d. Highlighting key departmental guidelines and how to access all departmental guidelines.
   e. Explanation and distribution of the doctor's rostered work pattern, and their roles and responsibilities when rostered to work both during the daytime and out of hours.
   f. Arrangements for access to all IT systems, including passwords, provision of identification badges and tutorials on the use of any clinical IT systems on the day of induction.
   g. Assigning each doctor an Educational Supervisor[9].

7. There must be a regular (e.g. weekly), consultant-led teaching programme relevant to all non-consultant grade doctors. Time to attend this must be protected, with attendance mandatory

for all non-consultant grade doctors rostered to be on duty. These sessions should be open to all members of the MDT (multidisciplinary team).

8. There must be regular clinical governance, morbidity and mortality, and literature review meetings open to all members of the MDT. These meetings must be attended by both consultants and non-consultant grade doctors and non-consultant grade doctors must have the opportunity to lead the presentations at these sessions.

9. All consultants responsible for the educational supervision of trainees must be recognised by the GMC for this role and there must be sufficient time allocated in the Educational Supervisor's job plan to allow 0.25 SPA per trainee[10].

10. All non-consultant grade doctors must have a bespoke personal development plan relevant to their developmental needs, and the doctor must be given the time and opportunity to achieve the objectives within the personal development plan as agreed with their Educational Supervisor[11].

11. All staff supplied through an agency to work in intensive care must provide evidence of appropriate experience and competence to care for critically ill patients[5].

RECOMMENDATIONS

1. Clinical Nurse Educators should be in possession of a post-registration academic programme in intensive care and an appropriate postgraduate certificate in education or equivalent[2].

2. Nurse education programmes should follow the National Standards for Critical Care Education (2016) and include both clinical competence and assessment[2].

3. Study leave should be provided for all members of the MDT for intensive care-related courses and conferences.

4. A creative learning environment should be provided for all staff offering a range of learning experiences to meet the defined learning outcomes for their continuing professional development[1,2].

5. There should be a regular monthly forum chaired by a senior member of the department, where all members of the MDT can feed back any patient safety, educational or operational issues to the senior medical, nursing and management team.

6. The hospital and/or departmental library should provide access to relevant and up-to-date Intensive Care Medicine journals and books relevant to nursing, medical and AHP staff

7. The critical care unit should provide access to online clinical resources from within the clinical area for all clinical staff.

8. All consultants should provide regular teaching and feedback to non-consultant grade doctors, nursing staff and allied health professionals[1]

9. There should be a regular multidisciplinary educational programme, including simulation involving medical, nursing and allied health professional staff[1].

10. Step 4 leadership competencies (or equivalent) (CC3N, 2018) should be completed by all senior nurses who undertake the role of shift leader (including those who lead partial teams in larger units) and those aspiring to such a role.

11. Specialist step competencies (CC3N, 2018) should be completed whenever relevant to the case-mix of the unit. For example, nurses working in critical care units in major trauma centres should complete the major trauma step competencies.

BACKGROUND

Critical care units are staffed by multidisciplinary teams from medical, nursing and allied health professional backgrounds, and the education and learning environment should reflect this. The learning environment must encourage transparency in reporting patient safety issues and any deficiencies in educational provision, as well as providing timely feedback on the issues raised and how they have been resolved. The learning environment should be such that it encourages the professional development of all groups of staff as well as ensuring the delivery of safe, quality patient care.

In order to provide quality education and training, trainers must be given time and resources with which to prepare and deliver educational opportunities, and this requires underpinning by an educational delivery infrastructure for all staff groups. Due to the multidisciplinary nature of the delivery of intensive care, educational activities should, as far as is possible, be shared with participation encouraged by all members of the multidisciplinary team.

The provision of education for all intensive care staff must be considered a high priority due to its intrinsic link with the delivery of safe and high quality patient care. The agreed standards and recommendations for intensive care nurse education now provide a benchmark against which organisations can be assessed in their delivery of quality education and support of nursing staff. The standards and recommendations have been agreed at the Critical Care Nurse Education review Forum (CCNErF) and published in *National Standards for Critical Care Nurse Education*[3] and *The National Competency Framework for Adult Critical Care Nurses*[4]. The standards set out in these documents ensure that the intensive care nursing workforce is fit for purpose, with the skills to provide high quality, safe and effective care to patients and their families.

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2.4 Advanced Critical Care Practitioners

Authors: Carole Boulanger & Jane Poynter

INTRODUCTION

The purpose of the Advanced Critical Care Practitioner (ACCP) role is to provide care that is focused on patients and their needs, recognises acutely ill patients, initiates early treatment, supports patients through critical illness and, where appropriate, enables a dignified death. The inclusion of ACCPs provides an effective workforce solution enhancing continuity and quality of care. The ACCP role has facilitated a new way of working and complements existing roles within the intensive care team.

STANDARDS

1. ACCPs must act within the formal code of conduct of their present statutory regulator. Trainee ACCPs are required to practice within the structure of the FICM curriculum, with the appropriate level of supervision.

2. Successful completion of the Non-Medical Prescribing module is an essential requirement of an ACCP. Those not eligible to prescribe will not meet FICM requirements for FICM ACCP membership.

3. ACCPs must acknowledge any limitations in their knowledge and skills and should not perform clinical activities they do not feel skilled or competent to perform. As part of their training and ongoing professional development, they must develop (and continue to develop) a high level of clinical judgment and decision making.

RECOMMENDATIONS

1. A FICM-associated ACCP with supervision from an ICM consultant falls within the definition of an intensive care resident and may provide the onsite 24/7 immediate clinical/medical cover for patients.

2. An ACCP who entered a training post after 5 November 2017 should successfully complete an ACCP specific two-year Postgraduate Diploma (PgDip) which meticulously follows the FICM ACCP curriculum[1], and register with FICM as a trainee ACCP. ACCPs who entered training pre the above date should ensure their training programme adheres to the requirements of the FICM ACCP Membership criteria.

3. After successful completion of clinical and academic PgDip ACCP requirements, including Non-Medical Prescribing, ACCPs should apply to the FICM for ACCP Membership.

4. It is recommended that employing units should only appoint FICM-associated ACCPs to ensure a standard knowledge base, minimum skillset and that FICM ACCP curriculum competencies have been met.

5. While working autonomously, the ACCP will always work within a multi-professional team led by a consultant who is trained in ICM.

6. It is recommended that critical care units employing ACCPs have transparent ACCP standard operating procedures and outcomes, and that any incidents are reviewed as part of the unit's governance arrangements.

7. It is recommended that line management of ACCPs forms a tripartite arrangement between an ICM consultant, ICU clinical supervisor and professional lead such as a senior nurse or AHP from the ACCP's base profession.

8. Continuing professional development (CPD/appraisal) for ACCPs should be undertaken according to the FICM CPD/appraisal guidance[2] on an annual basis.

BACKGROUND

The National Education and Competence Framework for Advanced Critical Care Practitioners[3] was published in 2008, and since then, over 100 nurses and physiotherapists have entered training. ACCPs are now forming part of the intensive care workforce, in most situations working on the trainee medical rota.

The FICM ACCP curriculum based on the Framework forms the basis of the requirements for training. ACCPs are highly skilled practitioners who can:

- Take a comprehensive patient history.
- Undertake clinical examination.
- Use their expert knowledge and clinical judgement to identify the potential diagnosis
- Refer patients for investigations where appropriate.
- Make a provisional differential diagnosis.
- Decide on and carry out treatment, including the prescribing of medicines, or refer patients to an appropriate specialist.
- Plan and provide skilled and competent care to meet patients' health and social care needs, involving other members of the healthcare team as appropriate.
- Ensure the provision of continuity of care including follow-up visits.
- Assess and evaluate, with patients, the effectiveness of the treatment and care provided and make changes as needed.
- Work independently, under consultant supervision as part of the intensive care team.
- Provide leadership.
- Make sure that each patient's treatment and care are based on best practice
- Support the knowledge, skills and competence of medical trainees in ICU, trainee ACCPs and other members of the MDT.
- Provide a stable workforce and support quality improvement.

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2.5 Pharmacists

Authors: Emma Graham-Clarke & Mark Borthwick

INTRODUCTION

Clinical pharmacy is an integral part of the multidisciplinary critical care team, delivering direct pharmaceutical care to patients, optimising pharmacotherapy in individual patients as well as on a unit-wide basis and providing a key role in medicines optimisation. There is good evidence that the direct inclusion of pharmacists within the multi-professional team reduces medication errors and improves patient outcomes by enhancing and individualising medication therapy while reducing costs[1-4]. Pharmacists also provide fundamental professional support activity such as developing and implementing medicines-related guidelines, improving resource use via medicines optimisation activities, evaluation of medication use and medicines expenditure analysis.

STANDARDS

1. There must be a designated intensive care pharmacist for every critical care unit.

2. The critical care pharmacist must have sufficient job time within which to do the job. There should be 0.1 whole time equivalent (WTE) pharmacist for every Level 3 bed and 2 for every Level 2 bed for a 5/7 a week service.

3. Clinical pharmacy services should be available seven days per week. However, as a minimum, the service must be provided five days per week (Monday-Friday) with plans to extend the ward service to seven days a week before 2020[5].

4. The most senior pharmacist within a healthcare organisation who works on a daily basis with critically ill patients must be competent to at least Advanced Stage II (excellence level) in adult critical care pharmacy.

5. Other clinical pharmacists who provide a service to intensive care areas and have the minimum competencies to allow them to do so (Advanced Stage I) must have access to an Advanced Stage II (excellence-level) intensive care pharmacist for advice and referrals.

6. As a minimum, the pharmacist must attend daily multidisciplinary ward rounds on weekdays (excluding public holidays).

7. There must be sufficient patient-facing pharmacy technical staff to provide supporting roles.

RECOMMENDATIONS

1. To maintain the continuity of the service during annual leave, sick leave and training leave, additional appropriate resources will be required (20% minimum is recommended).

2. Intensive care pharmacists should undergo an independent, recognised process to verify competence level.

3. Senior specialist intensive care pharmacist support should, preferably, be provided within the organisation but may be provided from a critical care network or on a regional basis.

4. A peer-to-peer practitioner visit should occur at least once a year to ensure training issues are identified and to help maintain the competence of small teams and sole workers. This supports General Pharmaceutical Council (GPhC) revalidation.

5. Where a team of intensive care pharmacists is in place, there should be a structured range of expertise, from trainee to Fellow level.

6. Intensive care pharmacists are encouraged to become active independent prescribers.

BACKGROUND

Intensive care pharmacists optimise medication use in the critically ill, manage medicines-related risks, utilise evidence-informed decision making and encourage professional collaboration. Their expertise improves prescribing quality in a patient group characterised by pharmacodynamic and pharmacokinetic instability and complexity, resulting in improved outcomes and reduced costs[1-4]. Data from the PROTECTED-UK study show pharmacist medication reviews led to medicines optimisation or error correction for one in six medicines prescribed, with pharmacist attendance at the multidisciplinary ward rounds key to this[6]. Where weekend services were provided, the weekend intervention rate was double that of weekdays and in its absence, contribution rates were significantly higher on Mondays compared to other weekdays. Experienced/specialist pharmacists made contributions with higher clinical impact than more junior team members[7].

Compared to medical and nursing teams, pharmacy teams may be relatively small, consisting of one or two practitioners, often sharing other job/clinical commitments to make viable posts. An appropriate proportional uplift must be applied to the core staffing figure to ensure service continuity for annual leave, sickness, study leave, etc., and may be greater than the 20% suggested to make small teams workable. Additionally, the *Core Standards for Intensive Care Units 2013* staffing guidance is sufficient for a five-day service and additional time is required to provide a seven-day service (overall, 0.12-0.14 WTE per Level 3 bed or two Level 2 beds).

Wherever possible, structured teams of intensive care pharmacists should exist to bring the highest levels of clinical pharmacy expertise to patient care, as well as facilitate training, recruitment and retention of staff. Larger teams typically comprise a fellow-level pharmacist and deputy, with the remainder of the team a combination of Advanced Stage II and I Level pharmacists. Small teams or sole practitioners must consist of Advanced Stage II Level practitioners as a minimum. A recent UK wide survey of intensive care pharmacists showed significant regional variation in staffing levels[8]. The PROTECTED-UK cohort staffing ratio is higher than the remaining UK, with greater involvement in ward rounds and other activities associated with reduced costs and reduced mortality[8]. High-medication safety resourced units (e.g. advanced-level pharmacists; daily multidisciplinary ward rounds; admission medicines reconciliation; clinical guidelines; weekend clinical pharmacy services), resulted in significantly more clinically-important medicine optimisations, compared to low-resourced units where pharmacists are primarily focused on reactive medication error identification[9].

The Faculty of the Royal Pharmaceutical Society provides an independent recognition process for assessing pharmacist competency at three levels[10]. To date, the process is voluntary and it remains

the responsibility of chief pharmacists (or equivalent) to ensure that pharmacists are competent for their role. GPhC revalidation requires pharmacists to demonstrate ongoing minimum competence to maintain registration through continuing professional development, including peer discussion, though this is not designed to identify and annotate advanced practice. The Carter report in England recommends healthcare organisations increase prescribing pharmacist numbers and clinical pharmacy deployment[11].

Pharmacy technicians provide a valuable supportive role, undertaking activities such as medicines reconciliation, medicines management, and expenditure reporting, enabling more time for medicines optimisation activities by clinical pharmacists. No specific staffing level for pharmacy technicians is currently recommended.

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2.6 Physiotherapists

Authors: Gareth Cornell & Paul Twose

INTRODUCTION

Physiotherapists provide assessment and intervention for a range of acute and chronic respiratory pathology, including the prevention, support, and resolution of respiratory failure. Physiotherapy has a prominent role in the prevention and management of post-operative pulmonary complications, as well as supporting physical recovery following major surgery. Importantly, physiotherapists promote early mobilisation and prevention of deconditioning during periods of acute illness, in addition to providing specialist rehabilitation following critical illness or severe injury.

STANDARDS

1. Physiotherapists must participate in opportunities for integrated decision making and dissemination of clinical information. This may include handovers, consultant-led multidisciplinary ward rounds, MDT meetings, team briefings or operational and patient safety briefings.

2. The intensive care MDT must have an identifiable lead physiotherapist who will be accountable for clinical service delivery, provide training and mentorship to junior staff, and oversee clinical governance and quality assurance.

3. All physiotherapy staff must receive appropriate capability-based training to ensure delivery of high-quality physiotherapy intervention within critical care. Training must extend to non-intensive care staff involved in out of hours/on-call cover[1,2].

4. Physiotherapy staffing must be adequate to provide both the respiratory management and rehabilitation components of care, ensuring compliance with both clinical and professional guidelines and standards[3,4,5].

5. Respiratory physiotherapy must be available to critical care patients 24 hours a day and seven days a week. This includes the provision of an out of hours/on-call service which may utilise specialist and non-specialist intensive care staff[6].

6. Physiotherapists, as part of the multidisciplinary team, must ensure the completion of a comprehensive clinical assessment of those at risk of or with identified physical and non-physical morbidity within four days of admission to intensive care and before discharge from intensive care. This should include the collaborative setting of individualised, patient-centred rehabilitation goals[4,5].

7. Patients receiving rehabilitation must be offered therapy by the multidisciplinary team across a seven-day week, and of a quantity and frequency appropriate to each therapy in order to meet the clinical need and rehabilitation plan for an individual patient. Rehabilitation plans should be updated accordingly.

8. Physiotherapists must ensure a formal handover of care to the relevant ongoing physiotherapy team(s) following discharge from intensive care. This should include the holistic individualised structured rehabilitation plan[4,5].

RECOMMENDATIONS

1. The service provision should be based upon the overall patient case-mix taking into account acuity, dependency and complexity of the clinical case-mix. Staff resources and capability should be appropriately matched both in knowledge, skills, and number to deliver comprehensive respiratory care and holistic rehabilitation. The suggested ratio would be one WTE physiotherapist to four ICU Level 3 beds. However, further work is recommended of paramount importance exploring demand-capacity models to robustly determine physiotherapy staffing ratios in intensive care.

2. Physiotherapy services should provide assessment and intervention for physical rehabilitation seven days per week.

3. The value and role of Therapy Support Workers or Rehabilitation Assistants should be considered as part of either the intensive care physiotherapy or multidisciplinary workforce.

4. Competency/capability frameworks should be in place encompassing all Agenda for Change (AfC) bands applicable to the local service. This should reflect relevant national competency and professional development frameworks. A local training and development programme should exist to align with these frameworks[1,2,7].

5. Clear role specifications should exist for intensive care physiotherapists who have reached the level of Advanced Practice according to the Health Education England Framework[8].

6. The intensive care physiotherapy service should have a clear local operational policy and core standards for service provision which reflects both national guidance and standards and local variations.

7. The intensive care physiotherapy service or, where appropriate, as part of the MDT, should have robust and evidence-based clinical guidelines/standard operating procedures surrounding airway clearance interventions and specialist rehabilitation interventions including the early mobilisation/rehabilitation of patients in intensive care [2,9,10].

8. The lead physiotherapist, or appropriate deputy, should participate in all relevant local (and where appropriate, regional) intensive care operational delivery, governance and quality improvement groups. This may include, for example, governance meetings, service improvement work-streams, morbidity and mortality review meetings, business continuity meetings, operational or clinical management meetings. This should also include active participation/collaboration with their regional Critical Care Operational Delivery Network.

9. The physiotherapy intervention(s), as part of the patient's individualised, structured rehabilitation plan, should be matched to the acuity, dependency and complexity of the patient, considering the patient's clinical needs and tolerance to intervention. This should align with the individualised, patient-centred rehabilitation goals and a holistic rehabilitation approach should be taken across a 24-hour period[4,5].

10. Physiotherapists should play a key collaborative role in the coordination and delivery of ventilation and tracheostomy weaning plans, including post-extubation and post-decannulation

care[2,11]. Additionally, physiotherapists should be a core part of the multidisciplinary delivery of non-invasive ventilation in intensive care[11].

11. Targeted airway clearance interventions should only be considered in selected patients when clinically indicated. Routine secretion clearance therapy for all invasively-ventilated patients is not recommended[3].

12. Where a local intensive care follow-up clinic/services exists, a physiotherapist should contribute to this service[4,5].

BACKGROUND

Physiotherapy is an integral component in the multidisciplinary management of critically ill patients admitted to intensive care, considering both respiratory management and early rehabilitation.

Physical rehabilitation continues to evolve with increasing evidence supporting the delivery of early mobilisation to prevent or reduce the debilitating effects of critical illness. Current literature and national guidelines[4,5,10] support the role of physiotherapy in coordinating and delivering holistic rehabilitation programmes. Recent work has shown the benefits of service remodelling and innovative interventions[12,13] to place greater focus on early structured rehabilitation to improve patient outcome and length of stay.

Respiratory physiotherapy remains a major focus for both the spontaneously breathing and mechanically ventilated patient. Airway secretion clearance, optimisation of lung volumes and improvements in oxygenation, ventilation and respiratory function remain core to practice. Physiotherapists will continue to play a key role in the post-operative recovery phase and remain integral to the Enhanced Recovery After Surgery (ERAS) ethos. More recently, point-of-care lung ultrasound is being undertaken by physiotherapists as an enhanced role to aid clinical examination and decision-making.

In contrast to other professions in intensive care, no current national post-registration competency framework or curricula exists, however an AHP professional development framework has recently been published[1,2,7]. Further work exploring clinical skills frameworks and post-registration training structure similar to that of the nursing and medical professions in intensive care, as well attention to developing advanced practice and consultant physiotherapy roles in critical care is needed[8].

Across the UK, significant variance exists with how physiotherapy services are structured and provided to intensive care. Challenges are apparent with how physiotherapy services are commissioned and resourced. Utilisation of therapy support workers or rehabilitation assistants is an area requiring exploration as part of workforce modernisation, as well as new models of service delivery, integration and funding of physiotherapy posts. Further attention is required to prove the benefits of a seven-day service delivery model on improving patient outcomes and enhanced patient flow.

A recommended staffing ratio for physiotherapists per intensive care bed is unclear. It depends upon multiple factors such as the acuity, complexity and diversity of the patient case-mix, skill mix of the physiotherapy team and service structure. Work is recommended on this matter as a priority.

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2.7 Dietitians

Authors: Ella Terblanche & Danielle Bear

INTRODUCTION

Patients in the critical care setting are at high risk of malnutrition[1]. Critically ill patients are likely to require enteral, parenteral or oral nutrition support (or a combination of these) to meet their nutritional needs. Recent evidence suggests that provision of nutrition to critically ill patients is complex, and that not all patients will gain the same benefit[2].

The dietitian is best placed to provide nutritional advice to the multi-professional team on the optimal way to manage the nutritional needs of all critically ill patients[3].

STANDARDS

1. Critical care units must have access to dietitian five days a week during working hours.

2. There must be a dietitian as part of the critical care multidisciplinary team. If the critical care dietitian is working alone, they must be at the level of advanced practice[4]. Where more than one dietitian is required, there must be an identifiable lead dietitian of advanced clinical practice level[4] to ensure an appropriate range of expertise within the team and to have overall responsibility for the service provision.

3. Intensive care dietitian(s) must have satisfied local or national competency requirements and be able to undertake a nutrition assessment and implement an appropriate nutrition support plan for critically ill patients. If working at advanced clinical practice level, dietitians must be able to demonstrate application of the documented capabilities outlined in the multi-professional framework for advanced clinical practice in England[4].

4. Intensive care dietitian(s) must work collaboratively contributing to consultant-led ward rounds, MDT meetings, and have regular consultant communication where nutritional goals, risks and plans are discussed as per the Nice CG83[5].

5. Intensive care dietitian(s) must lead on the development and implementation of any local nutrition support guideline(s).

6. Intensive care dietitian(s) must contribute to appropriate strategic meetings and clinical governance activities, including leading regular nutrition-related audits and acting on the results, plus undertaking quality improvement projects that demonstrate the impact of dietetics on service delivery, quality and effectiveness.

7. Intensive care dietitian(s) must provide ongoing education and training for other healthcare professionals.

8. Intensive care dietitian(s) must provide a structured handover to a ward dietitian when patients are discharged from the critical care unit, considering nutrition-related morbidity as per the NICE Quality Standard[6].

RECOMMENDATIONS

1. A staffing level of 0.05-0.1 WTE per critical care bed is recommended. This level is necessary to meet the capabilities expected of advanced clinical practice[3,4] including the development of protocols and guidelines, teaching, audit, research and staff development as set out in Standards 3-10.

2. Intensive care dietitian(s) should consider extended scope practitioner roles such as inserting feeding tubes, using indirect calorimetry to determine energy expenditure and supplementary prescribing where appropriate.

3. Intensive care dietitian(s) should consider undertaking and disseminating nutrition-related research to widen the evidence base.

4. Intensive care dietitian(s) should consider joining national (Critical Care Specialist Group of the British Dietetic Association) and international intensive care and nutrition-specific societies (Intensive Care Society, European Society for Intensive Care Medicine, European Society for Parenteral and Enteral Nutrition, etc.).

5. Intensive care dietitian(s) should represent dietetics on national and international society committees and guideline development groups.

6. Intensive care dietitian(s) working at an advanced level should have or be working towards a master's level award[4].

BACKGROUND

Analysis from the International Nutrition Survey continually shows that there is a direct correlation between the total number of funded dietitians in intensive care and improved patient care, including better provision of nutrition support and earlier initiation of enteral feeding[2,7,8,9]. The combination of a dedicated dietitian on the critical care unit and a feeding protocol increases energy provision to patients, increases the use of combined feeding methods to achieve targets and reduces the inappropriate use of parenteral nutrition[10,11]. In one study, the dietetic provision was only equivalent to 0.02 whole time equivalent WTE per bed[10]. This was considered inadequate by the authors, and possibly contributed to the failure to demonstrate further benefits to patient outcome. For this reason, a minimum of 0.05-0.1 WTE is considered essential to allow the above standards to be met[5].

Provision of nutrition support in this group of patients is complex and not all patients will benefit to the same degree. The dietitian has the knowledge and skills to manage complex cases, in partnership with the clinicians, patients and carers. This includes advising on the most appropriate nutrition regimen and providing ongoing monitoring to ensure patient safety and demonstrate outcome benefit. We have used the multi-professional Framework For Advanced Clinical Practice in England[4] to guide our standards and recommendations. Because of the expertise and complex decision-making skills required for the safe nutritional care of critically ill patients, any dietitian

leading care or working alone must have advanced clinical practice capabilities[4]. The stated minimum staffing standards are necessary to provide adequate clinical and professional contributions to the care of critically ill patients. Local or national competency training is recommended to equip the intensive care dietitian with the highly-developed knowledge, skills and expertise required to be able to manage the complex issues seen in these patients. In addition, it will provide the competence to lead on the development and implementation of guidelines and protocols, as well as being central to the provision of teaching and education of the MDT. It is recommended that any local competency training must be led and assessed by the lead dietitian (Advanced Clinical Practice Level).

Extended scope of practice is favourable to enhance the provision of dietetic services to critically ill patients. It has been shown that dietitians can safely and successfully insert post-pyloric feeding tubes in these patients along with performing indirect calorimetry to enhance the nutrition assessment of the patient. Additionally, non-medical supplementary prescribing is now available for dietitians and should be considered for such interventions as parenteral nutrition, vitamin and mineral supplementation and pancreatic enzyme therapy.

Critically ill patients frequently experience nutrition-related morbidity on discharge from the ICU (e.g. risk or presence of malnutrition, changes in eating patterns, poor or excessive appetite, inability to eat or drink). As per NICE CG83[5], nutrition goals must be set with the patient (short-, medium- and long-term). In addition, a structured handover must be provided on discharge from ICU to the ward in line with the NICE quality standard for rehabilitation after critical illness[6].

Dietitians also have a professional development framework for critical care[12].

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2.8 Speech and Language Therapists

Authors: Sarah Wallace & Susan McGowan

INTRODUCTION

People with intensive care needs who have difficulty with communication and/or swallowing require timely access to a Speech and Language Therapy (SLT) service. The specific value of SLT input within the intensive care setting and inclusion as a key member of the multidisciplinary team is now recognised in a number of national documents[1,2]. SLT assessment and intervention address the increasingly complex communication, swallowing and tracheostomy weaning needs of patients. SLT is essential for performing instrumental assessments such as FEES (Fibreoptic Endoscopic Evaluation of Swallowing) and videofluoroscopy, guiding timing for oral intake, early identification of laryngeal injuries, advising on speaking valve use, contributing to weaning assessments and specialist tracheostomy tube selection.

STANDARDS

1. Critical care units must have access to a speech and language therapist five days a week during working hours.

2. All patients with a tracheostomy must have communication and swallowing impairment assessed by a Speech and Language Therapist.

3. All critically ill patients who have communication and/or swallowing difficulties (dysphagia) must have timely access to an SLT service.

4. All Speech and Language Therapists working in intensive care must be appropriately trained, competent and familiar with the use of relevant equipment.

RECOMMENDATIONS

1. A minimum staffing level of 0.1 WTE (whole time equivalent) per bed is required in order to deliver a critical care Speech and Language Therapy service. A higher level WTE may be required dependent upon local case-mix, acuity, complexity, new initiatives or delivery of more than a five-day service[2].

2. Patients should have access to a communication aid according to individual need in order to facilitate patient interaction and rehabilitation[2,3].

3. Speech and Language Therapists should contribute to a suitable tracheostomy or non-invasive ventilation weaning plan for complex or long-stay patients[4,5].

4. SLT should be available for a minimum of five days a week, ideally seven days [1,2,4].

5. FEES should be available for Speech and Language Therapists to use in assessment and management of dysphagia in intensive care patients [1,2,4,6-9].

6. Speech and Language Therapists should work as an integral member of the multidisciplinary team on the critical care unit, contributing to all multidisciplinary ward rounds, tracheostomy teams, clinical governance groups, audit, research, education and policy development [1,2,4].

7. Swallowing and communication recommendations and treatment plans should be included in any medical handover when the patient is transferred from intensive care to another unit or ward.[3]

8. Patients who are being considered for 'risk feeding' should have access to an SLT assessment in order to clarify their level of aspiration risk and optimum oral feeding consistencies.

BACKGROUND

The minimal staffing level of 0.1WTE SLT per critical care bed care reflects the need to provide frequent SLT intervention in line with the expected risks of dysphagia (49%)[10], dysphonia (76%)[10] and other communication problems in critically ill ventilated patients [6,7,9-13]. Local discussion and planning should involve the SLT department and reflect the size and case-mix of the unit and account for any unmet need. Where shortfalls are identified, these should be benchmarked against other established SLT services already achieving high standards of care in similar units.

Speech and Language Therapists have clinical expertise in the assessment and management of communication and swallowing difficulties, whether they arise due to the nature of the underlying medical conditions (e.g. COPD), are due to concomitant conditions (e.g. neuromyopathy of the swallowing musculature) or the presence of equipment/technologies used to support life (e.g. intubation, tracheostomy or ventilation). SLT expertise is therefore integral to the intensive care multi-professional team (MDT) approach, providing specialist knowledge and skills which all people with communication or swallowing needs, irrespective of complexity, should be entitled to access [1,2,4,14].

Intubation and tracheostomy have long been associated with high risks of dysphagia and aspiration, which is frequently silent[2,6,9-12]. More recent research has also shown a high prevalence of dysphagia amongst patients with critical illness neuromyopathy (91%)[7]. The prevalence of swallowing dysfunction after extubation has been reported in 20-83% of patients intubated for longer than 48 hours[3,10,12]. Long duration of mechanical ventilation is independently associated with post-extubation dysphagia, which is independently associated with an increased need for tracheostomy, longer hospitalisation and overall poorer patient outcomes[10]. Thus, swallowing problems may often be undiagnosed in the intensive care population, due to high rates of silent aspiration, yet they have a greater impact in this vulnerable group.

Speech and Language Therapists are positioned to offer expert assessment and advice once the decision to wean from the ventilator has been made and the sedation hold has started, irrespective of cuff status[2], and continuing throughout the patient's intensive care stay. Early assessment by a Speech and Language Therapist of oromotor function and saliva secretion management can provide diagnostic and prognostic indicators and directions for therapy. Assessment of the effects of cuff inflation and deflation and speaking valves on swallowing function and voice quality can inform oral feeding and weaning decisions.

Laryngeal oedema, vocal fold palsy and glottic insufficiency are common, occurring in 58-83% of tracheostomised/ventilated intensive care patients, and impact on airway protection, airway

patency, decannulation potential, voice and communication[4,8-10,14]. Laryngeal injury as a result of intubation or surgical trauma to the recurrent laryngeal nerve is frequently detected by FEES. This can be undertaken by a specialist Speech and Language Therapist, performed as part of dysphagia evaluation [10,15]. FEES also enables direct visualisation of saliva secretions and any effects of cuff inflation, deflation and speaking valves on swallowing safety on oral trials, and often expedites feeding decisions[4].

At times in intensive care, a palliative approach may be taken by the medical team and, under these circumstances, it may be appropriate to feed a patient orally even if they are deemed to have an unsafe swallow. This 'risk feeding' approach accepts aspiration and its negative consequences in favour of the best quality of life for the patient. A swallowing assessment by the Speech and Language Therapist is valuable in determining the actual risk of aspiration and detriment, the least distressing and most pleasurable diet and fluid consistencies, advising and supporting the patient and family and assisting the best-interest feeding decision[16].

The prevalence of communication difficulties in the intensive care population is reported to be between 16-24%[13] and causes significant patient anxiety, frustration and difficulty participating in treatment, rehabilitation and decision making[17]. Therefore, SLT expertise in diagnosing communication problems, assisting with communication strategies and patient participation is vital for mitigating anxiety and supporting decision making and communication of choices in intensive care. Facilitating communication between the patient, family and professionals has been shown to minimise negative psychological effects of communication deprivation[17]. Speech and Language Therapists can contribute knowledge and skills of techniques including early voice restoration (Above Cuff Vocalisation, ACV[15,18]), speaking valves, low- and high-tech communication devices and strategies to facilitate patient communication with their family and the multi-professional team. They also have a professional development framework for critical care[19].

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2.9 Occupational Therapists

Authors: Lauren Maher & James Bruce

INTRODUCTION

In recent literature there is an indication for a shift in patient care towards early intervention, addressing physical and cognitive rehabilitation and encouragement to participate in meaningful functional activity[1,2]. The *Core Standards for Intensive Care Units* provide brief guidance for the inclusion of occupational therapy services on intensive care to address these needs. The Royal College of Occupational Therapists has provided further support and guidance for this area of practice through a Critical Care Forum.

STANDARDS

1. Critical care units must have access to occupational therapy services 5 days a week during working hours.

2. Patients receiving rehabilitation must be offered therapy by the multidisciplinary team, across a seven-day week, and of a quantity and frequency appropriate to each therapy in order to meet the clinical need and rehabilitation plan for an individual patient; rehabilitation plans should be updated accordingly.

3. All occupational therapy staff working in a critical care environment must adhere to the Royal College of Occupational Therapists' Code of Ethics and Professional Conduct (COT 2015) and the Professional Standards for Occupational Therapy Practice (COT 2017)[3,4].

RECOMMENDATIONS

1. There should be an identifiable lead occupational therapist with appropriate experience, who will be accountable for service provision and development.

2. The occupational therapy clinical lead should be responsible for supporting learning opportunities, training and clinical supervision for junior staff providing occupational therapy services in intensive care.

3. Clear role specifications should be developed for intensive care occupational therapists who are able to demonstrate capabilities aligned to the relevant frameworks, for example the Health Education England advanced clinical practice or consultant level.

4. The critical care team should include a senior occupational therapist with sufficient experience to contribute to and develop rehabilitation programmes that address the complex functional, cognitive and psychosocial needs of the patient cohort.

5. Occupational therapy staff on the critical care unit should be able to assess and provide non-pharmacological treatment for those patients who present with delirium[4].

6. Occupational therapists should be involved in intensive care follow-up clinics to assess and facilitate appropriate referrals rehabilitation or specialist services and to address any long-term physical and non-physical impairment affecting occupational performance.

7. The occupational therapy service should aspire to delivery of a seven-day service for critical care patients. It is important to note that ratios of staff to patient will be dependent on unit case-mix acuity.

8. Occupational Therapists should attend intensive care MDT meetings and ward rounds to ensure the communication of plans and progression of patient rehabilitation.

9. All occupational therapists working in critical care should use the 'ICS and FICM: AHP critical care professional development framework as a yearly appraisal tool to track and guide their professional development[5]. The RCOT Career Development Framework is another important resource[6].

BACKGROUND

The National Institute for Health and Care Excellence (NICE) guidance for rehabilitation after critical illness in adults (CG83) recommends early intervention from a multi-professional therapy team to deliver patient-centred, goal-directed rehabilitation programmes[7]. Experienced occupational therapists are an essential part of the team to ensure delivery of meaningful, functional interventions which address patients' complex physical, cognitive, psychological and social needs[1,3,8,9].

Service provision should be flexible and based on overall patient case-mix and the level of dependency. Those centres with specialist critical care units, for example, cardiac or neurological, must also give consideration to specific guidance and ensure therapy staffing is competent within those specialities. Specifically, it is recommended that occupational therapy teams are able to assess and treat patients in a disorder of consciousness[10] and can meet cognitive assessment requirements for patients following out-of-hospital cardiac arrest[11]**.** The development of a national competency document is recommended to standardise the therapist's skill mix across critical care services.

Each patient will require an individualised, goal-led rehabilitation program, with consideration to their clinical acuity and activity tolerance.

The NICE guidance for rehabilitation after critical illness outlines the need for review of functional and heathcare needs two to three months post discharge from intensive care. It is acknowledged that following critical illness, patients may experience a range of physical and non-physical morbidities that may impact their occupational performance and quality of life. This is further supported by a growing body of literature, demonstrating the socioeconomic burden of critical illness for both patients and families[2]. Occupational therapists are uniquely trained to assess function using a holistic approach and have a broad knowledge of primary care services making them an essential member of the critical care follow-up team.

Limited evidence is available to identify a standard for staffing ratios of occupational therapists in intensive care. Alvarez et al. demonstrated, through their randomised control trial, that a ratio of 0.23 WTE occupational therapists per bed ensured adequate functional and cognitive rehabilitation interventions and comprehensive non-pharmacological delirium management[5]. With NHS services moving towards seven-day service provision, it is essential that consideration be given to increasing

the number of allied health professionals working in intensive care to ensure sufficient staffing and continuity of care for this patient cohort. Need for this may be best assessed on an individual service basis and established through local service level agreements.

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2.10 Psychologists

Authors: Dorothy Wade & David Howell

INTRODUCTION

The psychological impact of an intensive care admission may be severe, with approximately 50% of patients suffering acute stress and long-term psychological morbidity[1,2]. Families[3] and staff[4] are also affected by intensive care stress, and often require psychological support. Psychologists, defined here as health, clinical or counselling psychologists registered with the Health and Care Professions Council (HCPC), should play a key role in promoting well-being, both in critical care units and during patients' recovery period in the wider hospital and upon discharge into the community. Our recommendations are in line with NICE clinical guideline CG83 and quality standard QS158 on rehabilitation after critical illness in adults[5,6]. NICE guidelines on delirium[7], post-traumatic stress disorder (PTSD)[8], anxiety, depression and patient experience in NHS hospitals[9] should underpin development and provision of psychological interventions in intensive care.

STANDARDS

1. All patients must be screened daily for delirium using a validated instrument.

2. Non-pharmacological strategies must be in place to prevent and reduce delirium[7].

RECOMMENDATIONS

1. Psychologists should ensure that delirium is accurately assessed by nurses using a validated instrument[7], and that when delirium is detected, risk factors are reviewed and corrected by the MDT. They should advise on non-pharmacological strategies to prevent and reduce delirium at the ward level (by improving the environment) and patient level (to facilitate orientation and engagement).

2. Psychologists should ensure that patients and relatives receive psychological education to explain the psychological impact of intensive care drugs, procedures and environment. This can be delivered in person or via information leaflets.

3. NICE CG83 and QS158 stipulate that patients should receive assessments and interventions for psychological as well as physical problems throughout the intensive care pathway[5,6]. These should be delivered or supervised by qualified psychologists.

4. Psychologists should organise short psychological assessments for all awake, alert patients in intensive care[6] using a validated measure such as the Intensive Care Psychological Assessment Tool[10].

5. If a patient is screened as being at risk of future psychological morbidity, psychological support should be offered by psychologists or other appropriately trained staff (e.g. nurses or psychology trainees) to give patients the opportunity to express their needs and feelings, and to have those feelings validated and normalised.

6. All patients found to be at risk of psychological morbidity (following the short assessment) should receive a comprehensive assessment before discharge from critical care[5]. Psychologists should ensure that psychological needs, support and goals are included in the individualised structured rehabilitation programme that is formally documented and handed over at the time of transfer to general wards[6].

7. The psychologist should advocate (in conjunction with hospital outreach and mental health teams) for a system to be in place for at-risk intensive care patients to receive psychological support on general wards.

8. Psychologists should contribute to the information (verbal and written) patients and relatives receive to help them continue their personal rehabilitation plans and to know who to contact if they need support after leaving hospital[6].

9. Psychologists should participate in the follow-up reviews that intensive care patients receive in the community or at outpatient clinics[6].

10. As part of the critical care unit MDT, the psychologist should provide:
    a. Training for staff to increase knowledge and understanding of psychological reactions, delirium, environmental stressors and psychological outcomes of critical illness.
    b. Consultation with the multidisciplinary team on communication, sleep, effects of sedation, anxiety, stress, mood, delirium, family issues and holistic care plans.
    c. Psychological support for families. Relatives may need support to cope with the shock of a family member becoming critically ill and being admitted to the critical care unit, as well as stress and exhaustion from caring for a patient during a long-term admission. They may also need bereavement support if their family member dies in the critical care unit.

11. During patients' rehabilitation and recovery period, the psychologist should provide:
    a. Consultation with outreach and general ward staff regarding psychological support for intensive care patients.
    b. Tailored evidence-based interventions for persisting morbidity such as anxiety, depression or PTSD; these should be offered by psychologists in a well-resourced follow-up service and should include trauma-focused cognitive behavioural therapy.
    c. Where funding for the above is not available, referrals of patients directly to psychological therapy services, or recommendations for GPs to make referrals to these services, or advice to patients on how to access local psychosocial services
    d. Drop-in support groups for intensive care patients and their families after discharge from hospital, held in the hospital or community.

12. Employers have a duty of care to support staff working in a stressful environment such as intensive care, where burnout is highly prevalent[4]. Workplace stress should be addressed at organisational, team and individual levels. Psychologists should consult with intensive care leadership on systemic issues influencing staff well-being. Additionally, psychologists should run or oversee staff support programmes including one-to-one sessions, drop-in groups or reflective rounds according to staff wishes and availability, as well as coaching sessions for senior managers.

13. To develop this coordinated service for patients, families, and staff, critical care units should employ a senior HCPC-registered practitioner psychologist. Large critical care units should have

access to a WTE, and smaller units should have access to a psychologist with dedicated time for intensive care to deliver the points above.

BACKGROUND

Around 50% of patients in critical care units experience acute stress, including unusual experiences such as hallucinations and delusions. Subsequently, psychological morbidity, including post-traumatic stress disorder (PTSD)[2], anxiety and depression, affects up to 50% of patients[1]. Families can also be traumatised[3] and intensive care staff are at high risk of stress and burnout[4].

It is important to detect and address symptoms of acute stress, including traumatic memories, in intensive care patients, as they are known risk factors for poor psychological outcomes. An intensive care psychological assessment tool (the IPAT) for patients has been validated, and may be used by appropriately trained intensive care staff[10]. Psychological support should be provided as part of patients' rehabilitation and recovery plans in units, on general wards and after hospital discharge[5,6].

The work of psychologists in intensive care has not yet been widely evaluated. An intervention to introduce a psychology service in an Italian critical care unit reduced the incidence of PTSD a year later with a large effect-size (although the study was not randomised)[11]. National and international studies are underway to evaluate a range of interventions to reduce psychological morbidity following intensive care.

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2.11 Healthcare Scientists Specialising in Critical Care

Authors: Stefanie Curry, Michal Pruski, Antonio Rubino & Dave Edwards

INTRODUCTION

The healthcare science workforce is at the forefront of the NHS[1]. Critical Care Scientists/Technologists (CCS) have specialist knowledge of scientific and technical principles, with application to advanced physiological monitoring and direct patient care within the critical care setting. As part of a multi-professional team delivering care to critically ill patients, CCSs work to support advanced clinical practice, development of clinical services and adoption of new technologies in response to scientific research and innovations[1]. In this way, CCSs deliver the commitments of the NHS Constitution and support service improvement to ensure a sustainable NHS.

STANDARDS

1. Critical Care Scientists must comply with the professional standards of behaviour and practice set out in *Good Scientific Practice (GSP)*[2].

2. Critical Care Scientists responsible for management of medical devices and point of care diagnostic services must comply with the standards set by the Medicines and Healthcare Products Regulatory Agency (MHRA)[3] and the International Organisation for Standardisation (ISO) standard (22870:2016)[4].

3. Critical Care Scientists voluntarily registered with the Health and Care Professions Council (HCPC) must meet the Standard of Proficiency[5] and comply with the Standards of Conduct, Performance and Ethics[6].

4. Critical care units receiving trainee healthcare scientists for training in intensive care must comply with the requirements for training set for them by the National School of Healthcare Scientist (NSHCS)[1].

RECOMMENDATIONS

1. The Critical Care Scientists should successfully complete an approved training programme, either via accredited specialist training or as part of the Scientist Training Program (STP) commissioned by the National School of Healthcare Science (NSHCS) and should be registered with the HCPC.

2. The Critical Care Scientists should work collaboratively to be a dynamic member of the multidisciplinary team, assisting in the provision of high quality, patient-centred care within the critical care environment.

3. The Critical Care Scientists should draw on specialist knowledge to provide advice to medical, nursing and wider multidisciplinary team working in a critical care setting about the safe and effective use of medical devices used within the critical care environment, including monitoring,

diagnostic and therapeutic technologies supporting critically ill patients.

4. The Critical Care Scientists should develop and support research activities, including facilitating evidence based practice and Implementation of the latest technologies and software to the critical care environment.

5. The Critical Care Scientists should provide effective management and support for medical devices, including advising on optimal clinical settings and troubleshooting, resulting in focused, efficient and high-quality care.

6. The Critical Care Scientists should contribute to the educational needs of the multidisciplinary team, including delivering training, mentorship and educational support.

7. The Critical Care Scientists should demonstrate flexibility and adaptability to work across diverse pathways of patient care and clinical services that are both routine and highly specialised.

8. The Critical Care Scientists should work safely and effectively within their scope of practice and ensure they do not practise in areas where they are not proficient.

9. As part of the multidisciplinary team, the Critical Care Scientists should contribute to the strategic direction, planning and delivery of critical care services.

10. The Critical Care Scientists should engage with the Society of Critical Care Technologies (SCCT) as their professional body in order to work in collaboration with the Academy for Healthcare Science and the NSHCS.

BACKGROUND

Healthcare scientists comprise approximately 5% of the total healthcare workforce across the NHS in the United Kingdom, with more than 60,000 healthcare scientists employed in over 50 different scientific specialisms[1]. In their specialist roles, healthcare scientists undertake complex scientific and clinical roles, defining and choosing investigations, making key judgements about complex facts and providing specialist knowledge in clinical situations[2]. As a result, approximately 80% of all diagnoses across the NHS can be attributed to the work of healthcare scientists[1]. The CCS workforce was modernised as part of an initiative led by the NSHCS in order to plan for a future workforce with the right skills and behaviours to deliver high-quality patient care. This lead to the establishment of the Scientists' Training Programme (STP) to ensure CCSs were educated and trained to meet the challenges of modern healthcare[1]. A structured clinical training programme and careful supervision ensure trainees and qualified CCSs never work outside of their competencies and are consistent with patient safety at all times.

The output from these master's level STP and accredited specialist training programmes are relevantly trained CCSs who are able to work across traditional professional demarcations, with flexible skills and the ability to adapt and innovate[1]. *Good Scientific Practice* sets out the principles, values and the standards of behaviour and practise for the whole healthcare science workforce, which has demonstrated a high calibre of work and has a positive impact in raising standards and enhancing the quality of patient care. To ensure that quality is placed at the centre of healthcare science delivery, CCSs play a central role in safe and effective patient care by ensuring information dissemination and by ensuring innovative scientific and technological advances are translated into models of integrated care for improved patient outcomes. Working directly with the medical,

nursing and allied health professionals in intensive care, the CCS is able to enhance delivery of highly technical patient care. This benefit is most apparent when the CCS is able to apply specialist knowledge of technology and scientific processes to directly support the intensive care team. In this way, the CCS facilitates effective diagnosis, therapy, monitoring, rehabilitation and risk management. To help meet the standards of the Care Quality Commission[7] and to ensure healthcare organisations comply with the Medical Devices Regulation[3], CCSs can help optimise cost, risk and performance of medical devices by addressing strategies for appropriate use of medical devices and development of local policy.

As a qualified, permanent position on the critical care unit, the role of the CCS represents a, highly-skilled member of the multidisciplinary critical care team.

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2.12 Support Staff

Authors: Julie Bracken & Karen Cotton

INTRODUCTION

In addition to registered medical, nursing and allied health professionals, critical care units are reliant upon a range of support staff whose role are vital to the provision of high-quality care and form an essential part of the multidisciplinary team. Within this section, these key roles will be identified and standards established; acknowledging the lack of clear evidence to support these standards, critical care consensus is used.

`Support staff' include healthcare support workers (healthcare assistants), unregistered nurses, housekeepers/domestics/cleaners, ward clerks (receptionists), data clerks/analysts, secretarial and administrative staff.

STANDARDS

1. All support staff must have clearly identifiable roles with specific competencies.

2. All support staff must have a period of induction and supernumerary status.

3. All support staff must be appropriately trained, competent and familiar with the use of equipment[1].

4. All support staff must be included within the intensive care team and be updated on key unit issues and developments[2].

5. Support staff roles must be clearly identifiable to colleagues, patients and visitors to the department, either by uniform and/or name badges.

6. Intensive care areas must develop healthcare support worker roles to assist registered nurses in delivering direct patient care and in maintaining patient safety[3].

7. Healthcare support workers must complete the Care Certificate and adhere to the Code of Conduct for healthcare support workers[4,5].

8. Administrative roles must be developed to ensure all clinical staff are free to give direct patient care, and supported with essential data collection[3].

9. Each intensive care area must have sufficient staff responsible for the cleanliness of the environment.

10. Where direct care is augmented using support staff (including unregistered nurses), appropriate training and competence assessment of those staff are required.

RECOMMENDATIONS

1. All staff should be encouraged to attend further training and/or education to support their development.

2. Each critical care area should have healthcare support workers 24/7 to assist nursing staff in delivery of direct patient care.

3. Each critical care area should have ward clerk/receptionist cover seven days per week.

4. Each critical care area should have a dedicated housekeeper/cleaner seven days per week.

5. Each critical care area should have a data clerk or dedicated time allotted to a suitable member of staff for data entry to a nationally recognised audit programme (such as ICNARC or SICSAG) and responsibility for the validation of these data. The Intensive Care National Audit and Research Centre (ICNARC) 'advise that a unit with approximately 600 admissions a year need one full-time member of staff (or equivalent) to keep up with the demands of validation within the prescribed timescales for active participation'[6].

BACKGROUND

The importance of support staff in the provision of good intensive care, and in freeing up clinical staff time for such care, should be valued. Such contributions include assistance with the personal hygiene and the moving and handling of patients, stocking up of bedside consumables/equipment and cleaning of bed areas, all of which provide an excellent resource for registered staff and support for patients. In addition, all support staff play an important role in communicating with patients and relatives, ensuring comfort measures and relieving anxiety.

Training of such staff is important, with competency assessments and individual performance review embedded in the unit philosophy[1,2,3,4,5]. To sustain this workforce, units should consider appropriate progression pathways. Critical care units may achieve the standards within these guidelines with development of a variety of roles, depending on unit size.

Training programmes for Band 4 roles are developing within intensive care nursing and, although not a registered group at the time of this publication, are increasingly involved with delivery of care under indirect supervision of registered nursing staff. This group has not been included in the support staff chapter.

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2.13 Smaller Remote and Rural Critical Care Units

Authors: Chris Thorpe & Catriona Barr

INTRODUCTION

This guidance is intended to describe the steps that smaller geographically remote and smaller rural critical care units should undertake, with assistance from their local networks (Operational Delivery Networks in England), to develop sustainable solutions to maintain equity of access and breadth of service for their local populations.

It is accepted that there is some controversy about the precise definition of 'smaller' 'remote' and 'rural'. Organisations such as NHS England and the devolved health services may define small and remote hospitals, and by extension their critical care units, differently than outlined below. For example, the definition of 'geographically remote' may be defined by distance or drive time and the number of units affected will vary according to the limits set[*a]. There will be similarities with some of the challenges facing these remote units to other smaller rural providers of adult intensive care. The options for this latter group may be different and these units, similarly, should seek support from their local network[1] to develop sustainable solutions that ensure the care they provide is aligned to national standards. In terms of smaller, a catchment population figure of less than 200,000 has been used, but absolute numbers have to be taken in context with a particular hospital's circumstance and geographical positioning with other intensive care services. Hospitals with Level 2 beds and a stabilisation and transfer service for Level 3 patients have additional needs and these are addressed in a separate section. Developing and supporting these hospitals frequently demand an individualised and collaborative approach that takes into account geography and available skill mix.

This guidance is only expected to apply to a minority of critical care units in the UK due to their small size (catchment population of less than 200,000), or their remoteness (more than 30KM from the next nearest emergency department).

STANDARDS

1. Network support must be in place to ensure smaller, remote and rural critical units meet these standards and recommendations.

2. The critical care service must be led by consultants trained in Intensive Care Medicine (ICM).

3. There must be access to appropriate advice from a consultant in ICM at all times.

[*]a) For example, in work done for NHS England on smaller acute providers, `smaller' was defined by expenditure of <£300m and `very small' by expenditure of <£200m. These groups had an average in-patient population catchment of 275,000 and 195,000 respectively. Remote was defined as >30km from their next nearest emergency department, and this group had an average distance of 83km from their nearest tertiary centre. A further group, which could be described as rural, had a distance of 20-30km from their nearest emergency department, with an average distance of 38km from their nearest tertiary centre[2].

4. Dedicated daytime critical care must be provided by a consultant trained in ICM with no other commitments.

5. There must be a doctor or ACCP with advanced airway skills resident within the hospital 24/7.

6. There must be a 24/7 dedicated resident on the critical care unit.

7. There must be structured handover between daytime and night-time staff supported by standardised policies for practice.

8. Appropriate CPD must be supported by the employer and undertaken by all professionals who deliver intensive care.

9. Regional transport arrangements (road and air) must be put in place to allow timely, safe transfer of patients with an appropriate level of monitoring, staffing and skills.

10. All critical care units, including Level 2 units, must enter data into national databases such as ICNARC or SICSAG.

RECOMMENDATIONS

1. Network support should be explicit, resourced and supported by all the Healthcare Organisations, Boards, networks and regions involved, and recognised in job planning.

2. Units should consider the development of telemedicine techniques for clinical decision making and educational support, in conjunction with their regional network.

3. Remote critical care units should implement appropriate joint clinical governance procedures with both networked units and transfer services to include case-based review, critical incident analysis, and joint educational sessions.

4. Where an intensive care pharmacist or healthcare professional, such as a physiotherapist or dietitian, cannot be effectively delivered locally in a small unit, advice should be accessible from specialist colleagues through network support. Appropriate training bodies should devise and support remote and rural training posts in critical care.

BACKGROUND

Evidence that centralising acute care improves outcomes is limited to a few conditions, and there is increasing recognition that patients benefit from care closer to home[3,4]. This, combined with local political pressure, means that acute in-patient care, and therefore intensive care input, is likely to remain part of many smaller hospitals. In providing the necessary on-site intensive care to this cohort of patients, the smaller volume of patients necessitates different staffing patterns and the challenge is to implement a system which allows a combination of task-based skills available 24/7 within an overarching strategic support structure. Networked solutions are therefore embedded in the standards and recommendations of this chapter. Principle areas that need further clarification are resident staffing, consultant staffing, maintenance of competencies, transfer arrangements and sustainability of the service.

Resident staff

Medical resident cover should normally include a person dedicated to the critical care unit, however currently in very small isolated hospitals roles it may be necessary to combine roles providing processes are in place to call additional staff if required. There needs to be person with advanced airway skills resident within the hospital 24/7. Ideally, they should be dedicated to intensive care however, with current workforce, a dedicated intensive care tier which is at ACCP/non-anaesthetic trainee/staff grade level with basic airway skills with support from a person with advanced airway skills who is also resident within the hospital is acceptable. The on call team would then comprise a resident anaesthetist and a second resident without advanced airway skills such as an ACCP, clinical fellow or staff grade. The residents would work together so both are involved with intensive care patients. The blurring of silo roles is an inevitable part of ensuring that smaller hospitals remain safe. The resident overnight team may vary from night to night and the amount of on-site consultant presence will need to reflect this.

Consultants

Staffing structures reflect the smaller volume of patients and, in common with many specialties, it is a struggle to achieve separate consultant on call rotas. Evidence to date suggests that daytime dedicated consultant intensive care presence is important, but there is less clarity about night-time work[5]. In hospitals with low volumes of night-time work, what evidence there is from the UK suggests that patient outcomes are not worse when consultants combine out of hours activity in ICM with another specialty[6]. The standard of a consultant in ICM directing care is core for the specialty however, and this is best achieved by daytime cover with trained intensivists and access to out of hours advice from intensivists when needed, either on a local or networked arrangement[1].

Maintaining competencies

In providing a service in smaller remote hospitals, intensive care staff may be faced with looking after any age of patient, from adult to neonate, in any specialty, and in isolated areas may need to care for these patients for a considerable time. Furthermore, individual pathologies or age groups may be seen infrequently. Maintaining safe levels of technical skills for such a broad range of patients requires increased training resource for both medical and nursing staff. This may involve funding cross-site working with larger or specialist centres where geography allows, or by periodic attachments to other units. Telemedicine and video linkage both for clinical input and continued professional development can help improve collaboration and should be encouraged[7].

Transfer services

Patients may need transfer from remote and rural units because of the need for a higher level of care or for specialist care, and it is particularly important for remote and rural units that transport arrangements are timely, comply with intensive care transfer standards, and where possible, do not deplete remote and rural units of essential staff[8,9].

Sustaining the service

Attracting staff to work in smaller remote and rural hospitals hinges on work-life balance. There may be fewer (if any) trainees to help in times of increased demand, and allowing a wider group of doctors to participate in intensive care cover provides both an essential safety net and also a sustainable rota. Support from national bodies is important so that staff feel that their work is regarded as equally valid when compared to large tertiary centres. Lastly, there needs to be a focus on increasing training attachments to remote and rural hospitals. Trainees gain valuable insights when working in different types of unit and are more likely to take on consultant posts in hospitals where they have trained. Units themselves benefit; having a trainee keeps a unit vibrant and the connections made guard against professional isolation.

Level 2 (High dependency) units

A subset of remote and rural hospitals provide only Level 2 beds accompanied by a stabilisation and transfer service for Level 3 patients. Sustaining a service is difficult without Level 3 patients on site, and it may be difficult to attract consultants in Intensive Care Medicine such that care cannot be directly provided by a consultant trained in ICM. In such circumstances, alternative models of support are needed. A supportive network structure is therefore essential for staff to feel confident in dealing with a deteriorating patient. It is imperative that remote and rural Level 2 units should have **immediate** access to telephone or telemedicine advice from professionals in a Level 3 unit or retrieval service over secure means of communication, allowing specialist advice and support at all times. In these hospitals, maintenance of competencies is challenging and staff should have full access to training and support to enable them to fulfil their role in providing the service. In units close to other centres, it may be possible for staff to have a job plan involving two sites. In very small isolated hospitals, staffing may be further compromised in the current workforce climate and pragmatic management of limited resources may be necessary. These units should also be able to evidence adherence to recommendations and standards, even though the solutions they reach will be different to larger less remote units[9].

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Section Three

Critical Care Services: Process

3.1 Admission, Discharge and Handover

Authors: Tim Wenham & John Butler

INTRODUCTION

Minimising delays to definitive treatment is associated with better outcomes. Escalation of care up to and including intensive care admission must be timely, with referring and receiving consultants directly involved in the process. This is particularly relevant for patients requiring an unplanned admission where referral ideally should be consultant to consultant. Clinical care within intensive care should be delivered by a multidisciplinary team, and handover standardised for all clinical groups. Treatment plans must be produced immediately after referral and frequently reviewed.

Discharge should facilitate patient flow, and should occur as early as possible in the working day. Transfer documentation should be in a standardised format and comply with the NICE 50 and 83 Short Clinical Guidelines[1,2].

STANDARDS

1. The decision to admit to the critical care unit and the management plan must be discussed with the duty consultant in Intensive Care Medicine[3].

2. There must be documentation in the patient record of the time and decision to admit to critical care[4].

3. Unplanned admissions to the critical care unit must occur within four hours of making the decision to admit.

4. Patients must have a clear and documented treatment escalation plan.

5. Patients must be reviewed, in person, by a consultant in Intensive Care Medicine as urgently as the clinical state dictates and always within 12 hours of admission to critical care[5].

6. Transfer to other critical care units for non-clinical reasons must be avoided where possible.

7. Consultant in Intensive Care Medicine-led ward rounds must occur twice a day (including weekends and national holidays). The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy, and regular input from dietetics, SLT, OT and clinical psychology to assist decision making. The nurse in charge should be present in person for the ward round[6].

8. Patients discharged from critical care must have access to an intensive care follow-up programme which can include review of clinical notes, patient questionnaires to assess recovery and an outpatient clinic appointment two to three months' post hospital discharge if required for specific patients[2,7].

9. Discharge from critical care to a general ward must occur within four hours of the decision and must occur between 0700hrs and 2159hrs[8].

10. There must be a standardised handover procedure for medical, nursing and AHP staff for patients discharged from critical care units with a formalised transfer process[1,4,9]. This must include their structured rehabilitation prescription[4,7].

11. Units must monitor and review the causes for unplanned readmissions with a view to minimising their occurrence.

12. Patients undergoing specialist care must be repatriated to a healthcare organisation closer to their home when clinically appropriate to continue their rehabilitation, and this must occur within 48 hours of the decision to repatriate.

BACKGROUND

Data from the ICNARC CMP programme 2017 report 200,309 admissions to critical care units in England, of which 87,879 required Level 3 care (44%)[10]. The extent to which any individual hospital provides intensive care services should depend upon the skills, expertise, specialties and facilities available within that hospital. The service provided should be based on the principle of providing support to a level appropriate to the complexity of patient-care needs. For some patients this will mean transfer to another hospital where more complex clinical needs can be met. However, transfers for non-clinical reasons must be avoided wherever possible. The latest ICNARC data (2017) reports a rate of 0.3% of admissions in England undergoing non-clinical transfers to other units[10].

Studies from the UK Case-Mix Programme (CMP) of the Intensive Care National Audit and Research Centre (ICNARC) confirm the prognostic importance of timely admission to intensive care and initiation of definitive treatment for deteriorating illness. Consultants play a pivotal role in the formulation of the treatment plans and the presence, or immediate availability, of a consultant in Intensive Care Medicine guarantees the quality of care, decreases mortality and reduces length of stay.

Discharge from intensive care should occur as early as possible in the day to permit familiarisation of the patient with the ward staff. Discharges after 2159 hrs must be avoided. The latest ICNARC data (2017) reports night-time discharge rates of 1.9%. Increasingly patients are being discharged directly home from the critical care unit. Local guidance for discharge communication should be followed under these circumstances.

A standardised handover procedure must accompany the discharge. This should include:

- A summary of the critical care stay, including diagnosis, treatment and changes to chronic therapies.
- A monitoring and investigation plan.
- A plan for ongoing treatment.
- Rehabilitation assessment and prescription, incorporating physical, emotional, psychological and communication needs.
- Follow-up arrangements.
- Any treatment limitations in place.
- Plans if readmission to critical care becomes necessary, including DNAR (Do Not Attempt Resuscitation)/treatment escalation plan.
- Communication with GP and patient (where appropriate).

The receiving (ward) team responsible for ongoing care needs to be directly involved in this process and there should be verbal as well as written handover. The discharge process must ensure compliance with the NICE 50 and 83 Clinical Guidelines.

The prevalence of unplanned re-admission within 48 hours in the UK is reported at 1.2% (median 1.4%, CMP 2017 data). A high rate of early re-admission (within 48 hours) could reflect premature discharge, incorrect use of ward care, inadequate handover of the patient during the discharge process, or a poor response to treatment despite appropriate care. Re-admission is generally associated with increased length hospital stay, increased consumption of resources and greater morbidity and mortality, and rates should be kept at minimal levels[11].

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3.2 Capacity Management

Authors: Sam Waddy & Ben Chandler

INTRODUCTION

Critical care capacity management is extremely complex. There are constant operational pressures competing with individual patient need. Critical care teams have to balance the needs of patients referred to them, both as emergencies and planned admissions after elective major surgical procedures, with the needs of the patients already under their care.

STANDARDS

1. Hospital management teams must optimise the use of critical care capacity at all times. The admission and discharge of critical care patients must be prioritised, such that patients requiring critical care support are admitted without delay (within four hours after decision to admit and completion of essential resuscitation/imaging) and patients no longer requiring critical care are discharged within four hours.

2. The final decision on utilisation of critical care beds and staff (which includes moving staff to help in other areas of the hospital at times of need) rests jointly with the duty consultant and the duty nurse in charge of the critical care unit. Under no circumstances should clinical decisions be over-ridden by non-clinical operational management teams[2].

3. Critical care units must have documented escalation plans suitable for their hospital facilities and must audit and review the usage of these plans.

4. Hospital boards must demonstrate regular oversight of the use of critical care escalation and the provision of intensive care outside of the critical care unit.

5. Escalation plans must balance risks of non-clinical transfer against risk of care outside of the critical care unit.

6. Escalation plans must differentiate between escalation during 'normal' operation and escalation during major incidents or pandemic scenarios.

7. Regional Intensive Care Networks must have escalation plans documented and agreed at medical director and chief executive level to allow the duty intensive care consultants and duty nurses in charge to coordinate the usage of intensive care beds across the network.

8. Regional pandemic escalation plans must include trigger levels for agreed critical care admission criteria and thresholds for restriction of planned activity to assist neighbouring critical care units.

9. Regional Intensive Care Networks must have an agreed policy on escalation of care and repatriation between secondary and tertiary units to include escalation and, if required, prioritisation of transfers over local elective activity.

10. Regional Intensive Care Networks must ensure that a system to record capacity across the network is in use, and that this is updated regularly.

11. Transfer to other critical care units for non-clinical reasons must be avoided where possible.

RECOMMENDATIONS

1. Critical care units should determine the emergency capacity they require to meet Standard 1 locally, based on their admission and occupancy data[6]. The capacity to cope with the predicted emergency workload can then be managed by ensuring an appropriate number of beds available for emergency admissions before accepting elective admissions.

2. Acute hospitals will require at least one critical care bed per 35 acute hospital beds; hospitals undertaking a large amount of complex major surgical procedures are likely to need significantly more than this[1,4,5].

3. Training should be provided to nursing staff in areas used for critical care escalation.

4. When using alternative areas of the hospital to provide critical care capacity, there should be adequate senior nursing and medical input such that the standards of care provided to those patients meet the standards provided to the patients within the critical care unit.

5. Decisions to proceed with major elective surgery should take into account current occupancy, provision of emergency capacity over the next 24 hours and, at times of regional network escalation, the emergency capacity in neighbouring units.

6. Critical care units may find it useful to develop a statistical model locally that provides predictable data on the number of emergency admissions they should plan to accommodate in each 24-hour period, and use this model to assist decision making on when it is safe to proceed with planned elective work.

BACKGROUND

The UK has just over 4,000 adult critical care beds available and operates at around 81% capacity. It has amongst the lowest number of critical care beds in the European Union (6.6 vs mean 11.5/100,000 population respectively) and acute hospital beds, increasing pressure on critical care capacity. At least 280 urgent operations are cancelled each month due to lack of critical care bed capacity. Determination of cancellation and causation is hard (including cancellation of minor cases due to delays in starting major cases while determining capacity[1,4,7]), making this a likely underestimate.

Operating at or near maximum capacity adversely affects patient mortality, length of stay and acuity of admissions[7]. These effects are extremely complex and recent studies have attempted to assess the interactions of direct and indirect effects. When units operate at capacity, it is almost inevitable that only patients requiring immediate organ support are admitted – to the possible detriment of others more likely to benefit with good outcomes and long-term benefit. These interactions are so complex that it is very difficult to write policies that can account for multiple variables and every possible scenario. Decisions regarding how to manage capacity thus have to be made clinically,

taking into account individual patient need and likelihood of benefit from intensive care. Patients who are exposed to a non-clinical transfer have a longer critical care unit stay[3].

Staffing an unoccupied emergency bed (or more for larger units, especially major trauma centres) is an appropriate, straightforward method of ensuring timely admission (see Standard 1). Some smaller units may achieve this safely by using a supernumerary nurse (or nurse in charge, depending on their skill mix). Plans to recreate this capacity should start as soon as it is used, which will involve escalating staffing, using escalation areas, or identifying the patients most stable to transfer to escalation areas or to discharge from the unit. Decisions to proceed with elective surgery should take into account the provision of emergency capacity over the next 24 hours and the likely discharges from intensive care.

Escalation plans are essential to managing the risks around limited capacity in UK intensive care. All hospitals must have documented intensive care escalation plans and must audit and record the use of escalation. Hospital boards and executive teams must have regular oversight of the use of escalation plans and the incidence of intensive care provision outside the critical care unit, as this has a significant risk of harm to patients. It is vitally important that the use of escalation does not become 'normalised' behaviour amongst both clinical and operational teams. This should not stifle the development of appropriate alternative pathways that provide safe care and lower use of resources.

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3.3 Critical Care Outreach and Rapid Response Systems

Authors: Sarah Quinton & Isabel Gonzalez

INTRODUCTION

There are multiple different models for organisations to approach the recognition and management of the deteriorating patient in hospitals. The most common approach in the UK is a rapid response nurse-led team with medical support. Some of these teams also incorporate an element of pre-emptive management, education of ward staff and other roles, such as follow-up of patients discharged from critical care and rehabilitation after critical illness. The composition of the teams, how they are activated and whether they operate 24/7 or less, is still very inconsistent in NHS healthcare organisations.

The ideal Comprehensive Critical Care Outreach[1] is defined by the National Outreach Forum as a multidisciplinary organisational approach to ensure safe, equitable and quality care for all acutely unwell, critically ill and recovering patients, irrespective of location or pathway.

The seven core elements[1] which characterise Comprehensive Critical Care Outreach are:

- **P**atient track and trigger
- **R**apid response
- **E**ducation, training and support
- **P**atient safety and clinical governance
- **A**udit, evaluation and monitoring of patient outcome and continuing quality care
- **R**ehabilitation after Critical Illness (RaCI)
- **E**nhancing service delivery

STANDARDS

1. There must be a hospital wide, standardised approach to the detection of the deteriorating patient and a clearly documented escalation process[2].
2. All hospitals must use a validated track and trigger early warning score system that allows rapid detection of the signs of early clinical deterioration in all non-pregnant adult patients over 16 years. The National Early Warning Score (NEWS-2)[3] is the recommended tool for call systems as the more efficient and effective. Using a common score ensures that staff operate the same language across the patient pathway and enhances the benefits of an early warning system. As part of a multi-trigger system, other triggers such as urine output/ acute kidney injury alerts, cause for concern and patient/carer *Call for Concern*[4], should be considered as they will enhance the recognition of the deteriorating patient.

RECOMMENDATIONS

1. Each hospital should have a graded clinical response strategy consisting of three levels: low, medium and high[2]. Each level of response should detail what is required from staff in terms of observational frequency, skills and competence, interventional therapies and senior clinical involvement. It should define the speed and urgency of response, including a clear escalation policy to ensure that an appropriate response always occurs and is available 24/7.

2. Each organisation should ensure patients receive care from appropriately trained critical care outreach, rapid response or equivalent teams. The critical care outreach (CCO)/Rapid Response staff should have annual competency-based assessment of core and additional specific competencies from a local or regional programme. This should relate to first line clinical assessment and intervention, be clearly outlined and closely reflect the Department of Health (DH) competencies for the recognition and response to the acutely ill patients in hospital[5].
3. There should be accessible educational support for registered and non-registered ward staff in caring for the acutely ill ward patient in line with recorder and first responder level as outlined in the DH competencies for the recognition and response to the acutely ill patients in hospital[5]. Staff looking after Level 1 and enhanced care area patients should be trained following the National Competency Framework for Level 1 and Enhanced Care Areas[6].
4. Organisations should aim to deliver Comprehensive Critical Care Outreach[1] as outlined by the seven core elements and have an operational policy that defines the remit of the CCO/Rapid Response or equivalent team within the organisation, in regard to these seven core elements.
5. All patients should be reviewed by the CCO team (or equivalent) following discharge from the critical care unit to the ward
6. All CCO teams should participate in the National Critical Care Outreach Activity Outcome Dataset[7]. In addition, each organisation should develop audit tools to assess utilisation of their track and trigger and graded response system with clear governance procedures for action of poor compliance healthcare organisation-wide. This should be undertaken in combination with an audit of compliance against the standards within NICE CG50[2] and must be fed back to healthcare organisation Boards and Critical Care Networks where relevant.
7. Each hospital should be able to provide a CCO/rapid response team, or equivalent, that is available 24 hours per day, seven days a week[1]. There should be regular review of service provision to facilitate proactive approaches in order to match service configuration against local demands and activity. These should be reflected in the operational policy. There should be a nominated lead of service at healthcare organisation Board level with appropriate communication cascade[1,8].

BACKGROUND

Intensive Care Medicine has been developing outreach services over the last 15 years to intervene beyond the boundaries of critical care units with the intention of preventing unnecessary mortality and morbidity of seriously ill ward patients[8]. The introduction of Critical Care Outreach services was recommended in Comprehensive Critical Care[8,9] in response to evidence demonstrating the adverse consequences of failure to recognise and respond to obvious physiological deterioration[10].

CCO services support all aspects of the acutely and critically ill patient pathway, including early identification and management of patient deterioration, timely admission to an intensive care bed when required and delivery of effective follow-up for patients post discharge from intensive care. CCO is also fundamental in providing educational support to enhance the skills and knowledge of the multidisciplinary ward teams caring for the at-risk and deteriorating patient. All of these activities address recommendations in NICE Clinical Guideline 50[2] and 83[11] and in several NCEPOD reports[12,13].

The aim of CCO is to ensure patients receive timely intervention regardless of location. CCO staff share critical care skills with ward-based colleagues to improve recognition, intervention and outcome. Subsequent recommendations for the implementation of CCO services have been endorsed by the Intensive Care Society, the National Outreach Forum, the National Confidential Enquiries into Patient Outcome and Death and Critical Care Stakeholder Forum.

CCO services and team configurations have developed on an ad-hoc basis dependent upon perceived local need and resources available. This has led to a wide variety in the provision of these services. Additionally, the level of investment in education and preparation of CCO personnel also varies between organisations. The National Outreach Forum has developed operational standards[1]) and recommendations for the CCO practitioner competencies, which aim to rectify the absence of any other national guidance. The document provides an operational framework of standards for CCO, while recognising the need for organisational links with other hospital services, for instance hospital-at-night services, to facilitate provision of a robust 24-hour service for the recognition and management of the deteriorating patient.

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3.4 Infection Control

Authors: Peter Wilson, Donna Eddy & Lisa Fowler

INTRODUCTION

The critical care unit brings together patients who are more vulnerable to acquiring nosocomial infection and more likely to be receiving broad-spectrum antibiotics than in any other hospital ward. Hand hygiene, cleaning and antimicrobial stewardship are key to keeping such infection to the minimum[1]. This section makes recommendations and highlights clinical standards that apply to all intensive care patients. The microbiologist and infection control staff are an essential part of the team applying these standards.

STANDARDS

1. Staff must follow safe insertion and maintenance procedures for intravascular and urinary catheters, and remove them when not required to minimise the risk of infection[2].

2. Infection control procedures must be documented and agreed by the multi-professional team.

3. The WHO *Five Moments of Hand Hygiene* must be observed[3]. Hand contamination is often due to contact with the environment rather than directly with the patient.

4. Cleaning of the environment must be undertaken by trained staff and subject to audit and quality control, with particular attention to high-contact surfaces. Duties of cleaning and nursing staff, in cleaning specific surfaces, should be clearly defined.

5. There must be surveillance systems in place for audit and feedback of nosocomial infection, reporting to the national scheme where applicable, for example, reporting central venous catheter-related bloodstream infection to the Public Health England Infection in Critical Care Quality Improvement Programme ICCQIP).

6. The principles of antibiotic stewardship must be adhered to in consultation with the microbiology team[4].

RECOMMENDATIONS

1. Patients should be screened for carriage of MRSA (Methicillin-resistant Staphylococcus aureus) and/or carbapenemase-producing organisms according to locally determined prioritisation. Sensitivity of risk factor algorithms is generally low and universal screening is preferable in highly endemic regions.

2. Patients with MRSA carriage or infection should receive topical suppression to reduce shedding and, if possible, single-room isolation.

3. Patients with diarrhoea and airborne infections should take precedence over others in allocation of single-room isolation. Patients with suspected or confirmed influenza should be placed in single rooms appropriate for respiratory isolation[5].

4. Design of new units should include infection control specialists as part of the planning team. In particular, the bed spacing, proportion of single rooms and provision of sinks should be considered according to patient case-mix, national guidelines and prevalence of multi-resistant infections.

5. The intensive care team should have access to an infection control and prevention team led by a microbiologist who can offer timely review and advice. Ideally, this should be part of timetabled microbiology rounds during the week. The microbiologist will advise on the choice and duration of antimicrobial chemotherapy in accordance with local formularies as a part of antibiotic stewardship.

6. Infection control nursing staff or intensive care nurses with infection control training should be available to provide day-to-day advice on prevention of spread of infection, isolation priority and procedures and decontamination. Allocation of patients to single-room isolation for known or suspected infection should be reviewed on admission and frequently thereafter.

7. There should be a means of continuous improvement in infection prevention and control, for example using surveillance and feedback.

BACKGROUND

Critically ill patients are subject to invasive procedures and multiple direct contacts with staff and the environment. A trained infection control embedded in the intensive care nursing staff is an efficient method of managing infection control education and use of equipment. Most patients receive broad-spectrum antibiotics that reduce their resistance to colonisation. To prevent development of bacterial resistance, antibiotic stewardship should be observed as set out in local formularies[1]. Antibiotic treatment should be used only when clearly indicated, reviewed daily and discontinued as soon as it is no longer needed. In most cases, five days of treatment are sufficient. When a pathogen is isolated, narrowing of broad-spectrum should be considered. Excessive use of carbapenems has resulted in proliferation of carbapenemase-producing organisms (CPO), so alternatives need to be considered[2]. Single-dose antibiotics (or 24-hour duration) should be used for antibiotic prophylaxis. A diversity of antibiotics is less likely to promote emergence of multi-resistant infections than limiting use to a few agents with restriction of other classes of antimicrobial.

Alcohol hand rub should be used for hand decontamination before and after patient care, unless the hands are visibly soiled or the patient has vomiting or diarrhoea, when soap and water should be used. Alcohol hand rub is ineffective against *Clostridium difficile* and norovirus, in which case soap and water is required. Contamination of the local environment by hands following patient contact is a major source of accidental contamination of other staff whose hands touch that environment[6].

Urinary and intravascular catheter infections are correlated with the duration of placement of the catheter. The need for catheters should be reviewed frequently, with prompt removal if not required. Written protocols for safe insertion and maintenance, with appropriate staff education and ownership, will minimise the risk of poor practice. Hand decontamination before accessing a vascular device and aseptic technique for site care or administering medication are essential. The insertion site, access port or catheter hub should be decontaminated with a single use application of 2% chlorhexidine gluconate in 70% alcohol and allowed to dry before proceeding. Vascular access sites should be inspected every shift and a visual phlebitis score recorded. Care bundle approaches involving packages of evidence-based practices have been successful in reducing hospital-acquired infections, particularly central venous catheter associated bacteraemia[7].

Nosocomial pathogens particularly MRSA, *Acinetobacter* and *Clostridium difficile* can survive in the environment for many months[8]. Additional cleaning of high-contact surfaces is associated with a commensurate reduction in hand carriage of these organisms. Hand hygiene compliance rates vary widely and are lower at times of high workload, high numbers of agency staff, and when not observed by others, for example, at night or behind curtains. Shedding of MRSA should be reduced by the use of topical suppression, for example, nasal mupirocin and topical chlorhexidine washes during intensive care stay. Chlorhexidine bathing can be beneficial in preventing colonisation and infection with healthcare associated pathogens in critical care, although compliance should be monitored[9].

Useful clinical resources are given below[1,2,5,10].

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3.5 Interaction with Other Services: Microbiology, Pathology, Liaison Psychiatry and Radiology

Authors: Esther Davis & Raymond McKee

INTRODUCTION

Intensive Care Medicine is a multidisciplinary arena which, by its very nature, requires timely interaction with multiple services. Certain specialty areas have more significant impact on patient management; these are considered in greater detail.

STANDARDS

1. There must be daily input from microbiology[1,2].
2. There must be local antimicrobial prescribing guidelines in accordance with the principles of antimicrobial stewardship[3].
3. Clear protocols must be in place for management of massive haemorrhage including the role of laboratory services[4].
4. Acutely ill patients must have access to diagnostic radiology services at all times including timely access to a radiologist[5, 6].
5. All imaging investigations must be reported within an agreed timeframe relevant to the investigation by someone appropriately trained. All imaging investigations need to be accompanied by a formal, permanently recorded report covering the entirety of the investigation[6].
6. There must be seven-day availability of radiology services, appropriate to the specialties being cared for, to allow timely investigation of critically ill patients[5]. This would include, for example, ultrasound and CT-scanning to aid sepsis diagnosis and source control; and in neurocritical care units, access to interventional neuroradiology.

RECOMMENDATIONS

1. Microbiology advice should be from an adequately senior clinician, and onsite, face-to-face interaction is encouraged[1].
2. Critical or unexpected results of clinical pathology, microbiology or radiological investigations should be actively communicated to a responsible clinician according to local fail-safe policies[4,5,7].
3. Urgent clinical chemistry and haematology advice should be available within 60 minutes from an appropriate specialist[4] and a radiologist should be immediately contactable to support the management of acutely ill patients at all times[5].
4. All point of care laboratory devices used to assist clinical decision making should be subject to appropriate quality assurance mechanisms, agreed by laboratory and end users[4].

5. Clear protocols for access to radiology services that are not available on site (e.g. interventional radiology, MRI in ventilated patients) should be available[8].

6. Liaison psychiatry services should be available in all acute hospitals with a single point of referral. Emergency mental health referrals should be seen within one hour of referral and urgent mental healthcare referrals within 24 hours of referral (within the liaison team's usual operating hours)[9].

7. Patients who have self-harmed, irrespective of the apparent motivation, should have a comprehensive psychosocial assessment. This should generally be the responsibility of the liaison psychiatry service and should not be delayed until after medical treatment is complete unless life-saving treatment is necessary, or the patient is unconscious or otherwise incapable of being assessed[10].

8. Liaison professionals should be available to advise on issues around mental capacity and there should be working arrangements detailing who is responsible for assessing patients who may need to be detained under mental health legislation[9].

BACKGROUND

Effective communication is the foundation of successful interaction with other services. Radiological, laboratory and microbiological investigations are part of the daily routine in the critical care unit and their safe interpretation requires reliable, timely results, along with knowledge of the clinical context and local considerations. This requires established channels of communication. Outside times of planned discussion, a clear path of communication to ensure delivery of unexpected and critical results should be in place. This should include local 'fail-safes' for urgent and direct communication between the consultant in Intensive Care Medicine and the relevant service. The ability to discuss such results with the team providing testing is integral, especially in the situation where further time-sensitive testing or interventions may be required and, in complex cases, to determine further investigations.

Clinical priorities are often clearer when the discussions happen at the patient's bedside; face-to-face discussion can also provide an important opportunity for educational interaction. The provision of regular opportunities for presentation and discussion of radiological investigations related to intensive care patients is one such example. The presence of a senior radiologist can facilitate on-going quality assurance with respect to interpretation, allow educational development and foster improved co-operation between relevant departments. A microbiology ward round on the critical care unit, by direct communication and integration of the specialties, allows discussion around treatment rationale, duration and dosing of therapy. Appropriate antimicrobial de-escalation is encouraged, with relevance to local resistance patterns and ongoing surveillance. This results in better individualised care, as well as the wider benefit of reduced antimicrobial resistance.

The increased use of near-patient and point-of-care testing has important implications. Tests previously performed in a laboratory or other specialised clinical area have moved to allow more rapid result availability while avoiding the potential need for repeated transfers of the critically ill. Test results must remain valid and repeatable, and there should remain governance mechanisms which allow appropriate quality assurance. Point-of-care sonographic investigations, likewise, have developed in recent years, to answer specific questions relating to changing physiology. Appropriate training in use of the equipment, and image interpretation, which includes clear recourse to those with a defined specialty interest in the field (radiology, cardiac physiology), remains very important to ensure safety and applicability[11, 12].

The significance of mental health has been increasingly recognised during and after critical illness and the consultant in intensive care medicine will often require the specific expertise of mental health professionals. This is of particular importance when dealing with the complex issues around assessing capacity and other mental health legislation. As with interactions with other services, mental health referral pathways should be straightforward and streamlined, and advice from appropriate professionals should likewise be easily and clearly available.

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3.6 Rehabilitation

Authors: Karen Cotton, Stephen Brett & Bronwen Connolly

INTRODUCTION

In 2009, NICE published guidelines entitled *Rehabilitation after Critical Illness* (CG83)[1] that emphasised improved identification of need, access and quality of rehabilitation during the critical care admission, within the wider hospital, and upon hospital discharge into the community. In 2017, NICE refined CG83 with the publication of four standards (QS158), reflecting high-priority areas for quality improvement in relation to rehabilitation pathways for critically ill adults[2]. Enhancing survivorship, or the quality of survival, is now central to our management of critically patients. As such, rehabilitation should be multi-professional, interdisciplinary and coordinated across the recovery continuum to optimise patient outcome.

STANDARDS

1. The rehabilitation needs of all patients must be assessed within four days of admission to intensive care (or on discharge if sooner)[2] and a rehabilitation plan outlined by all relevant therapy professions as clinically indicated; depending on illness acuity this may initially focus broadly on minimisation of harm and avoidance of morbidity, followed by more specific rehabilitation strategies. Where feasible and appropriate, rehabilitation goal setting should involve the patient.

2. Patients receiving rehabilitation must be offered therapy by the multi-professional team across a seven-day week and of a quantity and frequency appropriate to each therapy, in order to meet the clinical need and rehabilitation plan for an individual patient. Rehabilitation plans should be updated accordingly.

3. All patients must be screened for delirium at least daily, and when changes or fluctuations in behaviour occur[3]; in the event of a positive delirium screen, family should be informed, strategies to facilitate patient orientation implemented and medical review of risk factors completed.

4. All patients with a tracheostomy must have communication and swallowing impairment assessed by a Speech and Language Therapist.

5. Patients who stay in critical care for more than four days and are at risk of morbidity must have their ongoing rehabilitation needs addressed at post discharge follow-up[2], or in the community setting, at two to three months after discharge from critical care. At this point, additional referrals to any necessary services can be made.

6. Adults at risk of poor quality recovery must have an individualised rehabilitation plan documented in their formal handover of care when transferred from critical care to a general ward[2]. All members of the care team must be aware of this. Patient involvement in setting this rehabilitation plan should occur as soon as feasible and appropriate.

7. Adults who were in critical care and at risk of poor quality recovery must be given information to explain what they can do to help their recovery. This information should be provided, at the latest, before discharge from hospital[2].

RECOMMENDATIONS

1. Physiotherapy services should provide assessment and intervention for both acute respiratory and physical rehabilitation seven days per week; provision should be made for other therapy services to be provided as needed at weekends.

2. Specialist rehabilitation co-ordinator roles should be considered to facilitate the oversight of the rehabilitation pathway for patients, and to ensure that assessments, referrals and documentation are completed and transferred to ongoing services and teams.

3. The role of therapy support workers or rehabilitation assistants should be considered as part of the rehabilitation team; these roles may be uni-professional or multi-professional in nature and recruited from nursing or allied health backgrounds. These may enable enhanced delivery and increased efficiency of rehabilitation service delivery, as well as ongoing rehabilitation to be delivered following discharge from critical care. Further work is required to determine the appropriate grading of these roles.

4. Rehabilitation outcomes should be monitored and progression made using outcome measures appropriate for the stage of recovery, individual therapy, and dependent on local resources (including personnel, equipment, and finance).

5. The rehabilitation plan that forms part of the handover of care on discharge from critical care should address all relevant domains for individual patients including, but not restricted to, physical, functional, communication, social, spiritual, nutritional and psychological.

6. To facilitate the rehabilitation component of the formal handover of care on discharge from critical care to a general ward, weekly multidisciplinary rehabilitation ward rounds should be led by a senior member of the critical care multi-professional team and result in an update to the rehabilitation goals. These should be set in conjunction with the patient and/or carer where appropriate.

7. Expectations of both patients and families should be identified regularly and addressed in a consistent manner by the most appropriate senior member of the team; all patient and family communication should be centrally documented to ensure that it can be accessed easily by all team members.

8. For high-risk/complex patients, capturing the experience for the patient and family in a manner that they can reflect upon and engage with during the time spent in hospital should be considered. This may take the form of diaries[4], either paper or electronic, and may include photos, videos and written information. This material may be collected prospectively or retrospectively depending on the desire of patient and family.

BACKGROUND

As mortality rates improve following admission to the critical care unit, even amongst patients with significant illness acuity, optimising quality of survival is imperative[5,6]. The protracted and multifactorial impairments that patients experience are encapsulated as 'post intensive care syndrome'[7] and reflect physical, cognitive and mental domains; albeit deficits in social roles and economic status[8], return to work[9,10] and increased healthcare utilisation[11] are also evident. Increasingly, the impact of critical illness on caregivers is now recognised[12,13]. Existing data suggest symptomology, as a result of critical illness, can persist up to at least five years post illness[14-17].

Recognising the role of rehabilitation within the recovery pathway of survivors of critical illness is vital for optimising patient outcome and is reflected by national guidelines[1,2] and the above recommendations for service provision. Early and ongoing screening for new and persisting critical illness-associated morbidity is vital, and given the broad range of impairments that patients can experience, input from a multi-professional team is essential to deliver comprehensive and holistic rehabilitation management across the recovery pathway. In particular, rehabilitation management should transition seamlessly as patients move from one healthcare setting to another, both within and across organisations. This will necessitate effective and efficient communication for handover of relevant information, which should be documented clearly. Regular team meetings to review rehabilitation progress may facilitate this process. Furthermore, proactive involvement of patients in setting their rehabilitation plan is advocated as soon as feasible and appropriate.

This chapter provides an overview around the process and pathway of rehabilitation service delivery. We recommend reference is made to the individual profession and service-specific chapters for further relevant detail. Multi-professional teams delivering rehabilitation therapy to patients will need to be flexible to adapt to changing clinical status, location and individual needs of patients, as well as external influences on services such as case-mix, staffing and other resources that may locally determine availability for provision. We recommend consultation on chapters addressing service delivery, workforce planning and new models of care.

These standards have been updated since GPICS V1 with reference to the recent publication of NICE QS158 Quality Standards[2] to accompany the original 2009 guidelines[1]. The central tenets of both NICE publications feature within these statements. Clarification has been provided where the earlier version raised potential uncertainty around interpretation, and certain stipulations of previous standards have been removed to allow for a more realistic implementation in clinical practice. The content of each standard has been expanded to offer greater elucidation to clinicians for translation into service delivery, and we have additionally indicated where reference should be made to other GPICS chapters for further specific detail.

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3.7 Intensive Care Follow Up

Authors: Jack Parry-Jones, Sandra Taylor & Carl Waldmann

INTRODUCTION

"Given the individual impact on patients, and ripple effects on families and society in general, poor-quality rehabilitation and impaired recovery from severe illness should be regarded as a major public health issue." (NICE CG83)

Maximising recovery from critical illness requires early multidisciplinary team (MDT) assessment of individual patient needs alongside specific rehabilitation goals, especially for those following longer stays and those frailer patients with multiple co-morbidities. Rehabilitation should start in the critical care unit, and continue through to ward discharge and subsequently primary care. The key function of rehabilitation, and then follow-up service, is to ensure continuity of care with the same healthcare professional(s) team from patient admission to recovery in the community. Mortality alone is increasingly recognised to be a poor marker of good intensive care. Instead, we should be utilising patients, their family and MDT assessment of morbidity, return to work, and late mortality to best assess the true success of our intensive care intervention.

Critical illness leaves patients at highly significant risk of long-term physical, cognitive and psychological problems. Leaving the critical care unit is only the start of a long recovery process which may take months to years, and there may be considerable residual impact on patient's morbidity and longevity. Implementation of an intensive care follow-up service allows the provision of vital support following hospital discharge and the most effective management of complications related to critical illness and treatment. Further research is needed in this area and follow-up clinics facilitate this.

STANDARDS

1. Patients with higher risk of morbidity related to critical illness must be given information about ongoing rehabilitation goals in the community[1].

2. Patients discharged from the critical care unit must have access to an intensive care follow-up programme which can include review of clinical notes, patient questionnaires to assess recovery and an outpatient clinic appointment two to three months' post hospital discharge if required for specific patients[1].

RECOMMENDATIONS

1. The follow-up programme should be formally and clearly communicated to the patient and their relatives on discharge from critical care, and again on discharge from hospital. Primary care should also be informed through the discharge summary.

2. The follow-up programme should ensure the delivery of structured and supported self-directed rehabilitation to all patients at critical care discharge and at hospital discharge.

3. A minimum 20-30 minute follow-up appointment should be offered two to three months after hospital discharge if appropriate. The follow-up team should include an intensive care consultant, intensive care nurse, clinical psychologist, physiotherapist, dietitian and occupational therapist according to the individual patient's needs.

4. Selection of patients for follow up should be based on length of stay (more than three days) or at increased risk (e.g. following anaphylaxis, or post-partum intensive care). Self-selection of patients should also be facilitated.

5. Follow up should involve actively seeking common physical sequelae, such as weakness, weight loss and sexual dysfunction[2], and the consequences of critical care unit-related procedures (e.g. tracheostomy).

6. Review of current medication should be performed and rationalised with input from pharmacy if required.

7. Psychological sequelae (such as anxiety, depression, nightmares and post-traumatic stress disorder) should be sought via screening tools e.g. Hospital Anxiety Depression Scale (HADS), and UK Post Traumatic Stress Syndrome score (UK PTSS-14). This could be facilitated by review of clinical notes with patients and family or patient diary, use of screening questionnaires and review by a clinical psychologist.

8. Following structured review, appropriate referrals to other services may be required and should be arranged where required.

9. A bereavement follow-up service should be offered where explanations of diagnoses, treatments and support can be provided.

10. The establishment of a critical care patient and relatives support group should be encouraged.

11. Patients and relatives should be surveyed regularly and this information should be utilised to assess rehabilitation and follow-up services.

BACKGROUND

The importance of improving outcomes following critical illness is increasingly realised. This requires appropriate structures to be in place, with processes to minimise the sequelae of critical illness and maximise the chances of returning to a good quality of life, and where appropriate, to work[3]. Good rehabilitation and follow up is a multidisciplinary affair that includes, to varying extents depending on the individual's needs, the involvement of physiotherapy, occupational therapy, psychology, nursing, and the primary and secondary medical teams. All patients discharged from intensive care should have an assessment of their rehabilitation needs; however, not all patients require ongoing input on the ward or community if their intensive care stay has been short and uncomplicated (e.g. following elective surgery).

Follow up facilitates service evaluation and audit of the standard of intensive care that patients and relatives are given. It has a fundamental role in assessing long-term outcomes including morbidity and return to employment. The follow-up appointments are a convenient point in time to review patients. Patients are typically seen two, six and 12 months after discharge; in England there is an outpatient tariff to pay for the consultations.

There may be specific physical issues worth addressing. For example, patients who have had a tracheostomy may need ENT follow up, imaging, and occasionally surgical intervention. Less specific physical complaints may need addressing, such as significant hair loss, skin changes, chronic pain, muscle weakness or nerve entrapments. Emotional and psychological sequelae need to be actively sought[4].

Continuity of care by consultants in Intensive Care Medicine enables early diagnosis and management of intensive care problems[5]. Patients and relatives often need an explanation of what was wrong with them and information about their treatment. Their medication should be reviewed and rationalised. By organising specialist reassurance and advice, psychological recovery can be facilitated. The large investments made during intensive care are only sustained when continued support is in place following discharge. All other specialties review patients following admissions, and intensive care should be no different**.** Provision of an outpatient follow-up clinic supports key objectives. Through meeting patients regularly, timely diagnoses of problems are made, and appropriate referrals can be made to other specialties. The follow-up clinic enables quality assurance of the intensive care service provided to both patients and relatives[6].

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Recommended web resources:

1. ICU steps: http://www.icusteps.org/
2. Rehabilitation after critical illness in adults, September 2017: https://www.nice.org.uk/guidance/qs158

3.8 The Patient and Relative Perspective

Authors: Catherine White & Kate Regan with ICUsteps Trustees

INTRODUCTION

Being critically ill is a life-changing event. Admission to critical care is often unexpected and it can feel a very alien and frightening environment for patients and their families*.

Patients might experience:

- Painful and distressing treatments.
- Delirium and/or paranoia.
- Confusion and disorientation.
- Amnesia.
- Partial awareness while under sedation.
- Lack of sleep.
- An inability to communicate or retain information.

Their friends' or relatives' experience is also likely to be traumatic and highly stressful, especially as and there may be uncertainty over whether the patient will survive. The experience often has a profound impact on patients and their relatives.

STANDARDS

1. All patients must be regularly assessed for the presence of pain which should be managed with a protocolised multimodal analgesic regimen.

2. The effects of delirium must be explained to patients and their families and this should be emphasised in follow-up visits post critical care. Written information about delirium must be provided[1] .

3. When patients are sedated or unconscious or have delirium and require any intervention or nursing care, staff must explain to them in simple terms what they are doing. These patients need frequent and repeated reorientation (time of day, reminding that they are in hospital, etc.) as they may be confused and find it difficult to retain information.

4. Critical care staff must offer patients ways to help improve the quality of their sleep, for example eye masks and ear plugs[2]. Staff must try to minimise light and noise during the night.

5. Patients and families must be given high quality verbal and written information while the patient is in critical care (such as information about the patient's treatment, what the patient might experience and how they might feel) and when they leave the unit (to help explain what has happened to the patient and what might help them in their recovery)[3]. Each unit must

* This chapter refers to family or relatives or friends of the patient. These terms are used interchangeably to denote people that are significant to the patient. Not all patients will have family visiting them and the unit needs to provide support and information to those who are important to the patient, even if they are not family or next of kin.

have such documents readily available and ready for patients and relatives[4]. Young visitors and their parents will need specific support[5].

6. Patients must be given help to communicate (e.g. speaking valves (for patients with a tracheostomy, wipe boards or flash cards). Speech and language therapists can help patients with more complex communication needs, and technology to help communication may be used[6]. Critically ill patients also need effective communication; this needs to be simple to understand, repeated frequently and appropriate to their needs. Staff need to check patients' comprehension and not assume information has been understood or retained. Relatives should be encouraged to talk with patients as a familiar voice will provide comfort and reassurance.

7. Critical care units must have policies about how to safeguard vulnerable adult patients.

8. Units must obtain regular feedback about the care that patients and relatives received during their critical care admission in order to learn from and act on the feedback received.

RECOMMENDATIONS

1. Intensive care patients should have a patient diary. Intensive care patients have an increased risk of developing post-traumatic stress disorder (PTSD), anxiety and depression, and the provision of a patient diary has been shown to reduce the incidence[7]. Staff and relatives should be encouraged to write in the diary. Units may find it helpful to have a designated Patient Diary Lead to help with their implementation.

2. Understanding the individual who has become critically ill is important to help their treatment and recovery. A 'This Is Me' board or document for each patient is very beneficial and should be used if possible. This can have information about a patient's character and preferences, photographs of them at home, what they like to be called, if they are hearing or visually impaired, and their interests or hobbies. This helps staff know more about the patient and about their lives before intensive care. This will help with their care and rehabilitation, and is comforting for the patient.

3. Intensive care and ward staff should have training in what intensive care is like for patients and relatives and what challenges patients face while in intensive care and during their rehabilitation. Asking former patients and relatives to help with this training is beneficial.

4. Intensive care staff should let relatives know how they can help the patient, for example by talking to or reading to the patient (even if the patient is unconscious or sedated), as a familiar voice can be reassuring. Relatives should also be allowed to help with simple aspects of caring for the patients, if they would like to, such as applying hand cream or brushing hair. Written information should be provided for relatives.

5. Intensive care staff should spend time talking to the patient and relatives, seeing how they feel, asking about any worries they have and checking their understanding of any information that has been given. Clear information should be given to relatives regarding when they can visit.

6. A room should be provided for relatives to wait in or have time away from the unit. This room should be comfortable and its facilities regularly reviewed. Feedback should be sought from families whether additional facilities and support are required.

7. On discharge from the critical care unit, patients should be given the contact details of the healthcare professionals who are co-ordinating the patient's rehabilitation pathway[8].

8. The step down from the critical care unit to a ward is often a stressful time for intensive care patients and their families. All patients should be visited by a critical care outreach team, who can help with this transition. They can screen for ongoing post intensive care issues and provide support and information to the patient, relatives and ward team.

9. Intensive care patients should have access to formal support provided by the critical care service after they leave. This could be a follow-up service, a support group[9] or another equivalent initiative. These services provide vital support to the patient and their family during the long rehabilitation period. A follow-up service provides a telephone number for patients and relatives to call if they have any concerns, offers a follow-up meeting once the patient is discharged, and referrals and additional support as required. A support group consists of former patients and relatives and healthcare professionals who meet and talk with newly discharged patients and relatives.

10. Critical care units should provide relatives of patients who died in intensive care the opportunity of a follow-up meeting with an ICU staff member to discuss any questions they may have about their relative's time on the unit. Families may be given a leaflet after their relative dies in order that they can arrange a meeting at a later date if they wish to. It can also include other sources of support. Some units hold memorial services for relatives.

BACKGROUND

Over 270,000 people are admitted to critical care units in the UK each year. For many patients, this experience is unexpected and traumatic. For those who survive, it can be a life-changing event and patients may be left with temporary or permanent disabilities and often significant psychological distress.

Patients and relatives are usually unable to prepare for their time in intensive care. Patients will be very ill and often unable to understand or participate in decisions about their treatment. They may feel like they are dying. It has only been in recent years that there has been general awareness and understanding amongst healthcare professionals about the burden of intensive care treatment. It is beneficial for all healthcare professionals who are involved in treating critically ill patients to have training about this experience by talking with former patients and relatives. Communication is the key to improving the patient and relative experience, for example:

- Helping patients to find ways to communicate.
- Finding ways to orientate patients.
- Regularly talking with the patient (whether the patient is conscious or unconscious).
- Understanding that the patient may be confused, disorientated and be unable to retain information so that regular, appropriate communication and checking patient understanding is vital.
- Providing timely and regular information to relatives, allowing time for questions and recognition that relatives may also find it hard to retain and understand information in such stressful circumstances.

For patients and relatives experiencing the intense emotional distress of critical illness, it is paramount that they receive kind and compassionate care by all healthcare professionals they come into contact with.

Patients who survive critical illness are often left with physical, psychological and cognitive issues which require support and rehabilitation. While guidelines often focus on the length of stay as a proxy for the impact of intensive care treatment, this is not an effective way to judge the effect any intensive care stay can have on an individual. There are many physical issues to contend with in recovery, such as extreme weakness and fatigue, and the psychological legacy of critical illness is profound. Support from those who understand what intensive care treatment entails is vital for recovering patients, yet many patients and relatives do not receive any help once they are discharged from intensive care and can feel very isolated. Patients can have very confused memories from their time in intensive care, and it is during recovery that their patient diary is so important, for those patients who want to use it, to make the first steps in understanding what has happened to them.

Good quality information is also essential for patients and relatives. It can help answer questions for patients and relatives during the critical illness and plays a significant role in preparing and supporting patients on the long road to recovery. Intensive care follow-up and support groups can be a lifeline to patients and relatives when they are trying to piece their lives together again.

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3.9 Staff Support

Authors: Daniele Bryden, Ganesh Suntharalingam, Suzy O'Neill & Duncan Tragheim

INTRODUCTION

Staff well-being has a positive impact on patient safety[1], quality of care and organisational performance[2]. The Institute for Health Improvement (IHI) has identified five core needs for staff at work: (i) physical and psychological safety; (ii) a meaning and purpose to the individual's role; (iii) a degree of choice and autonomy regarding the conduct of the work; (iv) an environment that provides camaraderie; and (v) an environment that promotes teamwork, fairness and equity[3]. The UK Health and Safety Executive considers it an organisational responsibility to modify factors such as these that impact on work-related stress[4].

Within this chapter, standards have been identified as those with a directly identified patient safety linkage, and recommendations are those that support the delivery of one of the five IHI recommendations.

STANDARDS

1. All units must have policies in place to support staff engagement and retention.

2. Induction and escalation policies must be clearly identified for all staff groups.

3. 100% of new staff must receive a job-specific induction to the unit.

4. Workplace equity within staff groups must be transparent (e.g. rostering, annual leave policies, job plans). Staff must be aware of the policies[5].

5. Staff well-being is an organisational priority. Units must monitor and regularly review metrics of staff well-being as quality indicators (e.g. sickness rates).

6. All staff must have opportunities for personal development reviews including annual appraisals.

7. All staff working in critical care must be able to access the Freedom to Speak Up Guardian.

8. Staff must be provided with adequate resources consistent with other GPICS standards to deliver their job role, e.g. adequate staffing ratios, access to facilities for nutrition and hydration, adequate equipment.

9. Staff rostering must comply with Health and Safety Executive recommendations for sleep and rest.

10. Units must provide adequate workplace facilities for staff breaks, which are separated from areas for relatives.

RECOMMENDATIONS

1. All staff engaged in a managerial or leadership role should have access to appropriate mentoring and/or coaching services to support them in their role.

2. All units should promote healthy rest and sleep policies for staff required to work overnight.

3. All staff members should have access to an independent, professional psychological support service, which provides counselling services.

4. All staff members should have self-referral access to an occupational health service and rapid access physiotherapy services.

5. All units should provide frequent opportunities for shared learning, clinical communication, and reflection, to reduce professional isolation. This includes routine clinical practice (e.g. multidisciplinary rounds, mortality and morbidity meetings), as well as specific reflective events (e.g. Schwartz Centre Rounds, debriefing following medical emergencies).

6. All staff should have ergonomic clinical work areas with appropriate access to light and control of noise.

7. All staff should be supported to maintain a healthy lifestyle, e.g. provision of advice on diet and exercise.

8. All units should conduct regular (at least annual) reviews of organisational policy on staff health and well-being.

BACKGROUND

This is a new chapter within GPICS and reflects the wider recognition of the role of workforce well-being in the delivery of patient care and the creation of a patient safety culture within individual critical care units. Many of these standards and recommendations are not evidenced directly from patient trials, but are identified from qualitative research studies, governmental or other national agency reports.

NHS organisations with higher levels of employee engagement have higher patient satisfaction and reduced staff turnover[6]. Conversely, poor psychological health at work has been identified as having a significant economic, societal and productivity impact across all workplaces[7]. Intensive care staff are particularly vulnerable to work-related stress, and addressing the recommendations in this chapter is a practical means by which critical care units can mitigate some of these factors and build staff resilience[8].

Many of the standards and recommendations in this chapter have been designed to operate as part of a package of measures for staff support. They are not intended to be single interventions, but will require a process of ongoing action and monitoring. The emphasis is on the physical and mental health of the multidisciplinary team as a means to delivery of better patient care.

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3.10 Inter and Intra Hospital Transfer of Critically Ill Patients

Authors: Rowan Burnstein & Melanie Wright

INTRODUCTION

Adult intensive care patients may require transfer both within the hospital (intra-hospital transfer) for a variety of reasons, and between hospitals (inter-hospital transfer). Such transfers may take place by road or air, and may be over very large distances. The principles for safe transfer of intensive care patients are the same regardless of the type of transfer, or the means of transfer. During patient transfers there is potential for patients to deteriorate, or for an adverse event such as tube or line displacement, to occur[1,2,3,4]. A risk assessment should be undertaken prior to any intensive care transfer. The decision to transfer the patient is based on the magnitude of the risk posed to the patient by the transfer in relation to the benefits of that transfer. All patients undergoing transfer should be managed with appropriate equipment and monitoring by staff trained in patient transfer. The standards for equipment monitoring and staffing are the same as those used for patients being managed on a critical care unit and in line with GPICS standards.

STANDARDS

1. Transfer to other critical care units for non-clinical reasons must be avoided where possible.

2. Appropriate equipment must be available to undertake a safe transfer and to manage complications/adverse events which may occur during a transfer. All equipment used for patient transfers must conform to the relevant safety standards, be regularly serviced, and checked immediately before use.

3. All staff involved in a patient transfer must be trained, competent and familiar with the use of equipment. Patients must only be transferred by staff members of appropriate seniority who have been formally trained in the transfer of critically ill patients. Air transfers should only be conducted by staff who have received specific training and experience. The makeup of the team transferring the patient should be determined by how sick the patient is, and how much support they require. Protocols should be in place to manage likely or serious adverse events which may occur during a transfer.

4. Where patient transfers result in a change of team managing the patient during or following a transfer, an appropriate and documented handover must be undertaken between the teams to ensure good continuity of care. This should include providing copies of the clinical record.

5. A named intensive care consultant must take overall responsibility for the decision to transfer a patient and the level of support required, but does not necessarily have to undertake the transfer.

6. Inter-hospital transfers must be undertaken in a timely fashion according to the patient's clinical condition.

7. For inter-hospital transfers, there must always be a named consultant who will take responsibility for the patient on arrival at the receiving hospital. This must be agreed prior to the

transfer being undertaken.

8. Where patients have completed specialist care and ongoing intensive care needs can be provided in the patient's home, hospital transfer must take place within 48 hours of referral to the receiving hospital.

RECOMMENDATIONS

1. Transfers should follow the advice and protocols presented in the latest ICS transfer guidance**.**

2. The reason for any transfer should be documented in the patient's notes. This should include an assessment of potential benefits against risks. Transfer decisions should only be made by consultant intensive care team members, and this information should also be documented.

3. An adequately stocked and regularly checked, dedicated transfer bag should be available for use during all patient transfers. This bag should contain appropriate drugs and equipment for interventions that might be required in transit. The transfer bag contents should be checked routinely (ideally daily and a log of checks maintained) or, if sealed with a tag, then a daily check that the seal is unbroken. The transfer bag must be restocked between uses to avoid delays when it is needed. Staff carrying out patient transfers should be familiar with bag layout and content.

4. The patient's vital signs should be documented at appropriate intervals while in transit. Where possible, action should be taken to remedy any physiological deterioration during the transfer.

5. Standardised transfer documentation should be completed for all intensive care patient transfers. Transfer documentation should be scrutinised within a robust audit system, allowing eventful or substandard transfers to be investigated and lessons learnt to be shared widely, as well as numbers and reasons for transfers.

6. Where an adverse event occurs during a transfer, this should be reported and investigated using the healthcare organisation incident reporting system at the transferring unit. All learning should be widely shared.

7. Every acute healthcare organisation should have a designated consultant and nurse who are responsible for maintaining standards of transfer of critical care patients, guideline production, training, governance, audit and reporting.

8. Training in transfer medicine should be an integral part of Intensive Care Medicine training for doctors and nurses.

For inter hospital transfers, the following additional recommendations should apply

1. Where multiple teams are involved in a patient's care, appropriate handover should be undertaken between the teams prior to transfer. This should not delay the transfer.

2. The patient, where possible, and their next-of-kin should be informed of the decision to transfer and an explanation given to them of the need for transfer. This discussion should be documented.

3. There should be a clear agreed escalation process for any delayed transfer across an operational delivery network geographical area. The definition of 'delay' will vary according to the reason for the transfer. For patients being transferred from a specialist critical care unit to a general critical care unit at the completion of specialist care, a delayed transfer is one that has not been undertaken 48 hours after the time of referral to the general critical care unit.

4. Appropriate infection control precautions, including isolation, must be made available for patients with known high-risk infections or who are at a high risk of harbouring such infections both during transfer and in the receiving hospital; their availability should be such that this does not delay a patient transfer. Similarly, isolation facilities must be available for immunocompromised patients who require them.

5. Critical care units should have an agreement with their local ambulance providers in relation to the contracted transport provision for intensive care services, and to ensure these standards are met throughout the entire patient pathway.

6. There should be a system for monitoring the quality of inter hospital transfers and governance arrangements which includes capture of numbers, indication for transfer, incidents, delayed transfers and outcomes. Audit measures and learning should be widely shared.

7. There should be standardised network wide transfer documentation and training programmes.

8. Consideration should be given to the formation of specialist transfer teams, as these may reduce the incidence of adverse events[2] and prevent the adverse impact of transfers on the transferring unit due to loss of key staff.

BACKGROUND

Transfer of critically ill patients within and between hospitals is common. Many critically ill patients admitted to hospital require transfer around the facility during admission from the emergency department or retrieval from the ward – for diagnostic tests, surgery, or interventional radiology. Patients may be transferred between hospitals for more specialised care or for ongoing care following completion of specialist care in a specialist centre. Every transfer is associated with a small but significant rate of adverse events, often related to physiological deterioration in transit, or problems with equipment or patient devices such as lines or tubes. The Intensive Care Society (ICS) and The Association of Anaesthetists of Great Britain and Ireland (AAGBI) guidelines inform standards for transfer of patients[5,6].

Any staff responsible for transferring patients around the hospital and between hospitals should be trained in how to transfer patients, including the use of the equipment required and how to deal with any adverse events or patient deterioration in transit. This training may be delivered as part of an Intensive Care Medicine or other training scheme. Consideration should be given to the make-up of the transfer team, and the seniority and specialty of the team members. All transfers between hospitals should be discussed with a consultant in Intensive Care Medicine.

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3.11 Care at the End of Life

Authors: Christopher Bassford & Joseph Cosgrove

INTRODUCTION

Intensive care focuses primarily on life-sustaining therapies, but with in-hospital mortality at approximately 20%, the provision of good care at the end of life is a vital component of Intensive Care Medicine[1]. Additionally, treatments instituted to save life can be invasive, distressing and potentially conflicting with effective palliative care[2]. There are therefore requirements for clinicians to recognise that treatments may not be in patients' best interests and be able to clearly and compassionately communicate such matters[3].

STANDARDS

1. Decision making surrounding care at the end of life, including the rationale for any decisions, must be documented clearly and communicated to patients and their loved ones[4, 5]. The latter being of particular relevance if patients lack capacity (below).

2. Decision making surrounding end of life care (EoLC) must be performed in accordance with relevant statutory requirements and professional guidance:
   a. *Mental Capacity Act 2005* (MCA 2005), England and Wales
   b. *Adults with Incapacity Act (2000)*, Scotland
   c. *Mental Capacity Act (Northern Ireland) 2016*
   d. *Human Tissue Act*, England
   e. General Medical Council's *Good Medical Practice*; specifically *Treatment and Care Towards the End of Life: Good Practice in Decision Making*.

3. Declaration of death by cardiorespiratory or neurological criteria must be done in accordance with professional guidance[6].

4. Consideration must be made as to whether organ and tissue donation can be offered to every dying patient, and where appropriate the specialist nurse-organ donation (SNOD) should be contacted[7].

5. In order to identify dying patients and respond to changes in their condition, those at high risk of dying must have their condition regularly reviewed to assess whether they are improving or deteriorating, enabling early and appropriate organisation of treatment and care[4, 5].

RECOMMENDATIONS

1. Patients with capacity should be kept informed of their clinical condition, and of the possibility that they may be dying[3]. Best practice dictates that those close to the patient should also be informed[3].

2. Decision making related to care at the end of life should, wherever possible, involve patients and people close to them, as well as medical professionals. If the patient lacks capacity and there is

no individual with Lasting Power of Attorney, responsibility for determining treatments rests with treating clinicians[3]. Previous decisions should also be taken into account e.g. treatment escalation plans (TEP), ReSPECT (Recommended Summary Care Plan for Emergency Care and Treatment).

3. At least two consultants, supported by senior ICU nursing agreement, should contribute to the process of recommending withdrawal or withholding treatments. Such processes are decided on a case-by-case basis and clarity of communication can be improved by outlining likely burdens and benefits of acts or omissions.

4. Once patients are recognised as being in their final days/hours of life, therapeutic goals should be reviewed and accordingly altered to focus on comfort and dignity. Interventions which do not contribute towards this should be withdrawn. The discussion of *Do Not Attempt Cardiopulmonary Resuscitation* (DNACPR) is intrinsic to palliative care in critically ill patients. This should be discussed with patients and families within that context. If instituted in emergent situations for incapacitated patients, DNACPR decisions should be discussed with patients' surrogates (as defined by the MCA or equivalent) at the earliest opportunity. The British Medical Association, Resuscitation Council-UK and Royal College of Nursing issue regularly updated guidance on DNACPR[8].

5. Dying patients should be managed by multi-professional teams that include senior medical and nursing staff from intensive care and referring teams. It may also include specialist palliative care teams[5].

6. Therapeutic plans should be made and anticipatory medications prescribed for all patients in their final hours/days of life, enabling prompt symptom control. This includes therapeutic options for analgesia, dyspnoea, anxiety and agitation. Doses should be titrated for symptom relief based on explicit assessments. Where appropriate, the double effect of drugs used should be transparent to patients, staff and family.

7. Care should address dying patients' need for spiritual and emotional support, and include that of their families and others close to them. The needs of loved ones to be with, care for and otherwise attend to dying patients should be met as far as is possible. If appropriate, religious or secular expertise should be sought (e.g. referral to chaplaincy, psychological services or patients' GPs). Staff should also have access to these support services.

8. If death is considered to be very close, patients should not normally be transferred out of the critical care unit unless it is to facilitate (via discussion with patients and loved ones) significant improvements in care. If practical to do so, patients should be given the opportunity to die at home or in a hospice. All transfers should involve a handover of plans and goals of care.

9. Intensive care clinicians often have a responsibility for decision making and care of acutely unwell and deteriorating patients outside of the critical care unit. When reviewing such patients for potential treatment escalation, they should work with patients' clinical teams to ensure that decisions and communication regarding care at the end of life are made to the same standards as on the critical care unit.

BACKGROUND

Despite continuing improvements in intensive care survival, approximately one in five patients whose hospital stay involves intensive care will not survive[1]. Furthermore, the quality of life after a critical illness is diminished and shortened for many patients[9]. Active aggressive, interventional treatments with associated pain and distress place considerable burdens on patients. When these burdens outweigh potential benefits of life-supporting treatments, intensive care may serve only to prolong death rather than life. In such circumstances, a transition to palliative care may be in patients' best interests[2]. Such a transition prioritises symptom management, psychosocial support of patients and families, and alignment of treatments with individual care goals, values and preferences. It recognises philosophical as well as physiological aspects of a *good life*. The purpose of this chapter is to guide the development of individualised care plans that meet current legal and quality standards for intensive care patients in the last days/hours of their life. It is not to produce a didactic recipe for care of the dying, but rather apply current evidence and best practice to individual patients.

Skills in quality end of life care are dependent on symptom management, good leadership, planning, decision making, communication and multidisciplinary working. The majority of deaths on the critical care unit follow withdrawals or limitations of treatments when failure of curative treatments becomes apparent[1,10]. Recognising this change is one of the most difficult decisions clinicians face. However, it is the essential first step in ensuring that clinical teams, patients and their loved ones work together to understand and achieve the outcomes that are best for individual patients. It is recognised that these decisions should be individualised, and include a shared approach to decision making [11]. The General Medical Council has published extensive guidance to aid decision making in this area. It covers best practice for patients with and without capacity, and takes into account relevant law[12]. It seeks to clarify the law's application within the critical care unit, rather than replace or reproduce it. Where there is a lack of capacity, it may be necessary to identify a suitable patient representative, e.g. Independent Mental Capacity Advocate or IMCA in England and Wales, within a *reasonable* (context-sensitive and not formally defined) timeframe.

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3.12 Organ Donation

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INTRODUCTION

Doctors have a professional obligation to facilitate organ donation by promoting best practice and incorporating the possibility of donation into all patients' end of life care plans[1]. Organ donation is a core service of every critical care unit, and acute hospitals are a key stakeholder in implementing best-recommended practice in all stages of the organ donation pathway based on a well-defined UK professional, ethical and legal framework. The standards and recommendations in this chapter are based on national best practice guidelines and recommendations, mostly developed with, or endorsed by, national intensive care professional bodies.

STANDARDS

1. If a patient is close to death, doctors must explore with those close to them whether they had expressed any views about organ or tissue donation. Doctors must follow any national procedures for identifying potential organ donors and, in appropriate cases, for notifying the Specialist Nurse-Organ Donation (SNOD)[1].

2. The National Institute for Health and Care Excellence guidance requires that the intensive care team caring for the patient should initiate discussions about potential organ donation with the SNOD whenever a patient meets the criteria for undertaking the tests, to confirm death using neurological criteria or when there is an intention to withdraw life-sustaining treatment in patients with a life-threatening or life-limiting condition which will, or is expected to, result in circulatory death[2].

3. Critical care units must comply with the criteria for diagnosing death using neurological or circulatory criteria as set by the Academy of Medical Royal Colleges[3].

4. All units must contribute data to the national potential donor audit.

RECOMMENDATIONS

1. Each acute hospital should have an Organ Donation Committee to oversee all aspects of deceased organ donation as recommended by the Department of Health's Organ Donation Taskforce[4]. Funding for the committee's activities is provided by NHS Blood and Transplant (NHSBT).

2. Each acute hospital should have a clinical lead for organ donation (CLOD) funded by NHSBT, with responsibility to implement organ donation policies, promote the adoption of best practice guidelines and to address any local barriers to donation.

3. Each critical care unit should have an embedded or assigned SN-OD employed by NHSBT to provide advice on all issues relating to donation, organise donor coordination, support the

intensive care staff in donor management, complete the potential donor audit, engage in teaching and training and support donor families.

4. Guidelines on end of life care and withdrawal of life-sustaining treatments (WLST) should be compliant with the Mental Capacity Act 2005[5], and based on the guidance provided by the General Medical Council[1], and should be followed irrespective of any potential for organ donation.
   a. Determining best interests at the end of life should include an assessment of a patient's preferences and wishes regarding organ donation[1,5,6].
   b. Guidance on decisions regarding WLST in patients with devastating brain injury (DBI) should be based on the recommendations of FICM/ICS and other professional bodies[6].

5. A planned and collaborative approach to the family for organ donation between the intensive care team and the SN-OD team should be routine practice as recommended by NICE in 2016[2].

6. Consultants in Intensive Care Medicine should actively manage brain stem dead consented donors to optimise organ quality and increase the number of organs successfully retrieved and transplanted[7]. Donor optimisation care bundles or protocols should be available and used.

7. The intensive care team should manage resources flexibly to facilitate organ donation and/or end of life care for patients outside the critical care unit whenever appropriate.

BACKGROUND

There has been an 80% increase in the number of deceased organ donor numbers in the ten years since the publication and subsequent implementation of the Organ Donation Taskforce Report[4]. This was mainly driven by an increase in identification and referral of potential donors, resulting in increased family approaches in critical care units and emergency departments (ED). This improvement also reflects the development of a robust ethical, legal and professional framework to underpin the practice of deceased organ donation in the UK, arguably one of the best in the world. However, the low consent rate to organ donation compared to most other European countries remains the major barrier to the UK achieving a world-class donation and transplantation service. Consultants in Intensive Care Medicine can contribute to improving consent rates by:

- giving families time to understand and accept the futility of the situation
- decoupling the conversation about brain stem testing or the WLST from the family approach for organ donation
- planning and undertaking a collaborative approach with the SN-OD as recommended by NICE[2].

Where organ donation can potentially be offered for a patient, it would be common for the intensive care consultant, intensive care nurse and SN-OD to meet the family together. The consultant would lead on breaking bad news before handing over to the SN-OD when it is clear that the family have accepted the inevitability of their loss and are ready to consider what may happen next[8]. Involvement of the SN-OD in this way provides timely information and support for the family, and significantly increases the consent rate[9].

It is also the most easily modifiable factor available to consultants in intensive care medicine to improve consent rates to organ donation. SN-ODs are specifically trained in these conversations; they can provide all the information required and help support the family. While SN-ODs must not be involved in end of life decision making, they remain a valuable resource for the intensive care staff and the potential donor's family. For these reasons, many consultants in Intensive Care Medicine will routinely encourage the presence of the SN-OD during the discussion with the family

regarding the WLST or the plan to undertake the clinical tests to confirm death using neurological criteria. This approach requires early notification of the SN-OD team to ensure their availability at the time agreed with the family for this conversation. An opt-out system of consent was introduced in Wales in December 2015, and similar legislation will apply in England from Spring 2020.

Consultants in Intensive Care Medicine are also the only specialists in the hospital with the full skillset required to facilitate organ donation from any part of the hospital (e.g. emergency department, recovery room). They will usually manage beds flexibly to admit patients to intensive care to facilitate organ donation, and increasingly end of life care, as occurs in Australia and the USA. Until recently, it was usual practice in the UK to only admit patients with DBI whose relatives had agreed to organ donation in the ED, and to withdraw life-sustaining treatment in the ED if the relatives declined donation. This approach resulted in some unexpected survivors, highlighting the pitfalls of early prognostication. This issue was addressed by the publication of guidance from stakeholder professional bodies who recommended delaying the decision to withdraw treatment and admitting this patient group to intensive care irrespective of any potential or consideration of organ donation; the aim is to improve prognostic accuracy and to make decisions to withdraw life-sustaining treatments more robust[6]. This approach also has the potential to improve end of life care for patients and their families, and to help the adoption of best practice in many aspects of the donation pathway. The guidance only recommends what it considers to be best practice, rather than mandate it, and also makes clear that there are circumstances where the approach may be inappropriate.

The increased use of healthcare resources at the end of life remains a cause for concern for some. Organ donation should however be considered as core business of the critical care unit. Organ transplantation is not only lifesaving or life enhancing for transplant recipients, but also because it brings resource benefits to the wider population and healthcare service[10].

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3.13 Legal Aspects of Capacity and Decision Making

Authors: Chris Danbury & Rosaleen Baruah

INTRODUCTION

Consultants in Intensive Care Medicine and other members of the multidisciplinary team frequently make decisions about patients who lack capacity to decide for themselves. It is key to safe, ethical and lawful practice that staff understand the legal principles that underpin the specialty. The Conflicus[1] study shows that disagreements can often arise. The department should develop mechanisms for resolving those disputes. If legal advice is needed, all healthcare organisations and Boards have a legal services department and/or access to one of the NHS Resolution Panel solicitors.

Due to legal history and the more recent devolved administrations, England and Wales follow most of the same legal framework, Scotland has its own legal process, as does Northern Ireland (which has not passed any primary legislation relating to mental capacity). Notwithstanding this, the Supreme Court is the final appellate court in the UK and its decisions bind all lower courts wherever they may be located[2,3].

Capacity is decision specific and may fluctuate over time. At any given time, a patient may have capacity for one decision but lack it for a different decision.

STANDARDS

1. Units must have regular, minuted, multidisciplinary team meetings to review cases where dispute have or may have arisen.

2. All patients must be presumed to have capacity to consent or withhold consent.

3. If the patient has made a valid and applicable Advance Decision Refusing Treatment (ADRT), it must be respected (although an ARDT does not have formal legal standing in Scotland, they are likely to be highly persuasive to the court).

4. Final determination of capacity for a specific treatment must be made by the treating clinician and documented.

5. If a patient has capacity, their decision must be respected, even if the treating clinician considers the decision to be unwise.

6. Patients who lack capacity must only be treated in their best interests (England & Wales) or if it is of benefit to the patient (Scotland).

7. Determination of best interests/benefit must involve consultation between the treating consultant and individuals close to the patient (family and friends).

8. The aim is to achieve consensus between team and family/friends as to what is in the best interests/benefit to the patient. When there is continued disagreement about best

interests/benefit, the treating clinician must not act unilaterally.

9. If, at the end of the medical process, it is apparent that the way forward is finely balanced, or there is a difference of medical opinion, or a lack of agreement to a proposed course of action from those with an interest in the patient's welfare, a court application must be made[4].

RECOMMENDATIONS

1. A written departmental protocol for resolution of disagreements should be in place. Disagreements may be within the team, between different clinical teams or between team and family/friends.

2. An ADRT that does not meet the criteria to be formally legally binding should nevertheless be taken into account as part of the best interests assessment as a strong indication of the patient's wishes and opinions.

3. In situations of intractable disagreement, mediation should be considered prior to approaching the Court of Protection (England & Wales)/Court of Session (Scotland). NHS Resolution or the Civil Mediation Council provide access to individual mediators or recognised groups.

4. Independent Mental Capacity Advocates (IMCA) should be consulted (in England and Wales) when a patient is 'unbefriended'. This only applies when there is no one who can be consulted about best interests, i.e. no family or friends. IMCAs should not be consulted because there is dispute about best interests between the medical team and family.

BACKGROUND

Autonomy or self-determination is a fundamental principle of human rights and a cornerstone of medical law. The principle is seen at its most forcible when patients exercise their right to self-determination by refusing life-sustaining treatment. With limited exceptions, adults who have capacity (i.e. who can understand, retain, weigh and communicate the necessary information) can make their own decisions to refuse treatment, even if those decisions appear to others to be unwise, or place the patient's health or life at risk[5].

The principle of self-determination means that when a patient lacks capacity, those who are charged with making decisions on their behalf need to take care to ascertain what the patient's likely view of that treatment would have been (at the point where they had capacity), and whether, on balance, they would have wanted to receive it or not. This is a crucial part of making a best interests decision that takes account of the person's values, wishes, feelings and beliefs. Decisions about life-sustaining treatments are not purely clinical decisions[6].

In those who lack capacity, a patient-centred decision about what is in the patient's best interests requires an assessment and understanding of the individual patient's own beliefs, wishes and values. It also involves seeking the views of those who know the patient about whether he or she would accept life-sustaining treatment, if able to express a view[7]. It is an essential part of good quality care that these assessments are carried out carefully and thoroughly[8].

Deprivation of Liberty Safeguards (DoLS) are not applicable to the majority of patients on the critical care unit[9]. In any event, DoLS do not give any authority to treat, do not apply in Scotland and a new

scheme (Liberty Protection Safeguards) is currently before parliament. It is not clear what the implications are of this new scheme as it has not been finalised at the time of writing of GPICS V2.

The goal of medicine is not to prolong life at all costs; knowing when to make this shift from active interventions aimed at prolonging life to palliation is a crucial part of medical care.

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Section Four

Critical Care Services: Clinical Care

4.1 Respiratory Support

Authors: Gavin D Perkins & Daniel F McAuley

INTRODUCTION

Over 100,000 patients per year with acute respiratory failure are admitted to intensive care in the UK for mechanical ventilation. There are peaks and troughs of demand with the winter months normally being the busiest time. Patients spend on average eight days requiring invasive mechanical ventilation[1]. Up to 20% of ventilated patients have the acute respiratory distress syndrome (ARDS)[1]. Liberating a patient from ventilation (weaning) is a key priority. Evidence-based guidelines should inform the optimal management of acute respiratory failure and approaches to weaning.

STANDARDS

1. Units must have access to sufficient modern invasive and non-invasive ventilators which will support pressure/volume controlled ventilation, titration of inspired oxygen concentration, support spontaneous ventilation and allow application of PEEP.

2. Pulse oximetry, capnography, ECG, blood pressure monitoring and ventilator alarms must be used for all ventilated patients whose trachea is intubated.

3. An accurate height must be measured on admission for every patient requiring invasive mechanical ventilation to calculate predicted body weight (PBW) and corresponding target tidal volume to allow protective ventilation (6ml/kg PBW in those with ARDS (Acute Respiratory Distress Syndrome) or at risk of ARDS).

4. Units must have evidence-based, written guidelines covering the use of non-invasive ventilation, the management of ARDS, prevention of ventilator-associated pneumonia and weaning from ventilation (including the use of sedation).

5. Referral pathways for patients with severe but potentially reversible acute hypoxaemic respiratory failure must be in place with Regional Extra-corporeal Membrane Oxygenation-capable (ECMO) Centres.

6. Units must have written guidelines on the indication, risks and practice of prone positioning in hypoxaemic respiratory failure.

7. Units must have immediate access to point-of-care testing to enable arterial blood gas analysis.

8. Standard operating procedures, including checklists, should be developed for intubation[2], extubation, bronchoscopy, prone positioning, tracheostomy and any high risk/invasive procedures.

9. Non-invasive ventilation must be considered and available for patients with acute hypercapnic respiratory failure[3].

10. High flow nasal oxygen must be available for the management of patients with acute hypoxaemic respiratory failure.

RECOMMENDATIONS

1. Tidal volume (ml/kg PBW), plateau airway pressures and cumulative fluid balance should be monitored and recorded daily in all patients requiring invasive ventilation.

2. Audit of compliance with ARDS, ventilator=associated pneumonia and weaning guidelines should be undertaken quarterly.

3. Units should have standardised systems to monitor VAP rates and antibiotic resistance patterns.

4. There is insufficient evidence at present to inform clinicians about the role of Extracorporeal Carbon Dioxide Removal ($ECCO_2R$) in acute hypoxaemic respiratory failure and ARDS. Patients should only receive $ECCO_2R$ within the governance framework set out in NICE Guidance[4].

BACKGROUND

This chapter incorporates the previous clinical chapter guidelines for acute respiratory failure and ventilator associated pneumonia. Standards are derived from areas where there is evidence that their use may reduce morbidity, mortality or resource use. Recommendations support the monitoring of key standards.

Critical care units must have sufficient access to equipment to provide invasive and non-invasive ventilation. Use of the expertise from Critical Care Scientists is beneficial in standardising the equipment specifications and provision of multidisciplinary staff training to ensure safe and effective equipment use. This may require escalation plans in the event of peaks of activity that may be seen in winter periods or at times of pandemic respiratory illness.

Pressure targeted, non-invasive ventilation is an effective treatment for acute hypercapnic respiratory failure[3]. Pressure targeted, non-invasive ventilation and/or high flow nasal cannula can also be effective in reducing the need for intubation and invasive ventilation in specific groups[5,6]. Evidence also supports its use following extubation in those at high risk of respiratory failure. It can be considered as an adjunct to aid weaning in those who fail a spontaneous breathing trial[7].

Studies show that patients with and at risk of ARDS benefit from ventilation strategies which limit exposure to airway pressures >30 cm H_2O and tidal volumes >6ml kg[1,8]. The joint FICM/ICS evidence-based guidelines for the management of ARDS summarise the optimal approach to managing such patients. The guidelines recommend the use of protective ventilation and prone positioning for at least 12 hours in adults with moderate and severe ARDS. Conservative fluid management, ECMO, neuromuscular blocking agents and higher PEEP strategies are also supported, while high frequency oscillation and inhaled vasodilators are not recommended.

Excessive use of sedation is associated with prolongation of the duration of artificial ventilation and other harmful sequalae, while under sedation may cause discomfort and tracheal tube intolerance. *The Intensive Care Society Review of Best Practice* provides contemporary guidelines on analgesia and sedation in critical care[9]. Protocolised strategies which seek to minimise exposure to sedation reduce duration of ICU stay and may reduce duration of ventilation[9]. It is difficult to control tidal

volumes in patients receiving spontaneous ventilation, and high tidal volumes in this setting might be associated with harm in injured lungs.

The time spent weaning occupies approximately 40% of the time that a patient receives invasive mechanical ventilation. Adoption of weaning protocols is associated with reduced duration of mechanical ventilation, weaning duration and ICU length of stay[10,11]. Joint guidelines from the American College of Chest Physicians/ American Thoracic Society provide contemporary guidance on best practices for weaning[10]. The guidelines promote the use of spontaneous breathing trials with inspiratory pressure augmentation, minimisation of sedation, use of non-invasive ventilation in patients at high risk of extubation failure, early mobilisation, weaning protocols and cuff leak test in patients at high risk of post extubation failure. Patients failing the cuff leak test but are otherwise ready for extubation may benefit from systemic steroids at least four hours before extubation.

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4.2 Weaning from Prolonged Mechanical Ventilation and Long-Term Home Ventilation Services

Authors: Michael Davies & Simon Baudouin

INTRODUCTION

A significant number of ventilated, critically ill patients will suffer from weaning delay, and a smaller number will become ventilator dependent. There is good evidence that a structured approach to the care of patients who require prolonged mechanical ventilation can improve outcome. This section makes recommendations and highlights clinical standards that are relevant to the care of critically ill patients who suffer delays in weaning and who may need input from specialist long-term ventilation services.

STANDARDS

1. Level 3 units must have access to a regional home ventilation and weaning unit. Arrangements must be in place to collaboratively manage patients with weaning difficulties and failure, including the transfer of some patients with complex weaning problems to the Regional Centre.

2. Units must hold multi-professional clinical governance meetings, including analysis of mortality and morbidity.

RECOMMENDATIONS

1. Patients with potential weaning problems should be identified at an early stage of admission. Most will have significant respiratory or neurological co-morbidities. Patients with slowly deteriorating neurological conditions are at particular risk of weaning failure.

2. Patients should be managed by a multi-professional intensive care team with specialist expertise and experience in managing patients with weaning problems and consisting of senior medical, nursing, physiotherapy, speech and language therapy, and dietitian members[1-2].

3. These patients should be managed in a consistent manner by the use of structured weaning plans, including sedation management, based on agreed protocols[3]. The majority of these patients will require a tracheostomy.

4. Early mobilisation and rehabilitation are likely to prevent weaning delay and failure. Units should have protocols in place and resources to provide these services as described in the section of this document on rehabilitation (Chapter 3.6).

5. The use of non-invasive ventilation (NIV) as a bridge to spontaneous breathing should be considered in selective groups. Resources and skill in NIV should be available in all units managing patients with prolonged ventilatory needs.

6. Early discussion with regional domiciliary ventilation services should occur in any patient with chronic neuromuscular impairment, and in those requiring more than 21 days of ventilation. Regional weaning centres should offer advice to referring units to assist with weaning [1].

7. The transfer of some patients with weaning delay and failure should be discussed with regional weaning/home-ventilation centres and protocols should be in place to aid these decisions[1].

BACKGROUND

The majority of patients requiring invasive ventilatory support in intensive care rapidly wean from ventilation. However, a small, but significant, proportion fail to wean and remain ventilator-dependent for a prolonged period. A UK survey showed that 12% of patients will suffer from weaning failure, as defined by the need for more than 28 days of ventilatory support despite the stability of other organ systems[4]. These patients have higher mortality and occupy a disproportionate number of intensive care bed days, leading to increased healthcare costs[5-6].

An international consensus document concluded that standard critical care units may lack the structure and focus to manage patients with weaning failure[7]. A range of organisational models exist, though international data via meta-analysis[8] show superiority for specialised weaning units, the recommended UK model of care. Data from such units emphasise the importance of expertise in the use of non-invasive ventilation (NIV) to facilitate weaning and long-term outcomes[9-10]. Home NIV is required for a significant proportion of patients who wean from prolonged invasive ventilation and are likely to be an important factor in the improved long-term survival seen for patients in UK series[9-10], in comparison to international data[8].

However, a specialised weaning unit is only part of the continuum of care for patients with weaning failure and a network approach is encouraged. Key to successful patient outcomes is to ensure that all components of care are optimal. Patients at risk of weaning failure should be identified as soon as possible following admission to intensive care. Early mobilisation and rehabilitation, optimal sedation management, and structured weaning plans in critical care improve the rate and timing of weaning from ventilation. In the event of weaning failure, discussion and transfer to a specialised weaning unit will enable the patient to wean to an appropriate level of respiratory support. Patients who then require long-term respiratory support at home should be managed by specialist regional home-ventilation teams. In the UK, these are typically co-located with the specialised weaning unit, although regional services have evolved according to demand. An NHS England service specification for specialised weaning centres and home-ventilation services has been developed[1] and commissioning arrangements are currently under review.

The above recommendations are based on the principles given in the NICE interim methods guide for developing service guidance document, which states:

- Multi-professional teams make better decisions than individuals
- The configuration of services should optimise clinicians' ability to specialise by providing a sufficient volume of procedures/cases to manage.

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4.3 Renal Support

Authors: Marlies Ostermann & Lui G Forni

INTRODUCTION

Renal replacement therapy (RRT) is the key supportive therapy for patients with severe acute kidney injury (AKI)[1]. In the UK, the main types of acute RRT for critically ill patients are haemodialysis and haemofiltration, which may be provided continuously or intermittently. Prolonged intermittent techniques are gaining popularity and may be increasingly utilised. Acute peritoneal dialysis is rarely used in the adult setting.

STANDARDS

1. Critical care units must have the necessary facilities and expertise to provide acute RRT for patients with AKI on a 24/7 basis.

2. Patients receiving acute RRT, where the cause of AKI is unclear or where RRT will be needed on intensive care discharge, must be discussed with the local renal team as per the NICE guideline[2].

3. Patients receiving acute RRT must be cared for by a multi-professional team that is trained and experienced in delivering and monitoring RRT.

4. Acute RRT for patients with progressive or severe AKI must be started before the onset of life-threatening complications associated with renal dysfunction.

RECOMMENDATIONS

1. The decision to initiate RRT should be based on the condition and prognosis of the patient as a whole, and not on isolated urea or creatinine values as per Kidney Diseases Improving Global Outcomes (KDIGO) recommendations and the NICE guideline[1,2].

2. Where life-threatening complications of AKI occur, such as intractable hyperkalaemia, RRT should be started emergently unless a decision has been made not to escalate therapy[1,2].

3. Patients with end-stage renal failure who are not in a renal unit/dialysis centre and require urgent RRT may require critical care admission. In such cases, there should be close liaison with the regional renal service regarding transfer and vascular access.

4. Continuous and intermittent RRT should be considered as complementary therapies for AKI[1]. The choice of therapy should be based on patient status, expertise of the clinical staff and availability of machines.

5. The dose of RRT should be prescribed at the beginning of the RRT session. It should be reviewed daily and tailored to the needs of the patient[1].

6. The decision to use anticoagulation to maintain circuit patency and the choice of anticoagulant should be based on the potential risks and benefits in an individual patient, the expertise of the clinical team and the options available. KDIGO guidelines suggest using regional citrate anticoagulation for CRRT rather than heparin in patients who do not have contraindications for citrate[1].

7. Bicarbonate, rather than lactate should be used as a buffer in dialysate and replacement fluid for acute RRT[1].

8. Drug dosing may need adjusting whenever RRT is started or the RRT prescription is altered. Close collaboration with an intensive care pharmacist with suitable experience in AKI and the effects of RRT is essential.

9. Patients treated with acute RRT should receive standard enteral nutrition as long as there are no significant electrolyte abnormalities or fluid overload refractory to RRT[3].

10. When discharged from critical care, the accepting team and GP should be informed that the patient had received RRT for AKI while in intensive care so that appropriate follow-up arrangements can be made.

BACKGROUND

In patients without limitations in care, RRT should be started before the onset of any serious potentially life-threatening complications of AKI, although optimal timing still remains unclear. As suggested by the KDIGO and NICE guidelines, the decision to start RRT should be based on the overall clinical condition of the patient, rather than isolated laboratory values of urea or creatinine[1,2]. The benefits of RRT must be balanced against potential harm arising from treatment, including risks related to central venous access, infections and anticoagulation.

The choice of technique depends on availability, expertise of the clinical team and patient characteristics. Continuous RRT offers the theoretical advantage of improved haemodynamic tolerance due to the slower fluid removal and the absence of metabolic fluctuations and fluid shifts induced by rapid solute removal. Therefore, continuous RRT is often favoured in patients who are haemodynamically unstable or those with acute brain injury or acute cerebral oedema[1].

The dose of RRT should meet the patient's needs and take into account their acid-base status, electrolyte derangement and fluid balance. Randomised controlled trials have failed to demonstrate improved survival or recovery of renal function with higher delivered doses in stable patients with AKI[4,5]. In sepsis patients with AKI, very high delivered doses (>70ml/kg/hr) also failed to demonstrate benefit and resulted in increased complications; although methodological concerns remain regarding this study[6]. The KDIGO guideline currently recommends delivery of an effluent volume of 20– 25ml/kg/h for CRRT in AKI[1]. To achieve this in routine clinical practice, a higher target dose may have to be prescribed (i.e. 25-30mL/kg/h) to compensate for interruptions in treatment or downtime due to technical reasons. When using intermittent RRT, a Kt/V of 3.9 per week should be delivered. The dose should be prescribed at the beginning of the RRT session. It should be reviewed at least once a day and tailored to the individual; if the delivered dose of RRT does not meet the patient's needs, as directed by solute and volume control, it should be increased and vice versa.

The role of RRT as an adjunctive treatment for sepsis and removal of inflammatory mediators remains uncertain.

Choice of anticoagulation will depend on local practice. The KDIGO guideline recommends regional citrate anticoagulation for patients receiving CRRT, and unfractionated or low-molecular weight heparin for patients treated with intermittent RRT. However, it needs to be recognised that citrate anticoagulation requires training and expertise and, although gaining in popularity, is not available in all critical care units in the UK.

Drug clearance is affected by the mode and dose of RRT. It is therefore essential that prescription charts are reviewed and drug doses adjusted each time RRT is started or the prescription of RRT is altered. Intensive care pharmacists have an essential role in providing drug information for patients with AKI, suggesting alternative therapies and adjusting drug doses in response to changes in physiology and patient management.

Critically ill patients are often hypercatabolic with increased energy expenditure. The nutrition regimen for patients with AKI should provide adequate calories and protein to support the patient during their catabolic illness while the underlying illness is controlled or improved[3]. Patients treated with acute RRT should receive standard enteral nutrition as long as there are no significant electrolyte abnormalities or fluid overload refractory to RRT.

There is increasing evidence that patients who survive an episode of AKI are at increased risk of long-term health problems, including chronic kidney disease and premature mortality. The optimal after care is not known but they should be considered as high-risk patients[7].

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4.4 Gastrointestinal Support and Nutrition

Authors: Ella Terblanche & Hugh Montgomery

INTRODUCTION

Up to 55% of patients are malnourished on admission to critical care[1]. The number at nutritional risk subsequently rises due to a prevalent hypercatabolic state and barriers that impair adequate conventional oral intake. Adequate nutritional support is thus vital, and is safe when delivered either enterally (EN) or parenterally (PN)[2]. Defining the 'optimal dose' of nutrition support, however, remains contentious. An initial period of protocolised feeding (e.g. <72 hours), with subsequent individualising of intake in response to the changing metabolic demands, clinical condition and nutritional risk of each patient, is generally advocated[3]. A multi-professional approach is required and there should be a dietitian as part of the critical care multidisciplinary team (see Chapter 12 on dietetics for more detail).

STANDARDS

1. The type and position of nasogastric feeding tubes (NGTs) used for enteral feeding, hydration and/or drug administration, must comply with NHS Improvement guidelines[4].

2. Intensive care services must have a nutrition support guideline with institutional strategies to promote nutrition delivery and to overcome EN intolerance. It is suggested that it should include:
   a. Measures to minimise the risk of EN aspiration
   b. Criteria for the use of prokinetic medications
   c. Criteria for naso-jejunal feeding
   d. Criteria for use of parenteral nutrition
   e. Consistent times for stopping and restarting EN around anaesthetic, surgical or bedside procedures
   f. A protocol for initiation of nutrition without waiting for a dietitian's plan.

3. Intensive care services must have guidance in place relating to the identification of, and nutrition support for, those at risk of re-feeding syndrome.

4. Intensive care services must ensure that there is access to a range of parenteral nutrition bags which include vitamins, trace elements and minerals. A 'standard' bag of parenteral nutrition must be available within 24 hours.

5. Intensive care services must have access to a range of enteral nutrition products to include:
   a. Low electrolyte
   b. High protein
   c. Fluid restricted
   d. 'Tolerance' (semi-elemental).

RECOMMENDATIONS

1. Nutritional status and risk should be assessed on admission, and energy, protein and micronutrient needs determined by a critical care dietitian or clinician with appropriate specialist training or experience. Consideration should be given to recent changes in weight, food intake (quality and quantity) and absorption; causes of altered intake (e.g. appetite, swallow, obstruction, and nausea) and how and when these might change; and to the possibility of specific micronutrient deficiencies.

2. It is recommended that nutrition support (PN if EN is not possible) should be instigated within 48 hours in patients expected not to be on a full oral diet within three days.

3. Nutritional intake targets should be set and compared daily with actual intake. Deficits should be monitored and steps taken to remedy them.

4. Efforts need not be made to cover full energy targets with EN or PN until clinical stability has been achieved. Delivering a calorie load which exceeds energy expenditure appears harmful and should be avoided, whereas hypocaloric nutrition may be safe initially[5].

5. The energy content from certain drugs (e.g. Propofol, IV glucose and citrate anti-coagulation renal replacement therapy) should be accounted for to avoid overfeeding.

6. Feeding plans should be adjusted for those with a BMI > 30 kg/m^2 according to international guidelines[6].

7. Volume-based or 'catch up' feeding should be used to allow nursing staff to adjust the hourly infusion rate of EN to optimise delivery after interruptions.

8. There should be access to nasal bridles to secure NGTs in agitated patients and guidelines for their use and aftercare.

9. Nutrition support targets should be included in the rehabilitation of critically ill patients.

10. There should be bowel management guidelines which include:
    a. Regular monitoring and documentation of bowel habits (frequency & type)
    b. Minimising the use of drugs that can cause constipation or diarrhoea
    c. The need for rectal examinations and treating faecal loading/impaction
    d. When to use laxatives, enemas and suppositories
    e. Management of ileus.

BACKGROUND

International guidelines advocate EN support within 48 hours of ICU admission to help meet macro- and micronutrient requirements, maintain gut integrity, and to support the immune system and reduce the frequency of hospital-acquired infections[5,6] PN carries no greater short-term benefit or risk than EN if excessive energy delivery is avoided, and should be considered if EN fails or is inappropriate[2,7].

The nutritional state of every patient should be assessed with specific reference to requirements for additional micronutrient supplementation and avoidance of re-feeding syndrome. There is currently

no internationally recognised nutritional screening tool for use in critically ill patients. Expert consensus suggests the use of tools, such as the NUTRIC score, to help determine nutritional risk[6]. What constitutes optimal nutrition (and energy) support in the majority of patients is still under debate, and guidelines conflict. ESPEN[8] states that during the acute and initial phases of critical illness, an exogenous energy supply in excess of 20–25kcal/kg BW/day should be avoided, with 25–30 total kcal/ kg BW/day provided during recovery. The SCCM/ASPEN[6] guidelines suggest administering 25-30kcal/kg, with re-evaluation more than once a week. The latest guidance (from the ESICM)[5] advocates initially not meeting 'full' energy targets, suggests that provision in excess of actual energy expenditure appears harmful and should be avoided, and that hypocaloric EN may be safe. Energy requirements may in fact rise during the recovery phase but the different phases of critical illness remain poorly defined. Optimal protein requirements are hard to determine, with 1.2-2g protein/kg/day currently recommended[6]. There is no current international guidance for vitamin supplementation in intensive care and as such, routine use of supplemented vitamins (beyond those in standard EN/PN), in combination with minerals, is not recommended. However, supplementation may be considered on clinical grounds for those in whom measured levels are low, substantial losses are possible, or there are specific clinical features of deficiency[6].

The unpredictable nature of critical illness and its medical management frequently disrupts EN delivery, with an average of 62% of energy and 58% of protein targets being received[9]. Frequently cited reasons include fasting for procedures, loss of access and gastrointestinal (GI) dysfunction. The use of fasting guidelines can improve EN delivery[10], as can a volume-based feeding approach, which allows EN rates to be adjusted to mitigate deficits which have accrued[6].

GI dysfunction, related EN intolerance and poor EN delivery are associated with greater duration of mechanical ventilation and ICU stay, and increased mortality[11], although whether this association is causal remains undetermined. Available evidence calls into question the rationale for routine monitoring of gastric residual volume (GRV)[12]; indeed, the 2016 American Association of Enteral and Parenteral Nutrition/SCCM guidelines[6] advise against it (although some, particularly surgical patients and those with multi-organ failure, may benefit). The (more cautious) Canadian guidelines[13] suggest the use of a 250-500ml GRV, checked every four or eight hours. The evidence for whether to return or discard GRVs is not compelling either way, and therefore decisions should be made at a unit level.

Prokinetic agents (metoclopramide, erythromycin) significantly reduce feeding intolerance and the risk of developing high GRVs, and increase the success of post-pyloric feeding tube placement. However, the impact on other clinical outcomes such as pneumonia, mortality and ICU length of stay is unclear[14].

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4.5 Liver Support

Authors: Julia Wendon & Nick Murphy

INTRODUCTION

Liver failure is defined by the onset of hepatic encephalopathy, but is often preceded by biochemical and coagulation abnormalities suggestive of severe liver dysfunction. There are usually relevant clinical factors in the history enabling the clinician to distinguish four general groups:

1) Acute liver failure (ALF) – rapid cessation of normal liver function in a previously health individual often leading to encephalopathy and multiple organ failure within days or weeks[1].

2) Acute on chronic liver failure (AoCLF) – worsening liver dysfunction and organ failure in the setting of decompensated cirrhosis or acute alcoholic hepatitis[2].

3) Liver failure following liver resection often for liver metastasis or primary liver cancer.

4) Liver failure as part of a multi-system illness. Often seen in the setting of sepsis or low cardiac output states.

STANDARDS

1. Contact with regional liver and or liver transplant centre must be made early following admission to a critical care unit of a patient with liver failure. Advice about management, prognosis and possible transfer can be discussed.

2. Patients with ALF must be managed in a liver transplant centre if liver transplantation is clinically indicated.

RECOMMENDATIONS

1. Patients with liver failure plus any other organ dysfunction should be managed in a critical care environment. Attention should be made to cardiovascular support, rapid correction of actual or relative hypovolaemia, early renal and metabolic support.

2. Sepsis is very common in patients with liver failure and intravenous antibiotics should be prescribed in any patient with a suggestion of sepsis on admission to critical care. The choice of antibiotic will be driven by knowledge of local microbiological flora and resistance patterns.

3. The use of prophylactic blood products and other procoagulants products prior to interventions should be avoided. In general, patients with liver failure develop a balanced coagulation disorder. Both pro- and anti-coagulant protein production is reduced. Viscoelastic tests, such as thrombo-elastography or ROTEM, may help in management[3].

4. Patients with ALF should have access to plasma exchange therapies[4].

5. Patients with ALF should have access to techniques used to assess intracranial pressure and/or cerebral perfusion, with intracranial hypertension being a recognised complication in patients with ALF. Strategies to monitor and manage ICH should be available in centres managing this group.

6. Advice should be sought from a specialist hepatologist for help with diagnosis, specific therapies and prognosis.

7. Centres managing liver failure and liver trauma should have access to interventional radiologists.

8. Links should be made with regional centres providing transjugular intrahepatic portosystemic shunt (TIPSS) for patients with bleeding varices (AoCLF).

9. Units that manage patients with liver failure should have 24-hour access to both diagnostic and therapeutic upper GI endoscopy service.

10. Drug dosing may need adjusting in patients with liver failure. Close collaboration with an intensive care pharmacist with suitable experience in liver failure is essential.

BACKGROUND

Acute liver failure (ALF) is often used (incorrectly) as a generic term for liver dysfunction in the setting of critical illness. It is also used as a description of severe liver injury accompanied by organ failure seen in patients with chronic liver disease, more correctly termed acute on chronic liver failure (AoCLF). Liver dysfunction, when seen as part of a multi-system illness, such as septic or cardiogenic shock, is more correctly referred to as hypoxic or ischaemic hepatitis. These distinctions are important, as prognosis and management are different.

ALF is a rare syndrome. Its true incidence is unknown but appears to be less than one per million of the population. The commonest cause in the UK is paracetamol toxicity. Cerebral oedema resulting in raised intracranial pressure can occur in those with high-grade encephalopathy (GCS < 8) and associated risk factors. In addition to supportive care, there is limited evidence that plasma exchange may be of benefit early in the course of the syndrome. Liver transplantation is the only definitive treatment in a select group who fulfil poor prognostic criteria.

Changes in conscious level should always be viewed as a serious development; encephalopathy is the most likely cause but metabolic causes, especially hypoglycaemia, should be excluded. Early intubation for airway control and protection may be required, and almost always for transfer to another centre.

Pregnancy-related ALF presenting to the critical care unit is most likely to be HELP syndrome, pre-eclampsia, fatty liver of pregnancy or liver rupture. Management of this cohort of patients requires effective and close working between obstetric services, neonatology and intensive care. Coagulopathy is often associated with bleeding in this disease group.

AoCLF is common; it is frequently a terminal event in patients with chronic liver disease or alcoholic hepatitis. There is often a precipitant such as an upper GI bleed or infection, although none may be identified. The syndrome is characterised by worsening jaundice and encephalopathy with an increasing organ failure burden carrying a worse prognosis. Renal failure in this setting carries a high attributable mortality. Care is essentially supportive with a focus on managing any precipitant and treatment of sepsis. Bleeding from oesophageal varices is a common precipitant of AoCLF. In this

specific group of patients, outcomes can be good, given early admission to intensive care for supportive therapy, airway protection, and endoscopic control of bleeding.

Management of liver dysfunction in the setting of a multi-system disease is a broad area perhaps best described as 'liver failure in the critically ill'. Systemic infections and other inflammatory processes can precipitate severe liver dysfunction. Malignant infiltration from lymphomas or overwhelming liver metastasis can sometimes present with liver failure. The list of other potential causes is long

A cohort of patients present with signs and symptoms of liver failure due to a low cardiac output state and present as hypoxic hepatitis; their management will require focus on improved cardiac parameters recognising the liver as a secondary event. Heat stroke can present in a similar manner, but this time metabolic demand can exceed supply.

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4.6 Cardiovascular Support

Authors: Simon Gardner & Alain Vuylsteke

INTRODUCTION

Cardiovascular dysfunction is the commonest reason for admission to UK critical care units, and basic cardiovascular support is the commonest organ support delivered. Advanced cardiovascular support is the fourth most common organ support provided[1].

While the requirement for cardiovascular support does not always indicate a primary cardiac dysfunction, critical illness frequently has a deleterious effect on both myocardial contractility[2] and cardiac rhythm[3].

The provision of cardiac ultrasound is fundamental to the diagnosis of many heart diseases.

STANDARDS

1. Electrocardiography, chest X-Ray and transthoracic echocardiography must be available at all times at the patient's bedside[4].

2. A consultant cardiologist must be available at all times either locally or through a formal network[4].

3. Adults with acute heart failure must be reviewed within 24 hours of admission by a dedicated specialist heart failure team (or equivalent), and their management should follow the guidelines detailed in the NICE Quality Standards[5].

4. Protocols for immediate transfer to a facility able to provide percutaneous revascularisation of patients presenting a myocardial infarction must be in place[6].

5. The intensive care team must facilitate the implementation of national standards, guidelines and pathways pertaining to the patients with a cardiac disease, to be delivered in addition to the other organ support being provided.

6. The advanced management of patients with acute valvular insufficiency or acute heart failure secondary to valve disease must be guided in consultation with a local cardiologist and the specialist cardiothoracic surgical unit[7].

RECOMMENDATIONS

1. A validated method for advanced haemodynamic assessment with a skilled operator in both the practical use of the device and interpreting the data it provides should be available at all times[8].

2. An intra-aortic balloon pump should be available (in consultation with local/regional cardiology team). This may require transfer to another centre.

3. Local protocols in the use of vasoactive drugs should be in place, although there is little evidence to support the use of any single agent in practice.

BACKGROUND

For all patients in whom clinically significant cardiac dysfunction is either diagnosed or suspected, it is essential that the intensive care team operates in close liaison with the cardiology team, irrespective of the initial admitting specialty.

Acute heart failure (AHF), whether de-novo or acute on chronic, remains a common condition associated with a high morbidity and high mortality, despite optimal therapy. The diagnosis of AHF is challenging due to similarities between symptoms of AHF and other conditions such as chronic obstructive pulmonary disease (COPD), pneumonia, and sepsis.

The incidence of arrhythmia in intensive care patients is virtually identical in surgical, medical, and cardiothoracic critical care units. Atrial fibrillation is the most common arrhythmia in critical illness, either as new onset (NOAF) or as a continuation of existing AF. There is a lack of high-quality evidence to guide the management of critically ill patients with AF.

The decision to measure cardiac output (CO) represents a balance between the risks involved with the measurement process, and the potential benefits gained from the additional haemodynamic information. Recent developments in CO monitoring devices focus more on tissue perfusion and microcirculatory flow and are aimed more at markers that indicate the effectiveness of microcirculatory resuscitation. The pulmonary artery flotation catheter remains the gold standard and the technique against which other methods of haemodynamic monitoring are compared.

All intensive care patients are at risk of myocardial injury from a variety of sources. Immediate cardiac angiography may be difficult to arrange or may be challenging in an unstable patient. The relationship between underlying coronary artery disease and Myocardial Ischemia, however, is less secure in the ICU setting than in a general population.

The awareness of valvular heart disease in the critical care setting has evolved substantially over recent years with the increasing availability of echocardiography. A delay in recognising the presence of significant valve dysfunction occurs frequently.

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4.7 Echocardiography and Ultrasound

Authors: Marcus Peck, Ashley Miller & Nick Fletcher

INTRODUCTION

Intensive care ultrasound is quick, non-invasive and facilitates the acquisition of critical information when and where it is most needed. Such use of ultrasound is rapidly becoming an integral part of managing critically ill patients[1,2]. Neither cardiology nor radiology departments have the resources to meet this need, so intensive care clinicians are increasingly performing their own focused ultrasound examinations to guide clinical decision making[3]. This has many benefits, but it consumes critical care resources and constitutes a potential clinical risk. The following standards and recommendations ensure the safety and quality of critical care ultrasound and apply to any unit providing this service.

STANDARDS

1. The gold standard investigation is a comprehensive study, performed and reported by a fully trained clinical specialist[4].

2. A more limited study, focusing on a specific clinical question, is appropriate in many instances. This must be performed by a trained and competent practitioner[5,6].

3. Individuals who scan and report independently must be trained to a level that is appropriate for their clinical practice[2,4-6].

4. The service must have a nominated lead consultant with dedicated time in their job plan that is sufficient to reflect the demands of the service and associated governance processes.

5. Ultrasound equipment must be readily available, serviced regularly and up to date. There must be sufficient equipment to ensure immediate access for ultrasound guided vascular access at all times. Linear, curvilinear and phased array probes are required to provide a comprehensive ultrasound service.

6. Infection control measures must be adhered to at all times.

7. The disinfection and storage of transoesophageal echocardiography probes must follow national guidelines. A record must be retained in order to identify and track patients after device usage in the event of future complication/infection[7].

8. All images must be securely stored for quality assurance purposes with appropriate data governance. Reliance on the ultrasound machine storage capacity is not a secure method.

9. Whenever scans are performed to inform clinical decision making, a structured report must be generated and stored in the patient record[4].

10. Training scan reports must not be stored in the patient record unless someone suitably trained verifies the document first.

11. Quality improvement, audit, and peer review activity must occur regularly.

12. Transoesophageal echocardiography (TOE) must be immediately available in all cardiothoracic critical care units and those units providing extra-corporeal circulatory support[8].

RECOMMENDATIONS

1. All critical care units should be able to ensure the provision of point-of-care ultrasound[4,5,6].

2. The service should be supported by a fully trained link-person within the cardiology and radiology departments, as appropriate.

3. Individuals who participate should regularly attend their institutional ultrasound meetings.

4. Individuals who scan and report independently should keep a personal logbook of their images and reports[4,5,6].

5. Individuals should not report scans beyond their level of accreditation, but should participate in a training programme, leading to more advanced accreditation[2,4].

6. Images and reports should be uploaded together to the same archive used by the host institution's cardiology or radiology department, as appropriate. Reports should identify the focused nature of the investigation and the clinical context. Scans undertaken as part of training should not be archived before they have been verified by a trainer.

7. Regional networks and electronic image transfer systems should be created to allow for prompt access to review scans by a specialist with Level 2 accreditation, or equivalent, when this is required.

8. Consideration should be given to the development of fully qualified physiologists with dedicated intensive care commitment and experience under joint supervision to deliver echocardiography services within intensive care.

9. Regular replacement of ultrasound equipment is required to ensure it remains up to date. Normal guidance states that electrical equipment is replaced every seven years, however ultrasound equipment may need to be updated more frequently to keep up with technological advances.

BACKGROUND

Focused ultrasound refers to imaging of organs by clinicians intending to rule in or out gross pathology by answering specific, dichotomous questions. This is done at the bedside as an extension of the clinical examination, rather than in the radiology department. It may encompass whole-body assessment, including cardiac, lung, abdominal, and vascular ultrasound, among others.

Ultrasound has been shown to be superior to physical examination and chest radiography in detecting life-threatening causes of shock and acute respiratory failure[9]. Diagnoses such as ventricular failure, pericardial tamponade, hypovolaemia, pulmonary embolism, pulmonary oedema, pneumothorax, and intra-abdominal bleeding (to name but a few) can be quickly detected by a

competent practitioner[10,11]. It consistently improves diagnostic accuracy, impacts on immediate management, and guides ongoing therapy. There is also accumulating evidence that elements of advanced echocardiography and lung ultrasound can predict important prognostic information, such as survival and weaning from the ventilator.

In the unstable critically ill patient, haemodynamic data are recorded from many monitoring devices. Echocardiographic data, particularly Doppler derived, can complement this information and add valuable diagnostic and pathophysiological insights. TOE may be of particular value in patients with poor windows for transthoracic imaging, trauma, patients following cardiac surgery, and those receiving mechanical circulatory support.

Ultrasound practitioners are not (usually) cardiologists or radiologists, but can achieve suitable levels of competence with appropriate training. Ultrasound competence is often described conceptually as having a pyramidal structure, with emergency or Level 1 (basic accreditation) at the base, Level 2 (fully accredited) in the middle, and Level 3 (imaging expert) at the apex.

Various competency-based ultrasound training and accreditation systems exist in the UK, notably the Intensive Care Society's CUSIC (Core Ultrasound in Intensive Care) and FICE (Focused Intensive Care Echocardiography), and more recently the British Society of Echocardiography (BSE)'s Level 1, which extends the cardiac skillset a little further. Advanced (Level 2) accreditation is also achievable with the BSE's ACCE (Advanced Critical Care Echo) accreditation, and the European Society of Intensive Care Medicine's EDEC (European Diploma in Echocardiography for Critical Care). It is anticipated that, in time, basic ultrasound competence will form part of the Intensive Care Medicine curriculum.

Knowing how to acquire, interpret and integrate images into clinical practice represents only the beginning of the learning process. To be a safe and effective ultrasound provider, and to develop new skills, one must be surrounded by the right framework of support and governance. This includes expert supervision, regular self-reflection, and participation in local quality assurance processes.

There are significant resource implications to consider in the provision of ultrasound and echocardiography within critical care units. Ultimately, this service may be delivered by practitioners internal and external to the critical care multidisciplinary team, and a variety of different models may develop according to local needs and resources.

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4.8 Neurological Support

Authors: Elfyn Thomas & Ronan O'Leary

INTRODUCTION

Despite the progress towards centralisation of specialist stroke, trauma, and other acute neurological emergencies, a substantial number of patients with acute brain and spinal cord pathology present, and are managed at, non-specialist centres. This includes patients who have sustained an out of hospital cardiac arrest and those with neuro-infective and neuro-inflammatory disorders.

Occasionally, neurological monitoring and support will be provided for patients within non-neurological specialist units, such as encephalopathic liver patients.

This chapter should be read in conjunction with, and complements the standards and recommendations made in, the neurocritical care chapter (Chapter 2.5).

STANDARDS

1. Adult patients with refractory convulsive status epilepticus must be admitted to critical care and have EEG monitoring established; the primary endpoint of treatment being the suppression of epileptic activity on EEG[1].

2. Adults who are unconscious after (out of hospital) cardiac arrest caused by suspected acute ST segment elevation myocardial infarction must be considered for coronary angiography with follow-on primary percutaneous coronary intervention if indicated[2].

3. Following traumatic spinal cord injury, a specialist neurosurgical or spinal surgeon at the major trauma centre or trauma unit must contact the linked spinal cord injury centre consultant within four hours of diagnosis to establish a partnership of care[3].

4. Previously fit adults, admitted to critical care following a primary intracerebral haemorrhage, must be referred to specialist neurosurgical centres for consideration of surgical evacuation[4].

5. Adults under the age of 60 with middle cerebral artery infarction admitted to intensive must have access to a decompressive craniectomy service at a specialist neurosciences centre[4].

6. Declaration of death by neurological criteria must be conducted as per the Academy of Medical Royal College's Code of Practice[5].

7. Prognostication in hypoxic-ischaemic brain injury after resuscitation from cardiac arrest must follow professional guidance such as the European Advisory Statement on Neurological Prognostication in comatose survivors of cardiac arrest[6].

RECOMMENDATIONS

1. Protocols should be available to deliver post-resuscitation care to comatose survivors following cardiac arrest as per the Resuscitation Council (UK) guidelines[7].
2. The management of traumatic brain injury should follow national and international best practice guidance[8,9].
3. Management of patients with prolonged disorders of consciousness should follow national guidance[10].
4. Patients with perceived devastating brain injury should be admitted to the critical care unit to aid prognostication as per national guidance[11].
5. Intracerebral haemorrhage should be managed in accordance with international guidance with particular attention to the reversal of anticoagulation and acute control of blood pressure[12].
6. The management of suspected viral encephalitis or acute meningitis in adults should follow national guidance[13,14].
7. The management of patients with ventilatory insufficiency due to neuromuscular disease should follow BTS/ICS guidelines[15].
8. The management of decompensated acute inflammatory neuropathy should follow best practice guidance[16].
9. Autoimmune encephalitis should be suspected and investigated in all adults presenting with the internationally described criteria proposed to identify this disease [17].
10. Adults admitted with an acute neurological problem should have access to daily consultation or advice from neurology specialists, if necessary by telemedicine[18].
11. Critical care units caring for patients with neurological pathology should have agreed venous thromboembolism (VTE) policies that balance the risk of recurrent haemorrhage with the need to provide prophylaxis against VTE.
12. Fever control to normothermia following traumatic brain injury, aneurysmal subarachnoid haemorrhage, ischaemic stroke, or haemorrhagic stroke may improve outcome.
13. Appropriate patients with acute ischaemic stroke should be referred for mechanical thrombectomy in accordance with the latest NICE guidance[4] and national commissioning policy[19].

BACKGROUND

This chapter recognises that many patients requiring either neurological support, or prognostic discussion following severe neurological injury, are managed within non-neurosciences centres. Sometimes these cases will be patients awaiting transfer to a neuroscience or major trauma centre, but many will also be patients with diseases that are appropriately managed in non-specialist units, occasionally due to perceived medical futility.

While there is inevitable overlap with the chapter on specialist neurocritical care, there are many areas where expert general intensive care can improve outcome for patients with acute neurological illness, or can facilitate evidence-based prognosis and end of life decision making. This is perhaps best exemplified in the care following out of hospital cardiac arrest (OOHCA), which now represents over 12% of all intensive care admissions and has internationally accepted guidelines and prognostic frameworks[6,7,20]. Guidance is likely to be refined further as the results from trials such as TTM2 (Targeted Hypothermia versus Targeted Normothermia after Out-of-hospital Cardiac Arrest 2) (http://ttm2trial.org/) emerge.

Moreover, there is immense scope for well-conducted Intensive Care Medicine to improve the outcome of diseases which were previously viewed as being associated with a bleak conclusion.

These include ischaemic stroke, especially lesions amenable to thrombectomy, and autoimmune encephalitis, where there is now genuine concern that the unrecognised burden of disease is substantial.

Finally, as with much of Intensive Care Medicine, thoughtful, comprehensive policies can improve both care and outcome of patients with neurological critical illness. Units are encouraged to develop policies that encompass a wide range of neurological critical illness where there are common treatment modalities. For example, a broad approach to VTE prophylaxis developed in conjunction with colleagues in other specialities will lead to less ad hoc therapy and unnecessary variation in care, arguably improving morbidity and mortality.

Given both the complexity and rarity of many of these conditions, critical care networks are encouraged to agree ramifying, regional policies for the assessment and transfer of critically ill patients with neurological illness.

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4.9 Burns

Authors: Joanne Bowes & Tushar Mahambrey

INTRODUCTION

Approximately 140,000 patients sustain burn injuries each year, with approximately 7,000 adults requiring admission to hospital. However, the number of patients requiring intensive care is very small, even major trauma centres may see only one such patient per year. Patients therefore require transfer to specialist burn care providers which are burn facilities, burn units and burn centres[1], with burn centres providing care for the most severely injured patients. UK burn critical care services are provided in three models: specialised burn-only critical care; general intensive care with input from the burn team; and finally burn team care with visiting consultants in Intensive Care Medicine[2].

The following standards and recommendations apply to all adult burn patients receiving critical care.

STANDARDS

1. Staffing models must promote joint care between burn and critical care teams as this may improve safety[3] and confer a significant survival benefit[2].

2. A burns theatre must be located in immediate proximity (preferably within 50 metres) to any service providing critical care for burn injured patients[4].

3. Burn injured patients who require critical care must be managed by consultants in Intensive Care Medicine who have an appropriate level of training in this field and have acquired and maintain the relevant knowledge and skills needed to care for these patients[4].

4. Burn injured patients must be cared for in an appropriate service as determined by the National Burn Care Referral Guidance[1].

5. Transfer of critically ill burn patients between services must comply with Intensive Care Society guidelines[5].

RECOMMENDATIONS

1. All burns over 20% total body surface area (TBSA) should have access to thermally controlled single-bedded cubicles[4].

2. Fibre-optic bronchoscopy should be used to assess inhalation injury[6].

3. Services providing centre level care should be co-located with a major trauma centre[4]. Where this is not the case, mechanisms for ensuring appropriate integration with trauma centre care should be in place.

4. In specialist centres, clinical guidelines should include:
   a. Fluid resuscitation and management of associated complications[4].

b. Assessment and management of burns to the face and airway[4].
c. Management of smoke inhalation injury and its sequelae, including carbon monoxide and cyanide poisoning.
d. Recognition and management of the acutely unwell and deteriorating burn injured patient, including burn specific criteria for the diagnosis of sepsis[4].
e. Management of hypothermia and hyperpyrexia.
f. Management of burn wound infections including antimicrobial stewardship[4].
g. Nutritional assessment[4].
h. Rehabilitation[4].

These guidelines should be subject to periodic review and update.

5. The implementation of end of life care as a result of burn injury should only be made following assessment by at least two consultants, one of whom should be a specialised burn care surgeon[7].

6. There should be a nominated lead consultant for burns, who participates in network and national morbidity and mortality audit meetings[4].

BACKGROUND

In a change from version 1 of the GPICS document, these recommendations focus on the intensive care service provision for burn injured patients rather than their clinical management. Key differences and strengthened points are expanded below:

Hypothermia has a profoundly adverse effect on burn patients, who are particularly vulnerable during initial assessment and resuscitation. Strategies to vigorously prevent this, including provision of a thermoneutral environment, should be used. In addition, despite advances in resuscitation, wound coverage and infection control, thermally injured patients remain at risk of significant morbidity and mortality secondary to complex metabolic changes following the initial injury. This hypermetabolic state is characterised by hyperpyrexia, proteolysis, glycolysis and lipolysis. Again, one of simplest methods to reduce this hypermetabolic response is to increase the ambient temperature[8] using a thermally controlled cubicle.

Infection is a significant cause of mortality in major burns. Diagnosis of sepsis is difficult because a systemic inflammatory response induced by the burn is a normal finding. Methods of protecting patients from infection include primary excision and skin grafting, regular aseptic dressing changes and isolation of the patient in a single-bedded cubicle[9].

The latest data would suggest that the 50% mortality (LD50) for burns based on total body surface area (TBSA) affected is currently 90% for young patients. To achieve these outstanding outcomes, care should be provided by a fully integrated multidisciplinary team, with daily multidisciplinary ward rounds[2].

Transfer of patients between services may involve considerable distances due to the relatively small number of burn critical care beds in the UK. Services should ensure that consideration is given to provision of adequate drugs, fluids, oxygen and warming devices for lengthier transfers.

With respect to the above recommendations, directly applicable clinical studies are few and far between, in part due to the relatively small numbers of patients with significant burn injuries who present in more affluent countries. Multi-centre trials should be encouraged.

Further detailed recommendations on the management of burn injured patients can be found in the 2018 document produced by the British Burn Association: Burn Care Standards and Outcomes[4]

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4.10 Care of the Critically Ill Pregnant (or Recently Pregnant) Woman

Authors: Audrey Quinn & Laura Vincent

INTRODUCTION

This chapter summarises the key standards and recommendations relating to the management of the critically ill pregnant (or recently pregnant) woman admitted to a critical care unit published in the intercollegiate guidelines: Care of the Critically Ill woman in Childbirth; Enhanced Maternal Care 2018[1]. Recently pregnant is defined as a woman within 42 days of having given birth[1].

Enhanced maternal care (EMC), is driven by a set of competencies deemed essential for those caring for sick mothers, both peri- and post-partum. The aim is to guarantee a unified approach and the highest standard of care for critically ill women, wherever they are located in hospital. In addition to a chapter dedicated to 'Care of the Acutely Ill Woman in the General ICU', the guidelines include optimising team-working (locally and regionally), education and training, and implementing standardised obstetric Early Warning Scores (ObsEWS).

STANDARDS

1. Any critical care unit that admits antenatal women over 20 weeks' gestation must have rapid access to obstetric and paediatric services able to attend in an emergency. There must be a clear plan and equipment immediately available for performing a peri-mortem caesarean section in the event of maternal cardiac arrest, with appropriate neonatal resuscitation equipment.
2. An obstetric team (normally a consultant obstetrician, a consultant obstetric anaesthetist and a midwife) must review all pregnant women admitted to critical care at least once in every twenty-four hour period.
3. In antenatal ICU admissions, when fetal viability is a possibility, a health care professional trained in neonatal resuscitation must be available within 10 minutes and a senior neonatologist or paediatrician must be able to attend within 30 minutes.
4. All critical care units that admit pregnant or recently pregnant women must have a named lead clinician for maternal critical care (MCC). The main function of this role is to be the point of liaison between critical care and obstetric services (including obstetric anaesthesia).
5. Breast feeding (including the use of breast pumps) must be encouraged and supported in all post-natal women admitted to critical care.
6. Women who require care that falls outside EMC must be referred as soon as possible to the general critical care service. The route of escalation to critical care services must be clearly defined.
7. Critical care outreach or equivalent must be available and provide clinical support and education into EMC.
8. Critically ill pregnant or recently pregnant women who undergo intra- or inter-facility transfer must be transferred in accordance with standards equivalent to the FICM/ICS guidance *for the transfer of the critically ill adult.*

RECOMMENDATIONS

1. Level 3 antenatal ICU admissions and post-natal admissions that are anticipated to last more than 48 hours should be considered for transfer to a regional or supra-regional critical care unit with experience in MCC.
2. Physical contact between a mother and her baby should be maintained during post-natal critical illness, even if the mother is unconscious. This contact and other events of the admission should be recorded in a critical care diary which can be used in psychological rehabilitation after critical care or in bereavement counseling.
3. All women admitted to critical care should be offered an appointment in a critical care follow-up clinic or a post-natal review, which includes input from a clinician with experience in critical care follow-up.
4. Recognition of EMC should be incorporated into midwifery pre & post registration curricula and feature in obstetric, anaesthetic and critical care training programmes.
5. Healthcare professionals looking after critically ill women should undergo regular, cross-specialty, multidisciplinary team training, to encourage sharing of knowledge and skills and to promote teamwork and effective communication.
6. Simulation-based learning should be considered to assist healthcare professionals to develop the technical and non-technical skills for EMC.
7. Critical care networks should consider nominating specific units as the nominated regional or supra-regional unit for MCC.
8. Obstetric units delivering EMC or level 2 critical care should be members of a regional MCC network which itself should have a formal relationship with the local Critical Care Operational Delivery Network and Strategic Clinical Networks.
9. MCC quality indicators should be monitored, using data reported through the ICNARC Case Mix Programme and the Scottish Intensive Care Society Audit Group and used to improve local performance.

BACKGROUND

The UK maternal mortality rate is one of the lowest in the world, yet with rising maternal age, rates of assisted conception and rates of obesity, more women are becoming unwell around the time of childbirth. From ICNARC data[2] the majority of obstetric patients admitted to ICU were recently pregnant with the main reason for admission being massive obstetric haemorrhage, whereas respiratory failure predominated in 'currently pregnant' admissions. Overall, there were 2.4 critical care admissions per 1,000 maternities[2]. However, around 1 in 20 maternities have complications that require level 1 care or higher. These women should have immediate access to the same standard of critical care and outreach as non-obstetric patients but it may not be possible or suitable to transfer a mother with fetus or newborn to critical care for a variety of valid reasons. Consequently, expertise in the care of the sick mother is challenging.

Sick pregnant women may present in any location where healthcare is delivered and can decompensate rapidly. Failure to identify early signs of illness is a recurrent feature of cases of maternal death and serious morbidity. In 2007, development of a national obstetric EWS was a key recommendation from the confidential enquiry into maternal mortality, yet 10 years on, a variety of EWS are in use[3]. Increasing numbers of hospitals are using electronic EWS. This should extend to the obstetric population and the associated rapid response systems to deterioration should be incorporated into maternity units. It is also important that staff quickly recognise the sickest mothers to ensure they receive the best possible care especially in rare conditions, which may include transfer to specialist units for management such as ECMO.

A unified approach, collaboration and networking between all interested parties is essential, from clinicians, to policymakers and managers.

As specialisation occurs earlier in medical subspecialties, training in acute general medicine and critical care for maternity healthcare professionals is no longer routine. Midwives are predominantly 'direct entry' which means limited medical or surgical nursing exposure or training. Similarly, intensive care professionals are increasingly from non-anaesthetic backgrounds, with reduced exposure to complex maternity patients. There are well-established courses for obstetricians and midwives in dealing with severe obstetric complications, but few with critical care topics and input. While postgraduate curricula are evolving to address these issues, opportunities for peer-to-peer cross specialty training. should be embraced. This can be organised through local Maternal Critical Care networks. Working in silos should be a feature of the past, with the focus on standardisation of practice, training together to share skills and knowledge. Simulation based training promotes the inter-professional communication and non-technical skills which underpin effective multidisciplinary team-working.

A holistic approach to recovery and rehabilitation from critical illness is sadly lacking. We must acknowledge the additional psychological burden that these patients, their partners and extended families are carrying, particularly if the health of the fetus or baby is threatened. We must listen to patient's reflections of their critical care experiences, but also pre-empt the psychological support that would benefit them[4,5]. Contact between mother and baby where at all possible should be facilitated on ICU, for the benefit of both parties in the short and long-term.

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4.11 Care of the Critically Ill Child in an Adult Critical Care Unit

Authors: Sarah Mahoney & Peter-Marc Fortune

INTRODUCTION

The vast majority of critically ill children are managed in a paediatric intensive care unit (PICU), however there is often a period of stabilisation that is necessarily undertaken by colleagues from adult units prior to transfer. There are also occasions where it may be appropriate to admit critically ill children to some adult critical care units because of issues of capacity, transport availability or the patient's pathology. The 5th edition of the Paediatric Intensive Care Society (PICS) Quality Standards (2015) describes the expected standards for clinical staff and appropriate service provision for care of the critically ill child in an adult critical care unit[1]. This chapter highlights the key standards that should be met in order to provide best care possible in these exceptional occasions. There is an expectation that effective application of these standards will have a beneficial impact on both the quality of care and safety for patients.

STANDARDS

1. Critically ill children under 16 years old must only be admitted to and stay on an adult critical care unit if a PICU bed is unavailable, or when there is an expected short duration of critical care e.g. an older child with overdose or alcohol excess.

2. Admission must be discussed and agreed by the local consultant in Intensive Care Medicine, local consultant paediatrician and the consultant in paediatric Intensive Care Medicine (this may be the regional paediatric transport team consultant).

3. A nominated lead intensive care consultant and lead nurse in the adult critical care unit must be responsible for intensive care policies, procedures and training related to the care of children.

4. An adult critical care unit that may provide care for critically ill children must have an appropriately equipped area for providing paediatric critical care.

5. Medical staff with responsibility for the resuscitation and airway management of the critically ill child on an adult unit must have up-to-date competencies in advanced paediatric life support and advanced airway management. This medical cover may be provided by anaesthetists or consultants in Intensive Care Medicine according to local arrangements.

6. Protocols for resuscitation, stabilisation, accessing advice, maintenance and transfer of critically ill children and the provision of paediatric critical care must be available.

7. Escalation, end of life and organ donation decisions must be discussed in collaboration with the regional consultant in paediatric intensive care (this may be the regional paediatric transport team consultant), under a shared care and shared responsibility model.

8. There must be collaborative working between the adult critical care unit and the regional PICU to ensure that staff are supported to work outside their normal core competencies. There must be 24/7 access to paediatric medical and paediatric nursing advice.

9. A local consultant paediatrician and consultant in paediatric Intensive Care Medicine must be available for advice at all times.

10. There must be 24-hour access for parents/carers to visit their child.

RECOMMENDATIONS

1. A registered paediatric nurse should be available at all times to support the care of the child.

2. The child should be reviewed by a consultant paediatrician twice a day during their stay on the adult unit.

3. There should be access to specialist paediatric healthcare professional and pharmacy advice at all times.

BACKGROUND

Increasing demand on paediatric ICU and HDU beds led to an independent enquiry which concluded that there was inadequate paediatric intensive care service capacity across the UK[2]. In 1997, the *Framework for the Future* document was published which set out actions, including the establishment of specific lead centres providing PICU services, regional retrieval services to transfer children to these PICUs, standards of care for staffing, training and equipment, and standards of care and staffing for receiving hospitals without PICU facilities[3].It also discussed the continuation of specialised paediatric intensive care in single specialty environments, such as neurosurgery and cardiothoracic units.

Concerns were raised that centralisation of PICU would result in a loss of paediatric skills by clinicians in hospitals without PICU's. In response, the Tanner Report highlighted ways to retain experience and knowledge in relation to critically ill children[4]. It identified six generic skills expected of all personnel involved with the care of critically ill children:

1. To recognise the critically ill child
2. To initiate appropriate medical treatment
3. To act within a team
4. To maintain and enhance skills
5. To be aware of the issues of safeguarding children
6. To effectively communicate with children and carers.

Some centres have established arrangements whereby doctors and nurses from hospitals without PICUs are able to access updates in the tertiary centre in order to maintain their skills and competencies; these include simulation courses, APLS (Advanced Paediatric Life Support)/PLS (Paediatric Life Support) attendance, use of regular paediatric elective lists, audit and governance. Outreach teaching with feedback and case discussion facilitated by local paediatric transport services for local anaesthetic and paediatric teams should also be encouraged. Studies have been performed to assess the impact of paediatric retrieval teams upon skill retention amongst the local hospital team members and demonstrated that deskilling had not occurred in relation to core practical procedures[5]. Core training in paediatric intensive care competencies is now included in the Faculty of Intensive Care Medicine curriculum; this recognises that in the future, critically ill children

will continue to present at their local hospital and the multidisciplinary team will need the skills onsite for stabilisation and initial intensive care management.

All critical care staff may be required to provide occasional support for the resuscitation and even transfer of critically care children that present at centres without a PICU. The provisions above can provide and maintain a suitable skillset for these occasions and the regional network of paediatric retrieval services are set up to provide support[7].

Continuous audit is critical to the maintenance of safe standards and delivery of PICU. The PICANet national audit (picanet.org.uk) was established to develop and maintain a secure and confidential high quality clinical database of paediatric intensive care activity, in order to identify best clinical practice, monitor supply and demand, monitor and review outcomes of treatment episodes, facilitate healthcare planning, and quantify resource requirements. The core dataset of demographic and clinical data on all admissions, collated by PICANet, allows comparison of PICU activity at a local level with national benchmarks such as PIC standards. This dataset provides an important evidence base on outcomes, processes and structures that permits planning for future practice, audit and interventions. PICANet has also expanded its data collection to include the referral and transport of children who need paediatric intensive care. This enables us to compare and audit important aspects of care for these children.

At the time of writing, a national review of paediatric critical care services, led by NHS England, is in progress[8]. Currently, the focus of the review is to seek to (re)structure services so that a child and their family are able to access the best care possible, as close to their home as possible. It is also looking to ensure that this care is efficiently delivered, joined up, and both safe and sustainable. The implications of the review are likely to have greatest impact for children requiring lower acuity critical care such as those receiving non-invasive respiratory support, but it may also alter the model for those receiving low risk, more complex elective procedures. Although no formal report has currently been published, the indications are that the delivery of these changes will be through regional networks over the next few years.

In theory, although there has been to date no great paediatric surge pandemic, escalation care of a child on an adult ICU is possible but presents numerous challenges. Adult ICUs cannot guarantee 24/7 parental access, and paediatric consent and family rights are very different to those in an adult setting. Adult ICUs may require PICU support for contentious decisions, and robust structured mutual support arrangements should be in place to ensure delivery of both quality and safety of care for patients.

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4.12 Standardised Care of the Critically Ill Patient

Authors: Richard Innes & Andrew Ferguson

INTRODUCTION

The evidence base underpinning intensive care practice is improving and has enabled a degree of consensus on a number of elements of care, which are briefly presented in this chapter. In addition to trial data informing major areas of practice such as ventilation, there are multiple observational studies suggesting that adoption of a treatment 'bundle' approach leads to better outcomes, although randomised studies are currently lacking and would be difficult to perform[1,2].

All critical care units should have policies, guidelines and/or checklists to achieve the following minimum standards, and should consider their position in relation to the recommendations. However, while these are standards and recommendations that most patients will benefit from, there will be exceptional circumstances (e.g. severe asthma, unstable spinal injuries, and morbid obesity) in which these standards/recommendations are not applicable or are unachievable.

STANDARDS

1. Patients must be assessed daily for risk of thromboembolic disease and receive appropriate prophylaxis[3].

2. Patients undergoing controlled mechanical ventilation must receive tidal volumes based on predicted body weight (PBW). Patients with ARDS must receive a tidal volume of less than or equal to 6 ml/kg PBW.

3. Ventilated patients must have respiratory function evaluated daily and undergo spontaneous breathing trials where appropriate.

4. Sedation must be individualised to patient needs and the appropriateness of a sedation hold considered daily[4].

5. All patients must be assessed regularly for evidence of pain, with analgesia optimised to minimise sedation requirements.

6. All patients must be screened daily for evidence of delirium using a validated method such as the Confusion Assessment Method for the ICU (CAM-ICU) or the Intensive Care Delirium Screening Checklist (ICDSC).

7. Indwelling intravascular catheters must be inspected daily for evidence of infection using a suitable scoring system e.g. Visual Infusion Phlebitis Score (Jackson 1998) to guide necessity for removal.

8. The continued need for indwelling catheters (intravascular or urinary) must be considered daily.

9. Monitoring of invasively ventilated patients must include continuous waveform capnography.

10. Care bundles must be in place for Intubation Associated Pneumonia (IAP) prevention, Central Venous Catheter (CVC) insertion and maintenance, and Peripheral Venous Cannula (PVC) insertion and maintenance.

RECOMMENDATIONS

1. For patients without ARDS, a tidal volume of 4-8 mls/kg PBW and a peak/plateau pressure (depending on mode) of below 30 cmH_20 should be targeted.
2. A ventilated patient care bundle should be in place with appropriate mechanisms for ensuring adherence.
3. Ventilated patients should receive H_2 receptor blockade (e.g. ranitidine) or a proton pump inhibitor for gastric protection until established on full enteral nutrition.
4. Unless clinically contra-indicated, ventilated patients should be nursed in a semi-recumbent position at 30 to 45 degrees.
5. Where there is no contraindication, enteral nutrition (EN) should be initiated within 48 hours after admission to the ICU[5].
6. When EN is not feasible or insufficient, parenteral nutrition should be started as soon as possible in patients with (or at high risk of) malnutrition, (which maybe a combination of cachexia (disease related) and malnutrition (inadequate consumption of nutrients).
7. All sedated patients should have sedation levels monitored hourly using a scoring system such as the Riker Sedation–Agitation Scale or the Richmond Agitation–Sedation Scale to ensure sedation is minimised.
8. Noise levels and patient interventions should be minimised overnight to facilitate natural sleep.
9. A transfusion threshold of 70g/L should be used in general intensive care patients. A higher target Hb may be beneficial in patients with sepsis (in the first six hours), ischaemic stroke, traumatic brain injury with cerebral ischaemia, or acute coronary syndromes[6]
10. Critical care units should consider standardisation of drug concentrations in line with FICM/ICS guidance.

BACKGROUND

The bundled approach to clinical care is considered effective in improving clinical outcomes. The underlying premise is that by ensuring adherence across multiple logical elements of care, outcomes for patients can be improved. Pronovost et al[7]. described this during implementation of a central line bundle in hospitals across Michigan, demonstrating a large reduction in infection rates (up to 66 %) during the study period of 18 months.

The most widely adopted bundle of care is the so-called Ventilator or VAP bundle as advocated by the Institute for Healthcare Improvement (IHI)[8]. Many hospitals have reported dramatic reductions in ventilator associated pneumonia rates (VAP) using this approach. However, VAP is a subjective outcome and lower VAP rates after implementing a bundle may partly reflect stricter application of subjective VAP criteria. Notably, most studies that have reported lower VAP rates after implementing a bundle have not reported parallel decreases in mortality, though it is likely they will reduce length of mechanical ventilation[1,2].

Some interventions beyond the IHI ventilator bundle might bring additional benefit to ventilated patients, such as low tidal volume ventilation, sedation minimisation, conservative fluid management, and early mobilisation. Thus, care bundles are an evolving entity, and new and better care bundles that integrate these promising new processes are needed.

It is important that care bundles are subjected to the same scientific rigour as traditional interventions, and to date this approach is lacking. Much data is observational in nature with varied study methodology and this makes comparison difficult. Some interventions which are initially thought to be helpful (e.g. chlorhexidine mouth washes for ventilated patients) may subsequently be shown to be harmful or of no benefit[9] Others, such as the use of drugs for gastric protection, have benefits (reduced bleeding) but also harm (higher rates of VAP), and so all components need to be implemented with some reference to the clinical context to ensure, where possible, benefit outweighs harm[1,2].

When implementing standards of care, the IHI recommends achieving reliability of > 95% . The three most frequently used strategies to achieve this are: education; reminders (such as checklists); and audit/feedback. The increasing use of electronic health records within intensive care may facilitate both development of new bundles and adherence to existing ones.

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Section Five

Critical Care Services: Additional Key Components

5.1 Research and Development

Authors: Timothy Walsh & Paul Dark

INTRODUCTION

Intensive care is a relatively young specialty. Observational research clearly demonstrates the high costs associated with critical illness during acute hospital stay, but also over time horizons extending many years after acute hospital discharge. In addition, quality of life is reduced, and patients have excess mortality compared to age/gender matched general population subjects. The National Institute for Health and Care Excellence (NICE) makes recommendations to implement and fund new treatments and interventions based on cost-effectiveness from the NHS perspective. Alongside NHS's commitment to deliver continual improvements, these factors make participation in Research and Development (R&D) activities of vital importance to UK intensive care and the patients it serves.

STANDARDS

1. All individuals participating in R&D activity must have completed Good Clinical Practice (GCP) training for research and keep this up to date.

RECOMMENDATIONS

1. Critical care units should nominate a lead for R&D activities who should coordinate activity and ensure it is carried out to UK Policy Framework for Research standards[1].
2. Critical care units should participate in research networks, which are organised at Local Clinical Research Network (LCRN) level through the regional National Institute of Healthcare Research (NIHR) Critical Care research network lead[2].
3. All research studies should be registered on the UK Critical Care Research Portfolio whenever they fulfil eligibility criteria[3].
4. Critical care units participating in research should provide information to patients, relatives, and surrogate decision-makers (SDMs) about ongoing research, for example through posters, leaflets, or within generic intensive care information resources.
5. Critical care units participating in research should have clear procedures for approaching patients, families and SDMs in a manner that minimises stress, but provides adequate information in a timely manner.
6. Critical care units participating in multiple research studies should have clear co-enrolment policies based on the UK co-enrolment guideline[4].

BACKGROUND

R&D is the mechanism by which new knowledge is acquired to develop new treatments, therapies and services, and to provide evidence that these are clinically and cost effective. High-quality evidence is needed to justify widespread adoption, and to ensure all NHS patients can benefit from new therapies.

The NHS is committed to supporting R&D activity. All patients have the right to participate in this activity, even when they are critically ill. The NIHR is the national organisation that oversees research funding, governance and delivery in the NHS[5]. In the UK, ethical and R&D approvals are managed through the NHS Health Research Authority's national gateway (Integrated Research Application System: IRAS)[6].

National Institute for Health Research (NIHR) organisation

The NIHR supports a Critical Care Research Network (CRN: Critical Care2). To organise delivery of clinical research, England is divided into 15 Local Clinical Research Networks (LCRNs), which have distinct geographical boundaries and a lead organisation. Each LCRN receives government funding to support research delivery within its hospitals and healthcare organisations, for example, through research nurses, pharmacy, and research time within job plans. For intensive care, each LCRN has a research lead, whose remit is to promote and coordinate a local research network. A nationally agreed target is for 80% of critical care units to be participating in R&D activity; each LCRN has a target that 80% of its critical care units participate in research. Devolved nations have different structures and funding organisations. LCRN intensive care leads meet regularly (four times per year) as a National Specialty Group (NSG) to coordinate and develop national clinical research activity and manage the UK Critical Care Research Portfolio.

Critical Care Research Portfolio

Research funded competitively by 'eligible' funding organisations, 'adopted' commercial research, and other 'adopted' research (for example international trials) comprise the UK research portfolio. Eligibility criteria and adoption processes have been refreshed recently[7], and the portfolio of current studies is accessible publically[8]. Intensive care studies are regularly reviewed to ensure support and delivery to 'time-and-target' by the national and local networks. Studies on the UK research portfolio are eligible for local support (for example, by research nurses) through LCRNs, and are the priority for NIHR.

Funding R&D activity

Funding for research studies in the NHS is divided into NHS support costs, direct research costs, and excess treatment costs. A description of these as they relate to critical care units, and where funding should be sought, has been published[9]. Support for screening and consent processes (for example, research nurse time), which is labour-intensive and time-critical for many intensive care studies, is an NHS support cost and should be sought through LCRNs or local R&D departments. Continual improvements for supporting and applying research are central to NHS core business[10].

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5.2 Audit and Quality Improvement

Authors: Kevin D Rooney & Steve Mathieu

INTRODUCTION

Quality healthcare is defined by the Institute of Medicine[1] as care that is "safe, effective, efficient, equitable, timely and patient centred". Clinical audit[2] is a means to find out if the healthcare provided is in line with agreed and proven standards, helping professionals and patients identify how their service is performing, and where improvement could be made. Quality Improvement (QI) completes the audit cycle and can be described as the "combined and unceasing efforts of everyone – to make changes that will lead to better patient outcome (health), better system performance (care) and better professional development (learning)"[3].

STANDARDS

1. Critical care units must have a structured and planned clinical audit programme to compare practice to published standards. There must be an identified lead for the audit programme.

2. Critical care units must participate in a National Audit Programme for Adult Critical Care, such as the Scottish Intensive Care Society Audit Group (SICSAG) or Intensive Care National Audit and Research Centre (ICNARC) programmes.

3. Critical care units must have a surveillance system in place for audit and feedback of nosocomial infection, for example, catheter-related bacteraemia and other blood stream infections, reported to the national scheme where applicable. Critical care units should also report the incidence of intubation-associated pneumonia. All units must participate in national audit programmes for nosocomial infections in intensive care, for example, Public Health England Infections in Critical Care Programme (ICCQIP) and Scottish nosocomial infections in ICU audit programme.

4. Critical care units must measure night-time discharges in order to encourage and support local improvement to reduce night-time intensive care discharges[4].

5. Critical care units must obtain regular feedback about the care that patients and relatives receive during their critical care admission in order to learn from and act on the feedback received.

RECOMMENDATIONS

1. Units should have nominated medical and nursing leads for quality improvement and audit. Appropriate time should be made available in job plans for these duties. Time to participate in audit and quality improvement programmes should also form part of the job plans of all intensive care staff (medical, nursing, pharmacists, healthcare professionals and ancillary staff).

2. Hospitals should have a quality improvement (QI) programme in place for each critical care unit in their organisation. The programme should aim to deliver safe, efficient, effective, patient-

centred, timely and equitable patient care, which is evidence based, and should follow recognised quality improvement methodology.

3. Staff should be encouraged and supported to train in quality improvement methodology and all projects should be multidisciplinary, recognising the necessity for a team approach and the contribution of all staff groups.

4. Audits should be linked to QI (quality improvement) programmes. Units should have robust data-collection systems in place that support the collection of activity and quality data for local and national audit programmes.

5. Critical Care Networks should have a formal, multi-professional, peer-review programme in place for the units in their jurisdiction. Peer reviews should be based on published national standards, but are likely to include other areas that are agreed locally.

6. All critical care units must measure and report their delayed discharge, out of hours discharges, non-clinical transfers and readmissions within 48 hours of discharge, as a potential indicator of resource pressures. It is recommended that units should also measure early discharges as they may be a marker of insufficient resources.

BACKGROUND

In order to support audit and QI, units require robust data-collection systems. These systems should be easy to use, secure and resilient. It is important that resources are identified to employ staff to facilitate data collection and input. Recognised national audits, together with the collection of nationally mandated datasets provide information for both quality assurance and quality improvement.

QI must be supported by regular measurement, e.g. monthly review of patients readmitted after discharge from ICU. Charts can be simple 'run charts', and the construction and display of such charts should form an integral part of a QI process. Results should be made available to staff, patients and carers.

Measurement is an integral part of both clinical audit and quality improvement. As such, it is important that we monitor key measures of:

- Structure (e.g. participation in a national comparative audits)
- Process (e.g. care bundle compliance)
- And outcome (e.g. standardised mortality ratio).

Minimum standards for all critical care units should be viewed as an assurance to patients, the public and clinicians that certain quality standards are being measured with local endeavours to maintain and improve them[5].

All measures, be they standards or recommendations should be SMART, namely specific, measurable, achievable, realistic and time bound. The recommendations or quality indicators are desirable, and not essential markers, of quality care and as such can be used as a means to drive improvement, for example, all patients staying in intensive care for four or more days should be screened for rehabilitation needs on intensive care discharge and have a documented management plan. Quality indicators are often aspirational and more difficult to achieve, as they often involve a

whole hospital, healthcare organisation or strategic health authority approach. However, it is the intention of the FICM and ICS that they should be routine practice in UK Intensive Care Medicine.

Quality indicators represent a systems thinking approach[5] with quality planning. They allow clinicians to diagnose their own hospital system and challenges, question and compare them with others and finally try to make improvements. All quality indicators encourage us to continually improve things and challenge the status quo and, as such, they must be understood in that context.

Minimum standards for Level 3 critical care units may be a quality indicator for a Level 2 high dependency unit and correspondingly, some quality indicators for intensive care may not be relevant to lower levels of care, such as high dependency.

As well as participation in a National Database for Adult Critical Care, all units should participate in an external peer-review process to monitor quality and quality improvement.

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5.3 Clinical Governance

Authors: Antony Thomas, Hywel Roberts & Ganesh Suntharalingam

INTRODUCTION

Clinical governance is a "framework through which healthcare organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish"[1].

Clinical effectiveness is "the application of the best knowledge, derived from research, clinical experience and patient preferences to achieve optimum processes and outcomes of care for patients". The process involves a framework of informing, changing and monitoring practice[2].

Many aspects of clinical governance, for example the training and development of staff and the management of critical care equipment, are dealt with in other sections of this document.

STANDARDS

1. There must be an appropriately trained consultant and senior nurse identified as leads for clinical governance. The consultant must not be the clinical lead or clinical director for critical care.

2. There must be a robust system in place for reporting, investigating, and learning from all patient safety incidents. Appropriate action plans must be formulated in response to incidents. Units should also learn from things that go well, a process described in excellence reporting[3].

3. Units must hold regular structured multidisciplinary clinical governance meetings, where they discuss unit morbidity and mortality, including all deaths, critical incidents and near misses. A written record of actions taken and lessons learnt should be kept and a timely and reliable method for dissemination of shared learning should be in place. There should be clear structures in place for disseminating findings to staff, and deficiencies in care should lead to measurable change.

4. Regular feedback must be obtained from service users and staff about the quality of care delivered, for example by the use of safety surveys[4] and relatives' questionnaires[5].

5. Critical care units must participate in a mortality review programme using appropriate methodology to maximise learning and improvements in care[6]. Appropriate actions must be taken whenever preventable factors are found.

6. All units must maintain a risk register that is regularly reviewed and updated by both senior managerial and clinical staff.

7. The unit must have processes to ensure clinical staff are aware, in a timely fashion, of key learning points from national safety alerts and local learning (for example from patient safety incidents, excellence reports, patient concerns and compliments). Staff must also be able to

easily access important information to inform patient care (for example information about medications and unit policies) whenever needed.

8. Staff who have to conduct reviews of patient safety incidents, root cause analysis and appreciative enquiry must be trained in the management of these processes so that the reviews are conducted sensitively and constructively. Similarly, effective quality improvement requires staff that are trained in quality improvement methodology.

9. Each unit must have local safety standards for invasive procedures (including tracheostomy, bronchoscopy, central line and chest drain insertion and lumbar puncture). They must also have safe standards for the handover of information for patients going to have invasive procedures in other departments. These standards should include documentation of invasive procedures, handovers and information transfer, procedural verification, a safety briefing and time out, and a sign out and debriefing. An example of this process is the NHS England *Safety standards for invasive procedures*[7].

10. Critical care units must comply with reviews and visits by national organisations, (for example the CQC in England)

RECOMMENDATIONS

1. Intensive care staff should work with other clinical teams in the hospital with respect to joint learning from morbidity and mortality review and ensuring best practice around handovers of care.

2. Units should regularly review guidelines from professional organisations and other sources of evidence to ensure that the unit complies with best practice. These evidence sources should be translated into comprehensive locally agreed guidelines or Standard Operating Procedures.

3. The unit should identify key performance indicators (KPIs) that describe outcomes of their service. Such KPIs may be generic and common to most units, such as complication rates, e.g. delirium rates, pain scores or pressure sores. Alternatively, these may be unit specific, for example rates of emergency thoracotomy on cardiac critical care units.

4. Staff should be recognised as the key resource in intensive care. A fully engaged, well-motivated well-trained and well-led workforce is essential to allow excellence in clinical care to flourish. Staff sickness rates, turnover rates and information from appraisal, staff feedback and exit interviews should all be monitored to ensure staff welfare.

5. Units should work with other units within their network, and nationally, to share learning, disseminate best practice, quality improvement and for benchmarking and peer review purposes. The governance of critical care units is rightly audited by outside agencies, including intensive care networks. The external responsibility for the oversight of governance arrangements varies between the devolved nations.

6. The unit should be able to demonstrate that it is continuously working to improve patient care using recognised quality improvement techniques delivered by appropriately trained staff.

BACKGROUND

This chapter replaces the 'Patient Safety in ICU' in the previous version of GPICS. The delivery of clinical governance, as described in 'A First Class Service', requires leadership within the healthcare organisation and the critical care unit. Leaders must be well trained and have time for their roles. Governance also requires an engaged and motivated workforce. Accountability and quality improvement can only happen when information is collected and reviewed across multiple aspects of the way the service is delivered. Since the standards were last published, the importance of learning from mortality has been highlighted, particularly following deaths of patients with learning needs[6]. On a more positive note, the opportunity of learning from things that have gone well has also been recognised in excellence reporting[3], and intensive care is starting to learn from the clear benefits seen in the introduction of the World Health Organisation surgical checklist.

Although there has been awareness of quality improvement techniques for decades[8], they have probably become more embedded in clinical practice since the previous edition of GPICS. We have recognised this by including quality improvement as a standard. There is no point in measuring problems accurately if we cannot then use this information to improve care.

Delivering a quality service requires the provision of resources in terms of staffing, staff training, beds and equipment; these issues are addressed in other chapters. Although these resources are essential for quality patient care, they are not enough on their own. Leadership, engagement and learning are also essential.

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5.4 Critical Care Networks

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With contributions from Brian Cook, Nichola Cullen, Ifor Evans, Edwards Farley-Hills, Sue O'Keefe, Richard Pugh, Tamas Szakmany and Elizabeth Wilson in terms of information supplied for Northern Ireland, Scotland and Wales.

INTRODUCTION

In 2000, the Department of Health report 'Comprehensive Critical Care: A review of adult critical care services'[1] recommended that adult critical care networks be formed to deliver a collaborative model of care for critically ill patients within defined geographical regions. From April 2013, there has been a requirement for adult critical care services to be delivered through integrated Operational Delivery Networks (ODNs)[2,3] in England. ODNs' primary aims are to improve equity of access, experience and health outcomes for critically ill patients, focusing on co-ordinating pathways of care between providers. The NHS Standard Contract reinforces the need for ODNs, although structure and funding arrangements remain varied.

STANDARDS

1. Critical care ODNs must support the activity of provider healthcare organisations in service redesign[3] and delivery of the commissioned pathway, quality improvements, innovation and standardisation of clinical practice. They provide a mechanism for peer review and benchmarking self-assessment in the network.

2. Critical care ODNs must support commissioners in the delivery of their commissioning functions, through creating and delivering innovation, quality improvements and efficiency across the pathway, and developing, devising and supporting local strategies for adult critical care services across the geographical footprint, including advice on improvement[3].

3. Critical care ODNs must support delivery of a resilient critical care service within a geographical area to meet emergency preparedness requirements[3].

4. Each provider of adult critical care must engage, contribute and participate in activities of their local critical care ODN[3] and will contribute to the funding of their local ODN through a nationally agreed mechanism[4]; this is currently a 0.1% CQUIN top slice, but may be supplemented by local agreements made in conjunction with key stakeholders through the ODN Executive/Oversight Group/Board.

5. The intensive care team in provider organisations must engage, contribute and participate in a critical care ODN, including audit activity, peer review and quality improvement processes[5].

RECOMMENDATIONS

1. ODNs should take a whole-system, collaborative-provision approach to facilitate the delivery of safe and effective services across the patient pathway, with an emphasis on the quality and equity of access to service provision.

2. ODNs should aid cross-organisational, multi-professional clinical engagement for the sharing of best practice and knowledge. They should both identify and implement improvements to enhance patient care, enabling the design of effective clinical flows and pathways of care for networked provision of services. This will allow for more local determination, innovation and efficiency across the pathway.

3. ODNs should focus on quality and effectiveness through facilitation of comparative benchmarking and auditing of services, with implementation of required improvements. This should span the wider hospital system, to include dedicated critical care units, as well as resources to support acutely unwell patients on general wards. This includes rehabilitation of patients recovering from critical care in hospital and in the community.

4. ODNs should create an operational model that allows effective work programmes for the delivery of local and regional priorities, service specification standards, national programme of care outcomes and outcome framework targets.

5. ODNs should have robust governance arrangements that ensure functionality, working with both providers and commissioners, to enable the development of improved service standards to continually enhance the patient, family and carer experience.

6. ODNs should have a core management team capable of delivering the work of the network according to local requirement. They should provide clinical and executive management/leadership to support the delivery of established network plans, enabling action in response to adverse situations or outlying practices. As a minimum, this would include senior management, lead medical and nursing roles and administrative support. These roles are independent of both the host organisation and the substantive employer (where this is not the host).

7. Each participating member organisation should ensure appropriate representation at critical care ODN meetings, task groups and other forums in accordance with the network's terms of reference. Through the baseline contract agreement (local or national), member organisations should comply with ODN standards, policies and guidelines.

8. Each adult critical care provider should adhere to requirements to measure and evaluate quality indicators and service delivery, in line with the national Adult Critical Care Service Specification (D05)[3]. This specification may be supplemented by additional requirements by the local ODN (for example GPICS V2 standards and recommendations). Such supplemental standards should be approved by the ODN through their local governance structure

9. ODNs should provide leadership support in network-wide emergency preparedness, have a role in clinical contingency planning and respond to increased demand through national, regional and local determination. ODNs should act on identified challenges as they emerge, e.g. a local critical care bed crisis or large-scale major incidents[6,7].

10. ODNs should encourage the positive engagement of adult critical care providers in their networks and support critical care units in developing their service to its maximum potential by implementing the recommendations outlined above.

BACKGROUND

ODNs are clinically driven and support a culture of collaboration. Their success relies on the engagement, interaction and commitment of stakeholder members and participating member organisations to deliver agreed outcomes. The outputs of ODNs are dependent on clinical engagement and collaboration across the patient pathway, and wherever possible ODN boundaries should reflect patient flow. The success of critical care managed clinical networks as an effective model for improving standards of healthcare led to their evolution as ODNs within the current architecture of the NHS[2]. These non-statutory organisations create climates for innovation and improvement that lead to the delivery of safer, high-quality patient centred care[8,9]. Although there has been national recognition of the positive impact of adult critical care ODNs, the structures and funding arrangements for the ODNs remain varied. What is important, however, is that the networks have a team and structure that can facilitate effective engagement with stakeholders and deliver network plans for the continuous development and delivery of quality services.

NHS England has provided supplementary funding for ODNs by allocating 0.1% of CQUIN funding[4]. This is the agreed funding mechanism to 2019. ODNs receive funding via NHS England regional teams with responsibility for specialised commissioning.

The NHS Standard Contract[3] reinforces the need for ODNs, and will require that their members comply with the functions and work plans of the network. As non-statutory organisations, ODNs do not have statutory constitutional rights of their own, but fit into the overall governance arrangements of a host organisation. The ODN host provider will have an agreement with the network for the delivery of ODN functions and work plans. This arrangement of a contract for services with each provider coupled with an overarching network improvement plan, agreed with the host and ODN members, is a mutually reinforcing system.

Cross-organisational co-operation and collaboration through effective clinical engagement are recognised as priorities to improve the quality of care of inherently high-risk and highly vulnerable patients[10]. The draft National Service Specification for Adult Critical Care (D05)[3] requires the ODNs to support providers in the redesign of services, enhancing patient safety and experience and partnership working.

Northern Ireland

The Critical Care Network NI (CCaNNI) was established in 2007 to support the Health and Social Care Board (NI) in commissioning critical care services across the region, through five Health and Social Care Trusts, with a total of nine units. The role of the network is to represent critical care delivery strategically at both a local and regional level. Engagement with front line critical care staff ensures professional standards are maintained, learning is shared and safety/quality of services are maintained through development and implementation of regionally agreed improvements. The CCaNNI standing committees and Network Board provide robust framework to ensure decisions and developments maximise service development and ultimately patient outcomes. CCaNNI ensures that case-mix data is utilised to inform and prioritise investment in Critical Care services, from HSC Board while liaising with colleagues in Public Health Agency (NI) regarding wider influences on population need etc. Although CCaNNI varies from ODN in definition of responsibility for financial and strategic decisions, the standards and recommendations cited are met by the network in terms of collaborative, multidisciplinary engagement to ensure safe, quality critical care services to meet the need of the population of Northern Ireland.

Scotland

Networks with formal management responsibilities do not exist in Scotland. Following the publication of *Better Critical Care* in 2000, local Critical Care Delivery Groups were established in all acute trusts. Later NHS reorganisation in Scotland changed this operational management to 15 health boards. The Scottish Critical Care Delivery Group was formed from the clinician chairs of each acute trust and subsequently, health board's Critical Care Delivery Group; usually the clinical director or lead for critical care. This group has links to Scottish Government through a Senior Medical Officer, but is clinician focused to share professional standards, mutual support and to inform national strategic planning. Each board commissions adult critical care beds based on local assessment of need with dependency definitions and benchmarking. All critical care units in Scotland are required to collect and submit a minimum dataset very close to CCMDS to the Scottish Intensive Care Society Audit Group (SICSAG), which reports annually to Scottish Government through NHS Scotland Information Services Division and to health boards and the public. This includes quality standards, capacity, activity and outcomes.

Units who are outliers for mortality are reported in the SICSAG annual report. Commission of investigation of SMR outlier data is the responsibility of the host health board and for a number of years this has been conducted by a group of clinicians external to that unit led by the SICS President.

Wales

In Wales, regional critical care networks have operated since 2007 and while sharing many of the objectives of NHS England ODNs, there have been notable differences in terms of funding and accountability, and with respect to roles in the commissioning and delivery of services. The Adult Critical Care Service Specification (D05) does not apply directly to Wales, but instead the networks have made a significant contribution to the implementation of national objectives set out in the Care of the Critically Ill Adult Delivery Plan[a]. To support integration with major trauma service developments crossing into England, the North Wales network became the North Wales Critical Care and Trauma Network in 2012, and a major trauma network for South Wales and South Powys is currently being established. Since 2015, Welsh clinical networks have operated in an all Wales configuration; the Wales Critical Care and Trauma Network is now hosted by the NHS Welsh Health Collaborative (Public Health Wales).

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5.5 Critical Care Commissioning

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INTRODUCTION

The Critical Care Minimum Dataset (CCMDS)[1] underpins commissioning of Adult Critical Care (ACC) in England. CCMDS is also collected in critical care in Wales and Northern Ireland for ICNARC's Case Mix Programme. Currently in England, contracts are negotiated by a combination of Clinical Commissioning Groups (CCG) and Specialist Commissioning services[2]. For some providers this involves multiple contracts. Local prices are used, reflecting local reference costs and significant variation is reported. A transition to national tariff, use of lead commissioner and greater use of outcome metrics to monitor performance is anticipated for England. Separate arrangements are in place in the other devolved administrations in the UK.

STANDARDS

1. All units must comply with national commissioning arrangements in place in England, Wales, Scotland and Northern Ireland.

2. CCMDS[1] must be collected and reported in all designated Adult Critical Care locations in England.

3. Data collection must commence from the date and time that the patient first occupies a designated critical care bed or, if in a non-designated critical care location (theatre recovery/ward), data entry should only occur when a patient has received critical care for a period of time in excess of four hours. The care received by patients in these non-designated areas must include clinical interventions, monitoring and continuous supervision normally associated with a critical care area.

4. Adult critical care reference cost submissions must assign costs to individual HRGs.

5. All providers in England, Wales and Northern Ireland with adult critical care services must be members of a Critical Care Operational Delivery Network.

RECOMMENDATIONS

1. Collection of all 34 fields in CCMDS is recommended. This should be done by dedicated trained personnel.

2. There should be clinical oversight of the CCMDS data entry/data submission to ensure accuracy of data.

3. Preparation of reference costs should include experienced clinician involvement.

4. Agreement should be in place to support early notification to a patient's CCG for longer-stay patients who are likely to have complex home needs, such as home ventilation to aid discharge planning including the identification of a funding package.

5. A lead commissioner should be identified with a commissioning forum for each critical care service.

BACKGROUND

The Adult CCMDS[1] was mandated for use in 2006. This dataset, combined with the NHS HRG 4 grouper, categorises patient-related activity into one of seven healthcare resource groups (HRGs)[3]. The HRGs describe the total number of organs supported throughout an individual patient's clinical episode within critical care; healthcare organisations then quantify their actual costs per HRG through the annual reference cost submission.

The first critical care HRG based reference cost submission occurred in 2008/2009. These quantified total expenditures in England at £1.29B in 08/09, £1.56B in 12/13, £1.710B in 2014/15 and £1.93B in 2016/17. This 42% increased investment in eight years, correlates with a 24% increase in bed day activity (1,212,515 bed days 2008/9, 1,499,289 2016/17 (reference cost publications), 523 additional beds (3,550 to 40,730 beds), rise in length of stay, and increase in delayed discharges. The majority (70%) of activity correlates to two or fewer organs supported (16/17 reference costs). This investment has had a significant impact on attainment of standards and patient flow, and discharge from critical care remains a significant operational pressure.

NHS Improvement in England requires healthcare organisations to assign costs based on the type of organ support provided. Historically, reference cost submission for critical care was assisted by the concept of cost blocks/pools[4], which defined expenditure by categories. Unfortunately, this model has been lost from practice, but nationally there is a drive to reintroduce it.

In addition to the commissioning currency (HRG), a contract needs to be accompanied by a descriptor of necessary clinical standards and accepted outcome measures. In setting the contract, healthcare organisations and commissioners agree the planned activity (bed days), case mix (% of each of the HRGs) and the prices via the annual contracting process. Healthcare organisations and commissioners report against these plans in year on a monthly basis. Data supporting the contract flows from the patient CCMDS records and onward into the HRG 4 grouper and hospital information system and then into SLAM (Service level agreement monitoring) and then the Secondary User Service which holds activity by CCG and healthcare organisation in NHS England's footprint. The underpinning standards/outcome metrics in England are described in NHS England's ACC Service specification[6] and performance is published quarterly in the National Dashboard[7], both products of NHS England's CRG for Adult Critical Care. The service specification is intended to be applicable to all adult patients requiring critical care irrespective of the source of funding.

Northern Ireland

In Northern Ireland, commissioning is undertaken by the Health and Social Care Board (HSCB) Specialised Commissioning, using block contracts, a service specification and a per bed payment (£1M per ICU bed, £500K per HDU bed). The number of beds have remained constant (86) for ten years, excepting an uplift of two beds for trauma. It is anticipated that the Department of Health will take on commissioning responsibility in 2019, accompanied by a review of capacity needs.

Scotland

The NHS in Scotland is provided through 15 health boards with a centrally allocated budget, calculated on a population basis. Each board commissions adult critical care beds based on local assessment of need with dependency definitions and benchmarking. This is done using a dataset very close to CCMDS collected through the Scottish Intensive Care Society Audit Group (SICSAG). All critical care units in Scotland are required to collect and submit a minimum dataset to SICSAG, which reports annually to the Scottish Government through NHS Scotland Information Services Division and to health boards and the public. This includes quality standards, capacity, activity and outcomes. The Scottish Critical Care Delivery Group is formed from the clinician chairs of each health board's Critical Care Delivery Group; usually clinical director or lead for critical care. This group has links to the Scottish Government through a Senior Medical Officer, but is clinician-focused to share professional standards, mutual support and to inform national strategic planning. It has no formal commissioning role. Scottish critical care beds recorded by SICSAG have continued to increase over recent years: 2013 Level 3 beds 161, Level 2 beds 283, 2016 Level 3 beds 186, Level 2 beds 320.

Wales

Critical care services are provided by six health boards in Wales. Each health board is also responsible for the planning of local critical care services according to need, overseen locally by health board delivery groups and supported nationally by the Critically Ill Implementation Group (consisting of representatives from the health boards, the Wales Critical Care and Trauma Network (WCCTN), Welsh Government, and other key stakeholders). CCMDS is used for benchmarking and quality assurance, but neither CCMDS nor HRGs are used for commissioning. Instead, units are designated in 'tiers' (by capability) and commissioned with defined quality metrics[8,9]. In 2011 there were 171 critical care beds, both Level 2 and Level 3 (8,992 bed days) compared with 176 beds in 2017, (9,748 bed days) representing an increase from 5.6 beds to 5.7 per 100,000 populations and 8.4% increase in activity (WCCTN). A recent programme of work has been initiated by Welsh Government to oversee the development of a national model for the care of the critically ill; currently Wales has among the lowest numbers of critical care beds in Europe.

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Section Six

Critical Care Services: Emergency Preparedness

6.1 Fire

Authors: Fiona Kelly, Rowan Hardy, Jeremy Cordingley, Claire Hughes

INTRODUCTION

At least three fires have occurred in UK Critical Care Units in the past 10 years, all of which required a full-scale emergency evacuation of patients, staff and relatives[1,2]. A fire in Bath was caused by an oxygen cylinder which caught fire as it was turned on[1]; a fire in the Royal Marsden Hospital was caused by an electrical fault in the roof above the unit[2]; a fire at the Royal Stoke University Hospital (UHNM) was caused by arson, originating in a corridor adjacent to the unit. Flood and power failure are other crises which may necessitate an emergency critical care unit evacuation.

STANDARDS

1. All units must have well marked fire call points, fire extinguishers and oxygen shut-off valves[2,3,4,5,6].

2. Each unit must have a specific fire evacuation policy in place[2,3,4,6,] which takes account of:
   a. the layout of the building, including any need to negotiate stairs during an evacuation
   b. the provision of ventilatory support, intravenous therapies and invasive monitoring for patients during such an evacuation[2,4,6]
   c. the fact that critical care staff may themselves be affected by a fire and therefore be unfit to continue working[1,2,4]

   Action cards summarising the evacuation procedure should be displayed within the unit,[4] ideally next to fire call points,[4] so that they can be referred to in an emergency.

3. Recommendations for the safe use of oxygen cylinders must be adhered to at all times and include:
   a. the safe use of oxygen cylinder bed brackets
   b. the safe storage of oxygen cylinders, including storing oxygen cylinders turned off at both the valve and the flowmeter
   c. following the recommended sequence of events when turning on an oxygen cylinder:
      - first connect the oxygen tubing and mask to the oxygen cylinder outlet
      - then turn on the oxygen cylinder and select the flow
      - finally attach the oxygen to the patient[1,2,4,5].

4. Units must comply with current Department of Health regulations regarding the fire-retardant nature of mattresses, bedding, flooring and curtains[3].

5. New units must be designed using Department of Health guidance and in conjunction with the Trust fire safety officer, with consideration given to the provision of:
   a. multiple exit routes
   b. ski pad, ski sheets or other evacuation aids for all bed spaces which are readily available
   c. adopting small bays rather than open areas
   d. splitting ICU departments into separate clinical and non-clinical areas[2,3,6].

6. Units must have a major incident plan in place which allows for the transfer in of multiple critical care patients from a neighbouring hospital's critical care unit should it need to carry out an emergency evacuation[2,4,6].

7. Any problem with oxygen cylinders and associated equipment must be reported immediately to both the medical gas supplier and the Medicines and Healthcare products Regulatory Authority (MHRA)[5].

8. All staff must undergo regular training in fire prevention and fire procedures, to include training in-situ in the specific clinical areas in which they work[2,3,4,6]. All staff must know:
    a. the location of fire call points within their own unit and how to operate them
    b. the location of fire extinguishers within their unit and which type to use in the event of a fire

    Medical and senior nursing staff must also know the location of the medical gas pipeline shut-off valves in their unit, how to operate them and the implications of doing so[2,3,4,6].

9. All intensive care staff must be given basic training regarding the safe use of oxygen cylinders[1,2,4,5,6].

10. Local unit evacuation policies must be drawn up, with consideration for:
    a. other locations within the hospital where critical care might be provided on a temporary basis
    b. provision of equipment and drugs
    c. evacuation case at each bed space
    d. triage of patients (the least unwell patients being evacuated first and the most unwell patients last)
    e. possible co-existing power and/or equipment battery failure
    f. use of transport ventilators and hand ventilation if needed
    g. temporary discontinuation of renal replacement therapy
    h. transfer of hospital notes especially if electronic patient monitoring is in use[2,4,6].

In a major fire, it is possible that serial evacuations will be required with a staged move to the outside[2], and that the whole hospital may need to be evacuated[2].

RECOMMENDATIONS

1. Evacuation policies should include liaison with the Bronze (Operational), Silver (Tactical) and Gold (Strategic) commanders in conjunction with the senior fire officer on scene[2]. Timing of evacuation is crucial: if evacuation occurs too early, then patients may be harmed by a transfer; if evacuation occurs too late, then patients and staff may be harmed by fire and smoke[2].

2. Local fire evacuation policies should be tested regularly, ideally as part of a simulation scenario[2,4,6]. Evacuation at night should also be practised[2].

3. Units should have a system whereby staff involved in a traumatic incident, such as a fire in the critical care unit, receive debriefing and are followed up for signs of a trauma stress reaction or Post Traumatic Stress Disorder (PTSD)[4,7,8,9]. The Trauma Resilience Management (TRiM) system is a screening tool used in the military and more recently used successfully in healthcare which could be considered[9].

4. Critical care networks should develop systems to support planning for, and management of, a major incident in one critical care unit within the network, so that other units can cooperate to accommodate all critically ill patients in this type of situation. A retrieval team approach, with staff from neighbouring units travelling to the affected unit to transfer patients, should be planned. Liaison with neighbouring units and local ambulance services at an early stage is advised[2,4].

BACKGROUND

A fire occurred on the ICU at the Royal United Hospital Bath one early evening in 2011. It was caused by an oxygen cylinder which caught fire as it was turned on while it was lying on a patient's bed[1,4,10]. The fire immediately spread to the mattress, the bed and the patient herself, rapidly followed by the curtains around her bed, the flooring and ceiling tiles. The unit was filled with thick, black, acrid smoke within seconds, reducing visibility to less than one metre and making breathing extremely difficult for both patients and staff. The patient on the burning bed was pulled to safety, ten patients were evacuated within seven minutes, and a twelfth patient (ventilated in a side room and not immediately affected) ten minutes later. The fire was put out by two doctors using five fire extinguishers. The patient on the bed suffered burns to her lower legs but no other patient was harmed; two members of staff suffered smoke inhalational injury requiring hospital admission[1,4]. Twenty five consultant anaesthetists arrived within 30 minutes to help deal with the aftermath, transfer five patients to neighbouring units and set up a temporary overnight HDU in the Post Anaesthesia Care Unit (PACU) for the remaining seven patients. The oxygen cylinder was almost completely destroyed in the fire, which hampered subsequent investigations, but it is thought that the fire started within the oxygen cylinder valve.[1,10]

In 2008, a fire in the roof of the Royal Marsden Hospital spread rapidly, resulting in destruction of the ICU and a complete evacuation of the building within 28 minutes.[2] At the time, there were six patients in the unit and three patients in the operating theatres. All ventilated patients were transferred to the critical care unit of the neighbouring Royal Brompton Hospital. No patients or staff were injured. The unlikely need for complete evacuation of the building had not been included in the major incident plan, and the timing (2nd January at 1pm) was fortunate in that both hospitals had relatively low occupancy as their workload is mainly elective.[2]

In 2017, a fire was deliberately started at 5.30pm in a shared corridor between theatres and the ICU at the Royal Stoke University Hospital. Although the fire was dealt with promptly, smoke permeated into the unit resulting in poor visibility and an acrid odour. A mass evacuation of 24 critical care patients ensued, with patients transferred into PACU and theatre suites sited elsewhere in the hospital building. The consultant and nurse in charge coordinated and enacted the Major Incident Protocol. No patients or staff came to harm.

Following these incidents, several lessons were learned. These included:

- The need to prepare for such an incident, including a possible 'internal major incident' where intensive care staff are themselves victims and so are unfit to work[2,4,6].
- The importance of regular staff training in fire safety and oxygen cylinder use[1,2,3,4,6].
- The role of regional critical care networks in such unusual situations even when this is not normal practice and Regional Hazard Response teams (who may be able to provide additional equipment)[4].
- The value of debriefs, clinical psychologist input and a staff follow-up system to ensure that staff members who do suffer a trauma stress reaction receive appropriate care[4,7,8,9].

A newly formed Fire Safety Group, with representatives from the Intensive Care Society, Association of Anaesthetists of Great Britain and Ireland, National Association of Healthcare Fire Officers, MHRA, Health and Safety Executive and other national bodies, is currently discussing whether critical care staff should be trained to use fire extinguishers[4] and whether sprinkler systems should be mandatory for new critical care builds as there is currently no consistent practice across the UK[3,4]. In addition, this group is discussing how to advise staff working in critical care units, operating theatres and emergency departments: it is highly debatable whether it is correct for staff in these areas to leave their patients, shut the fire doors and await the arrival of the Trust fire response team and local fire services as some Trust fire officers recommend. Of note, there is often a 20 minute delay before fire services reach a clinical area. Further guidance is awaited.

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6.2 Major Incidents

Authors: Jeremy Henning & Angela Walsh

INTRODUCTION

A major incident[1,2] is 'any occurrence that presents serious threat to the health of the community or causes such numbers or types of casualties, as to require special arrangements to be implemented'. Examples include major transport accidents, infectious disease outbreaks or flooding affecting service infrastructure. Major incidents are exceptional events and increases in demand.

All acute Healthcare Organisations have major incident response plans that are tested and regularly updated.

Core to their response is the concept that receiving hospital(s) will accept most of the sickest patients and that supporting hospitals will receive the less injured and may take transfers from receiving hospitals.

STANDARDS

1. All hospitals designated **receiving** hospitals with Level 3 critical care capability must be *prepared* to double their normal Level 3 ventilated capacity and to maintain this for up to 96 hours[3].

2. All nominated **supporting** hospitals with Level 3 critical care capability must be prepared to double their normal capacity for Level 3 beds for general use and to support the decant of patients from other receiving hospitals[3].

3. All hospitals with intensive care capacity must have in place plans to support the retrieval or transfer of patients; supporting hospitals must have to support patient transfers by providing suitably skilled transfer teams for each patient needing to be moved within Critical Care Operational Delivery Network areas and beyond[3].

4. All hospitals must have an evacuation and shelter plan that includes evacuation and shelter of highly dependent patients, including but not exclusively intensive care patients, should the intensive care areas become unusable for any reason[4].

5. All hospitals must have a **lock down** plan that includes all intensive care areas, preventing unauthorised access[5].

6. All hospitals must have a recovery plan to ensure a rapid return to normality once the incident is closed. This must include adequate rest and psychological support for staff.

7. Action cards must be available for use on activation of plan and must include information and communication routes that are to be used.

RECOMMENDATIONS

1. Intensive care leads should work closely with the Healthcare Organisation Emergency Preparedness, Resilience and Response (EPRR) leads and clinical colleagues to create the intensive care response to a major incident, hospital evacuation or mass casualty plans.

2. Intensive care should have access to emergency planning and response training including strategic/crisis leadership.

3. Intensive care service staff should participate in the local and regional multidisciplinary exercises including 'table top' and 'live' exercises to further refine local and regional plans and communication routes between organisations and networks.

4. Intensive care leads should work with their EPRR team to facilitate exercises in the evacuation of very dependent patients from any part of their hospital. This should include practical use of ski sheets, and other patient handling aids, as well as rehearsing the decision making and forward planning required by shift leads to support a controlled, staged evacuation.

5. Intensive care staff should be prepared to take a central leadership role in any major incident and should be prepared to send teams 'forward' to the Emergency Department, as well as any preoperative hold areas and recovery.

6. The plan to double the number of intensive care beds should include an inventory of where equipment is to come from, where the beds should be located and who should staff them. This should be near the permanent critical care unit, where possible allowing the normal functioning of the hospital around it.

7. Advance consideration of staff workforce requirements, including mutual aid from colleagues in neighbouring hospitals should form part of the intensive care service planning.

8. Staff welfare should be actively supported during an incident and critical care staff access to informal, immediate debrief or later formal counselling.

9. Clinical standards should be maintained as long as possible, critical incident reporting encouraged and contemporaneous note kept to enable quality post-incident lessons to be investigated, communicated and learnt.

BACKGROUND

NHS England's Emergency Preparedness, Resilience and Response (EPRR) guidance documents set out the legal and statutory responsibilities for the NHS and include a framework for mass casualty incidents.

Major incidents may be external `BIG bang' (e.g. rail crash) or `rising tide' (e.g. influenza) incidents leading to excess demand with increased patient numbers. Alternatively, they can be internal within the hospital, such as massive power loss, flooding or fire, which may stop the unit functioning and require evacuation of the critical care unit to a place of safety.

Effective command and control is vital; the scale of the major incident determines where the top level sits. For the biggest incidents, (tier 4 - national) NHS England "may enact its powers under

Section 252A of the NHS Act 2006 to take national command and control of the NHS and providers of NHS funded care"[3,5]. However all staff must be prepared to take on significant leadership roles in all phases of any emergency.

Often emergency planning exercises end at the Emergency department or theatre, before intensive care services are truly stretched and the full scale of the longer-term impact assessed. Being actively involved in the planning of exercises and having a full part while they are being run, can help to create more real representation of the longer-term issues to be faced. Intensive care response may be several weeks' duration and include frequent surgery for patients, as well as transfer of patients to other hospitals and to distant, possibly international destinations, for upgrade of care, to ease bed pressures or repatriation closer to home.

All staff working in intensive care need to know their specific role in the major incident plan, the relationships with other key departments, the command and control arrangement and information required. This should be written on an action card to be read when an incident is declared and practiced be in advance of a Major Incident taking place. This could take place at induction with further regular updates and exercises.

After a major incident the capacity of an individual healthcare organisation or site to provide optimal treatment for patients may be impaired for some time. Organisations should cooperate to develop plans to assist each other under these circumstances. These plans may include staff working at different sites, temporary expansion of capacity, loan of equipment and redistribution of consumables.

In the early hours of an incident, there may be many offers of help. Workforce planning for the likely duration of the incident needs to take place early.

In a mass casualty incident, intensive care resources may be overwhelmed, with the requirement for triage, which should be considered and agreed nationally. This may lead to complex and difficult ethical decisions[6].

Staff welfare during and after an incident response is paramount. For intensive care services, staff may be at their busiest when hot debriefs for ED and theatres are taking place. Remember to ensure debrief and support for key staff unable to attend these meetings. Some may be affected significantly more than others and some weeks after the event.

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6.3 High Consequence Infectious Diseases: Initial Isolation and Management

Authors: Stuart Dickson & Jake Dunning

INTRODUCTION

In the aftermath of the Ebola virus disease epidemic in West Africa, and following experience of managing Middle East respiratory syndrome (MERS) cases in the UK, the High Consequence Infectious Diseases (HCID) Programme was launched in England in 2015, with the aim of developing an effective and achievable end-to-end patient care pathway for individuals with suspected or confirmed infections due to high consequence pathogens. Additionally, public health agencies across the UK have issued interim guidance on managing specific high consequence infectious diseases, such as MERS, avian influenza and Ebola virus disease. While definitive care for confirmed patients in England will ultimately be delivered by commissioned HCID Treatment Centres, all acute healthcare organisations in the UK must have processes in place to isolate and safely manage patients with suspected high consequence infectious diseases while awaiting the results of investigations and/or prior to transfer. Contingency planning should consider how intensive care can be delivered locally to patients with suspected high consequence infectious diseases. Current high consequence infectious disease threats are described in Public Health England's monthly HCID summaries[1].

STANDARDS

1. Each critical care unit must ensure there are local contingency plans for the initial isolation and management of critically ill patients with suspected HCIDs. These plans must be regularly practiced and reviewed, including the use of table-top exercises and simulations.

2. Units must liaise with local Directors of Infection Prevention and Control to ensure the correct personal protective equipment (PPE) is procured and sufficient stocks are readily available for use by appropriately trained intensive care staff in the event it is required.

RECOMMENDATIONS

1. A consultant in Intensive Care Medicine should have responsibility for intensive care aspects of local emergency planning and resilience preparations, incorporating plans for the appropriate isolation and management of suspected patients with HCID.

2. A clinical area where critically ill patients with suspected high consequence infectious diseases may be isolated, either within the unit or elsewhere, should be prospectively identified. Ideally plan to utilise negative pressure rooms with anterooms where available.

3. All clinical equipment used in the management of a patient with a HCID should be dedicated to that patient alone. Equipment should be single use where possible.

4. Training should be provided on a regular basis to ensure critical care staff are familiar with using and safely removing the PPE provided. This should incorporate annual fit testing of respiratory

protective equipment (e.g. FFP3 masks).

5. Critical care staff providing care for a patient with a suspected or confirmed HCID should be dedicated to the care of that patient on a clinical shift and should not provide concurrent care for other patients, thus limiting the risk of cross-infection.

6. Contingency planning should incorporate plans for holding securely the large volume of clinical waste resulting from clinical care including discarded contaminated PPE. Once a HCID is confirmed, further advice on correct disposal of the waste will be provided.

7. Patients with a suspected viral haemorrhagic fever should be risk assessed in accordance with the Advisory Committee on Dangerous Pathogens Viral Haemorrhagic Fever (ACDP VHF) Risk Assessment algorithm[2] and investigations to exclude malaria promptly undertaken, in keeping with local procedures.

8. Patients with suspected airborne HCIDs should be risk assessed according to national guidelines where they exist (disease-specific e.g. MERS guidance collections[3,4] or generic airborne HCID guidelines, as appropriate).

9. Following recognition of a patient with a suspected HCID:
    1. local infectious disease and/or microbiology and virology services should be notified and advice sought, including guidance on obtaining appropriate diagnostic clinical specimens.
    2. local clinicians should liaise with the Imported Fever Service (note this service is available to clinicians across the UK) for further clinical advice and to facilitate access to specialist diagnostics as required[5].
    3. all suspected cases should be reported immediately to local health protection authorities (e.g. the local Health Protection Team).

10. Critical care units accepting international medical transfers should perform a risk assessment prior to transfer if a patient is being transferred from a country with known HCID outbreaks or countries where there is a significant risk of specific HCIDs; refer to national guidance (disease-specific or generic HCID guidance).

BACKGROUND

A high consequence infectious disease (HCID) is one that may give rise to an acute severe illness with a significant case fatality rate, is highly transmissible from person to person (including healthcare providers), and so is capable of causing an outbreak or epidemic. The causative pathogens may be transmitted by contact (e.g. viral haemorrhagic fevers) and/or by airborne transmission (e.g., MERS coronavirus, avian influenza).

Patients with possible HCIDs may present to any hospital at any time. NHS healthcare organisations should have in place emergency operational plans to deal with such an incident. Intensive care clinicians may be called upon to provide support to such patients pending results of diagnostics tests and/or transfer to a designated specialist centre (e.g. a commissioned HCID Centre, for patients in England). This care may or may not be provided within the critical care unit. Contingency planning should identify an area that separates the contaminated clinical area from other areas, thus minimising the risk to patients, staff and the local community.

The local management of patients with suspected HCID prior to transfer to a designated specialist centre will be dictated by local factors and hospital design. The stated standards and recommendations provide a framework for local contingency planning. The patient with a suspected HCID may, of course, subsequently prove to have an alternative diagnosis. Such patients may still be critically ill and should not be disadvantaged by delays in instituting appropriate intensive care monitoring and support for fear of the presence of a HCID. However, healthcare organisations are obliged to ensure that appropriate infection prevention and control measures are maintained until the possibility of a high consequence infectious disease has been excluded. Therefore, it is vital that critical care units plan how such situations will be managed, minimising the risk of transmission to hospital staff, patients and visitors, while providing appropriate patient care without undue delay.

Healthcare workers in non-specialist hospitals must rely upon appropriate infection prevention and control measures, including HCID-appropriate PPE, to protect them from the potential high consequence infectious pathogen. PPE must be worn correctly if it is to provide adequate protection. PPE will inevitably become contaminated during patient contact. Safe removal and disposal of PPE is a key skill in order to prevent inadvertent exposure to the infectious pathogen and must be practiced. Fit testing of respiratory protective equipment (e.g. FFP3 masks conforming to EN149:2001) must be undertaken before use and respiratory protective equipment should be fit-checked every time it is used.

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6.4 Surge and Business Continuity Planning

Authors: Andrea Baldwin & Bob Winter

INTRODUCTION

This chapter identifies the requirements for surge and business continuity planning for intensive care services (whether in the context of 'winter pressures', 'rising-tide' or 'surge' – as in sudden rapid, large-scale events).

The chapter supports the national Standard Operating Procedures for Critical Care services in England[1,2]. Strategic aims are to provide timely access to an appropriate level of care for appropriate organ support, to prevent avoidable mortality and morbidity in the critically ill, and maximise capability within the system in a coordinated approach, until all potential escalation options have been exhausted.

Critical care units are themselves high users of medicines, power and consumables, and are dependent on high levels of staffing for effective function. Any surge on service demands places effective operational function at risk, where there may be interruptions in supplies, infrastructure, or staffing due to numerous possible incidents; so good business continuity planning is essential for keeping patients and staff safe and services available.

It is acknowledged that, on occasion, the service may also be required to strategically support other age groups beyond that of adults requiring intensive care capability and capacity, and adult critical care services should be adequately prepared for this demand.

STANDARDS

1. Adult critical care units (in England) must submit twice-daily information on their bed capacity through NHS Pathways Directory of Services (DoS)[1].

2. Each organisation with an adult critical care unit must have their own escalation plan and business continuity plan[1].

RECOMMENDATIONS

1. Unit managers and senior clinical staff should develop plans and checklists for scenarios such as:
   a. Supply chain disruption (road/fuel crisis, extreme weather, industrial action or civil disturbance).
   b. Infrastructure failures (intermittent power cuts or 'brownouts', failure of water or heating).
   c. Interruption of normal staffing patterns (e.g. transport disruption, school closures).
   d. Checklists should include, for example, which drugs and consumables would run out first if supplies are disrupted.

2. Plans should also include options for:

a. Unit evacuation, both internally and externally to other sites in the event of major infrastructure failure, or other events (e.g. fire) which threaten the ongoing operation of intensive care facilities
b. Capability for accommodating intensive care patients evacuated from another site.

3. As lack of critical care capacity is frequently the bottleneck in other surge-events, managers and clinicians should have identified areas within their acute hospital sites to allow for expansion of critical care capacity. This may include use of operating theatres, recovery and augmented higher care areas, or upgrading Level 2 critical care areas to permit mechanical ventilation and Level 3 care.

4. If increased activity is anticipated, the increase in requirement for consumables should be quantified using the concept of 'days of supply' (i.e. what is needed to run one intensive care bed for a 24-hour period). This should include consideration of oxygen and air supplies.

5. Expansion may also require consideration of essential equipment and possible alternatives.

BACKGROUND

The objectives of surge and business continuity plans should be to deliver a resilient intensive care service, as well as to target efforts where the greatest return (mortality and morbidity avoidance) is likely, and to support clinicians by responding through clinical joint planning, information, intelligence, communication, resource identification, resource sharing, robust representation or other influences. Plans should also promote a consistent approach for resource-utilisation and mutual-aid options for intensive care services across all sites; this may be within one healthcare organisation, across single or multiple Critical Care Networks. Escalation processes should be coordinated through NHS England involving local area, regional and national teams[3,4].

Critical care capacity should not impact on front end services (e.g. ED) and the flow of non-critically ill patients by delaying the admission of critically ill patients. Internal escalation within a site or across a healthcare organisation should be maximised where appropriate to avoid unnecessary external escalation.

Communication and clinical response intelligence should be shared between clinicians and take place across sites to support sound decision making. This should involve use of existing sources of information such as NHS Pathways Directory of Services (DOS); this database can provide rapid identification of intensive care capacity across regions as required.

The benefits of business continuity planning ensure effective processes and responses are implemented to service delivery challenges, whether these are at a local, regional or national level.

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APPENDIX 3 PROCESS TABLE

STEP	TIME	ACTIVITY
1	Mar to May 2017	Early feedback from stakeholder organisations collected.
2	Jun 2017	Open survey sent to all FICM and ICS members and to stakeholder organisations.
3	Jul to Oct 17	Full review of feedback and discussion of forward plan.
4	Nov 2017	GPICS V2 author and chapter list approved.
5	Dec 2017 to Mar 2018	Authors create chapters.
6	Apr to Jul 2018	FICM and ICS review first chapter drafts.
7	Aug to Sep 2018	Stakeholder consultation. Over 400 comments received.
8	Oct to Nov 2018	Public consultation. Over 600 comments received.
9	Dec 2018 to Apr 2019	Editors complete final review of GPICS considering all comments and proof-reading requirements.
10	Apr to Jun 2019	Request to stakeholders for formal endorsement.
11	Jun 2019	GPICS V2 launched.

APPENDIX 4 LIST OF STANDARDS AND RECOMMENDATIONS

This appendix lists all standards and recommendations in GPICS separately from the narrative text and references for ease of review.

CHAPTER 1.1: LEVELS OF CARE	
Recommendations	
1.1.1	All patients admitted to a critical care unit must be included in a national clinical audit programme in which Levels of Care data are collected.
1.1.2	Level of Care classification must not be used in isolation to decide upon a patient's staffing requirements.

CHAPTER 1.2: OUTCOMES	
Standards	
1.2.1	Critical care units must hold multi-professional clinical governance meetings, including analysis of mortality and morbidity.
1.2.2	The unit must participate in a National Audit Programme for Adult Critical Care.
1.2.3	Critical care units must participate in a mortality review programme using appropriate methodology to maximise learning and improvements in care
1.2.4	Critical care units should participate in a programme of hospital-acquired infection surveillance to monitor and benchmark rates of catheter-related bloodstream infections, antimicrobial use, and frequency of multi-resistant infections.
Recommendations	
1.2.1	The UK intensive care community should encourage and develop a validated methodology to review referrals to intensive care and evaluate decision making and subsequent outcomes relating to intensive care admission and refusal.
1.2.2	Units should develop a consistent approach to patient-centred decision making, evaluating burdens and benefits of admission to intensive care, and be able to demonstrate this through the audit of pre-admission consultation, agreed ceilings of therapy, and time-limited treatment trials.
1.2.3	Longer-term mortality should be collected on all patients admitted to critical care
1.2.4	The UK intensive care community should encourage and develop validated measures of longer-term patient- and family-centred outcomes beyond mortality, including measures of functional ability, socioeconomic consequences, and carer burden.
1.2.5	The UK intensive care community should encourage and develop validated measures of quality of care relating to end of life and bereavement.
1.2.6	Critical care units should consider systematic assessment of patient and family experiences and demonstrate how these are used to guide improvement.

CHAPTER 1.3: LEVEL 2 AND 3 PHYSICAL FACILITIES	
Standards	
1.3.1	Critical care facilities must comply with national standards.
1.3.2	All new build units must comply with HBN 04-02.
1.3.3	Medicines and fluid storage must comply with HBN 00-03.
Recommendations	
1.3.1	Existing units that do not comply should have a timeline to establish when national standards will be met.
1.3.2	Depending upon the designated level, function, size and case-mix of the hospital and/or

	region that it serves, a critical care unit may range from 4 to over 50 beds. Large units should be divided into smaller units (e.g. 8-10 beds) to facilitate clinical care.[4]
1.3.3	The unit should have enough beds and resources to obviate the need to transfer patients to other critical care units for non-clinical reasons.
1.3.4	When planning or redeveloping a critical care area, Document HBN 04-02 should be considered with the following key stakeholders: i. Planning and design teams. j. Executive directors and senior managers of provider organisations, including estates directors and their staff. k. Clinicians from every profession working in, or in partnership with, the Critical Care area l. Infection control teams (see Chapter 4.12, Infection Control). m. All support staff employed within the critical care unit. n. Representatives of patients and their families. o. Manufacturers of information technology (IT), clinical and support equipment and furnishings. p. The medical engineering industry.
1.3.5	Critical care units should incorporate sufficient storage for medicines (including refrigerated and controlled drugs), IV fluids (including renal replacement) and enteral feeds. Storage areas/rooms should be secure and appropriately temperature controlled for all medicines. ICU designs also need to account for how selected medicines, including patient's own drugs, will be securely stored and readily accessible near the patient's bedside.
1.3.6	It is recommended that critical care areas that have undergone recent new unit planning and building are contacted by those embarking on a new build to share experiences and learning. The FICM and the ICS offer some guidance on 'what worked well' and 'what would you do differently' within their Critical Care New Builds guidance.
1.3.7	Additional factors that should be considered include potential noise and natural light levels, colour and decoration schemes, privacy and dignity needs, and staff and visitor areas. Consideration should also be given to the patient's recovery and rehabilitation needs, including the potential for long-stay patients to spend periods outside.
1.3.8	Critical care units should be inspected as part of the peer-review process, including the review of the building and facilities. Feedback should include any concerns or highlight any slippage to timeframes.
1.3.9	Failure to follow HBN 04-02 guidance should be questioned by both the Operational Delivery Network and commissioners.

CHAPTER 1.4: CLINICAL INFORMATION SYSTEMS	
Standards	
1.4.1	The CIS must comply with the set of common specifications, frameworks and implementation guides that support interoperability as specified within the NHS Interoperability Toolkit. (https://digital.nhs.uk/services/interoperability-toolkit).
1.4.2	CIS procurements and customisation must involve a multidisciplinary collaboration of all stakeholders who would typically use, maintain and develop the system. This must include input from end users (including representatives of all clinical staff groups), procurement officers, clinical engineering, the CCIO (Chief Clinical Information Officer) and ICT specialists.
1.4.3	The CIS must have a rigorous business continuity access (BCA) plan and resilience system so that critical patient information remains available and system downtime must not compromise patient safety in any way. There must be a process to ensure that sufficient staff trained in BCA contingency measures are available 24/7.

1.4.4	Where patient data management systems (PDMS) or electronic health record (EHR) systems are used, there must be access to a dedicated workstation computer at each bed space. An appropriate number of both mobile and fixed workstations must be available to facilitate timely patient care by medical, nursing and allied staff on ward rounds and on an *ad hoc* basis.
1.4.5	The CIS must have robust implementation and ongoing training programmes to support all staff in its clinical and management use. These should be provided by the NHS organisation in partnership with the vendor company. Due consideration should be given to how this training will be provided to new starters and locum staff. There should be a mechanism by which any specialty involved in the patient's care while on the critical care unit has access to all pertinent information and is able to document in such a way as to facilitate care. This is particularly important when critical care and hospital documentation systems are distinct.
Recommendations	
1.4.1	Critical care units should consider using a CIS.
1.4.2	CISs should be part of an electronic health record. The specification should include high-resolution data capture from patient monitoring, infusion devices, ventilators, cardiac output measurement, temperature management devices, intra-aortic balloon pumps, extra-corporeal life support (ECLS) devices, blood gas analysers and renal replacement therapy (RRT) devices. A CIS should be capable of customisable display of this information along with clinical notes.
1.4.3	The CIS should be connected to the hospital's patient information system for demographic and admission/discharge data, to laboratories for results, to radiology for reports and to other key software, e.g. National Critical Care Audit Systems and Hospital Electronic Prescribing and Medication Administration (HEPMA) for electronic data sharing. The CIS should be able to collect and share electronically Critical Care Minimum Data Sets (CCMDS) and national audit data to facilitate electronic generation of reports and audit. In the event of replacing an existing CIS, it must be possible to access archived patient records in a user-friendly format.
1.4.4	Investigation ordering should be fully integrated and recorded, and include electronic prescribing of drugs and fluids and ordering of laboratory and radiology services.
1.4.5	Daily summary plans should capture electronically activity data from the rest of the CIS, with the addition of free-hand text for healthcare professionals treating and visiting the patients.
1.4.6	The CIS should be capable of forming worklists for individual members of the critical care team to allow patient- and staff-based lists of tasks to be completed. The CIS should include the ability to alert when tasks are near due, due and overdue, and record and audit performance.
1.4.7	There should be a functionality within the database to alert, within a short timeframe, lack of compliance with care bundles and specifically for physiological abnormalities that are undesirable or life threatening. These alerts should be via dashboards displayed clearly within the unit and also via text or email to smartphones or notepad-type devices carried by healthcare staff.
1.4.8	The CIS should include a customisable transfer/discharge summary, pulling key information from diagnoses, intensive care management, clinical notes, labs and medication.
1.4.9	Flexibility through accessing care records online or through mobile devices should be possible.
1.4.10	The CIS should handle authentication and authorisation through Single Sign On, including the use of RFID/smart cards/biometrics.
1.4.11	The system should provide a capacity to evolve sophisticated electronic decision support

	systems, to facilitate patient safety and quality. The CIS should be capable of feeding data to other tele-health solutions for remote monitoring and advice on patient management.

CHAPTER 1.5: CLINICAL EQUIPMENT	
Standards	
1.5.1	All equipment must conform to the relevant safety standards, and must be regularly serviced and maintained in accordance with the manufacturer's guidance. Equipment must be checked immediately before use.
1.5.2	Uninterruptable power supply adequate to provide at least one hour of continuity of any critical equipment without battery back-up must be provided.
1.5.3	There must be a programme in place for the routine replacement of capital equipment.
1.5.4	All staff must be appropriately trained in and competent and familiar with the use of equipment. Up-to-date training records must be maintained to demonstrate that all staff (medical, nursing, AHP and support staff) have complied with this provision.
1.5.5	There must be an individual designated equipment clinical lead for intensive care whose responsibilities will include the assessment, procurement, use and replacement of equipment on the critical care unit in collaboration with the electro-biomedical engineering (EBME) provider and the organisation's overarching equipment governance framework.
1.5.6	EBME support must be available either in-house or on a contracted basis to ensure equipment is appropriately serviced. Regardless of the model of support, EBME personnel must have the appropriate skills and equipment to service the equipment used.
1.5.7	Equipment must be uniquely identified and listed on an appropriate asset register along with details of its life cycle and service history/requirements to facilitate planned maintenance and replacement.
1.5.8	There must be documented procedures for decontamination (cleaning, disinfection and sterilisation as appropriate, depending on equipment risk category and sensitivity of devices). Appropriate sterile services must be provisioned so that national standards are followed for the re-sterilisation of endoscopes and reusable.
1.5.9	Critical care units must have appropriate systems in place to ensure an adequate supply of consumables.
1.5.10	There must be a robust mechanism for reporting adverse incidents resulting from the use of clinical equipment. Serious incidents involving clinical equipment may also need to be reported to the Medicines and Healthcare Products Regulatory Agency (MHRA).
1.5.11	The MHRA may issue safety alerts pertaining to medical devices, as may device manufacturers from time to time. There must be a designated role and robust mechanism for ensuring that such alerts are cascaded to staff and acted upon as appropriate.
1.5.12	Sufficient equipment must be available to meet the service demand to enable treatment provision (basic and specialist monitoring, ventilation, renal replacement therapy, information technology facilities, etc.) in an appropriate timescale to meet patient need. Consideration must be given to the need to provide additional capacity in times of surge demand.
1.5.13	Magnetic resonance imaging (MRI) compatible equipment must be provided for use where mechanically ventilated patients are to undergo MRI investigation. These must be clearly labelled and staff must be adequately trained.
1.5.14	Where advanced monitoring techniques are used (e.g. diagnostic

	electroencephalography, cardiac output monitors, intracranial pressure/other invasive neuromonitoring), there must be provision of appropriately trained staff to adequately interpret the results in a timely manner and to deal with likely complications of their use where appropriate.
1.5.15	Immediate access to point of care blood gas analysis and glucose/ketone analysis on a 24/7 basis must be provided.
1.5.16	Where equipment is to be trialled on a loan basis for evaluation purposes, it is essential that adequate indemnity and governance arrangements are in place in case of injury to either patients or staff from potentially unfamiliar equipment, and the supplier should provide adequate training to ensure correct use. The EBME provider should facilitate this process by testing the equipment for safety as well as evaluating servicing and maintenance implications.
Recommendations	
1.5.1	Standardisation of equipment should be encouraged both within the critical care unit and in other areas where intensive care may need to be delivered.
1.5.2	The provision of diagnostic ultrasound equipment should be guided by the likely patient population and staff expertise. At very least, there must be immediate access to sufficient ultrasound equipment to ensure that intravascular catheters can be placed safely and in a timely manner, even in emergent circumstances.

CHAPTER 1.6: CARDIOTHRORACIC CRITICAL CARE	
Standards	
1.6.1	Consultant, nursing, resident medical, healthcare professional and pharmacy staffing must adhere to the standards outlined in the relevant staffing chapters of GPICS.
1.6.2	Each cardiothoracic critical care unit must have a designated lead consultant with training in cardiothoracic intensive care. This should be recognised in their job plan and they should be involved in multidisciplinary service planning and governance within the unit.
1.6.3	Each cardiothoracic critical care unit must have an identified lead nurse who is formally recognised with overall responsibility for the nursing elements of the service.
1.6.4	There must be a resident doctor or ACCP and a resident cardiac surgeon. There must be on-site 24/7 access to a doctor or ACCP with advanced airway skills. The resident team must be trained in Cardiac Surgery Advanced Life Support (CALS) and be capable of emergency chest re-opening 24/7.
1.6.5	Postoperative care pathways must be guided by appropriate protocols and delivered by trained personnel in a Level 3 clinical environment that complies with national standards. There should be a clear escalation pathway from post-operative care to intensive care.
1.6.6	The care of patients falling outside the protocolised care pathways must be reviewed by a multidisciplinary team led by a consultant trained in cardiac Intensive Care Medicine. Care of these patients must be guided by a management plan set during a structured bedside ward round. The consultant should not be covering a second specialty while undertaking this task. This consultant needs to receive an appropriate amount of information to make decisions. This requires the presence or input of other professionals to facilitate this process. This includes 7/7 input from nursing, microbiology, pharmacy and physiotherapy.
1.6.7	Ventilated patients must have a registered nurse/patient ratio of a minimum 1:1 to deliver direct care. A greater ratio than 1:1 may be required to safely meet the needs of some critically ill patients, such as unstable patients requiring various simultaneous nursing activities and complex therapies used in supporting multiple organ failure. A

	lower ratio is justified for the low acuity post-operative extubated patient.
1.6.8	Physiotherapy staffing must be adequate to provide the respiratory management and rehabilitation components of care.
1.6.9	There must be a critical care pharmacist for every cardiothoracic critical care unit, supported by sufficient pharmacy technical staff.
1.6.10	All cardiothoracic critical care units must participate in local and national audit. For example, for units in England, Wales and Northern Ireland, this is participation in the ICNARC ARCtIC (Assessment of Risk in Cardiothoracic Intensive Care) programme – the national clinical audit for cardiothoracic critical care units.
1.6.11	Transthoracic and transoesophageal echocardiography must be immediately available.
Recommendations	
1.6.1	The patient monitoring and physical support requirements in a cardiothoracic critical care unit should be no less than the requirements of patients cared for in a general (Level 3) critical care unit.
1.6.2	It is preferable that all cardiac and thoracic surgery and post-operative care be carried out in a dedicated environment with each component located in close proximity.
1.6.3	The cardiothoracic critical care unit should have in place agreed clinical criteria for the appropriate case-mix and arrangements for escalation to a general critical care facility as required.
1.6.4	ACCPs, with adequate training and appropriate support, can provide a safe, sustainable alternative to medical staff in the cardiothoracic critical care unit.
1.6.5	Each day, a consultant in charge of the cardiothoracic critical care unit should coordinate input from members of the various teams in the immediate post-operative period.
1.6.6	Perfusion services should be readily available.
1.6.7	Cardiothoracic anaesthetists and cardiothoracic surgeons should be integrated into the multidisciplinary nature of each cardiothoracic critical care unit and take an active part in shaping services and analysing quality. Patient mortality audit is currently in the public domain for each unit and each member of the MDT should have an understanding of how their own role contributes to patient outcomes.

CHAPTER 1.7: NEUROCRITICAL CARE	
Standards	
1.7.1	Consultant, nursing, resident medical, healthcare professional and pharmacy staffing numbers and work patterns must adhere to the same standards outlined in the relevant chapters of GPICS.
1.7.2	Neurocritical care units should have access to investigation facilities and appropriate clinical expertise for the following: d. diagnostic radiology (24-hour access to CT; access to MRI for ventilated subjects, and diagnostic angiography) e. access to biochemistry and microbiology services to analyse cerebrospinal fluid (CSF) f. neurophysiology (including electroencephalography [EEG] and evoked-response diagnosis and monitoring). Access to continuous 24-hour EEG monitoring is highly desirable.
1.7.3	All cases requiring immediate lifesaving neurosurgery must be admitted to the local neurosurgical centre irrespective of the initial availability of neurocritical care beds.
1.7.4	Patients with a Glasgow Coma Scale (GCS) score of ≤ 8 following a head injury at any time must have access to specialist treatment from a neuroscience unit.
1.7.5	As per NICE QS74, eligible patients must have assessment for in-patient rehabilitation if new cognitive, emotional, behavioural or physical difficulties persist for more than 72

	hours.
1.7.6	In addition to general rehabilitation, neurologically impaired patients must have access to specialist neuro-rehabilitation services.
1.7.7	Neurocritical care must have resources to support mechanical thrombectomy in line with NICE IPG 548.
1.7.8	Neurocritical care must have resources to support regional networks for the safe and timely management of patients with subarachnoid haemorrhage.
1.7.9	Patients must be cared for by a multi-professional intensive care team with specialist expertise and experience in managing critically ill neurological patients using agreed protocols based on the best evidence available.
1.7.10	Care of critically ill neurological patients must fully integrate involvement of admitting specialties (neurology, neurosurgery, spinal surgery), and diagnostic/interventional specialties (neuroradiology and neurophysiology).
1.7.11	When calculating cerebral perfusion pressure in the management of traumatic brain injury, the arterial transducer should be placed (levelled) at the tragus.
Recommendations	
1.7.1	Consultants providing out of hours care and advice should have regular timetabled sessions in neurocritical care.
1.7.2	Both the patient and family of the patient on neurocritical care should be offered support and guidance in the disease process and longer-term outcomes using specialist nurses and psychologists.
1.7.3	Multimodal monitoring of patients with neurological injury should be consistent with international consensus recommendations.
1.7.4	Early and formal involvement of the neurorehabilitation team as part of the multidisciplinary team should be sought to optimise outcomes and facilitate transitions of care.
1.7.5	Specialist equipment needs to be freely available to facilitate the acute rehabilitative needs of all brain and spinal injured patients while on neurocritical care.
1.7.6	Neurocritical care units must be part of a regional network of care, with agreed rational transfer and repatriation protocols that ensure rapid acceptance of patients for specialist care, and transfer back to referring hospitals or onwards for further specialist long-term care when the need for specialist neuroscience care no longer exists.
1.7.7	Follow up and audit of outcomes from neurocritical care should include a measure of functional recovery at a minimum of six months.
1.7.8	Regular neurocritical care morbidity and mortality meetings should be undertaken involving all members of the multidisciplinary team, including the admitting specialties, allowing structured judgement case review.
1.7.9	Patients requiring intensive care for acute neurosurgical and neurological diseases in non-specialist centres should have direct communication to expertise in specialist neuroscience centres.

CHAPTER 2.1: MEDICAL STAFFING	
Standards	
2.1.1	Patients' care must be led by a consultant in Intensive Care Medicine, who is defined as *"…. a consultant who is a Fellow/Associate Fellow or eligible to become a Fellow/Associate Fellow of the Faculty of Intensive Care Medicine. A consultant in Intensive Care Medicine will have daytime Direct Clinical Care Programmed Activities in Intensive Care Medicine identified in their job plan. These programmed activities will be exclusively in ICM and the Consultant will not be responsible for a second speciality at the same time."*

2.1.2	Consultant work patterns must deliver continuity of care.
2.1.3	The daytime consultant to patient ratio must not normally exceed a range between 1:8 and 1:12. This ratio is complex and needs to be cognisant of the seniority and competency of junior staff, the reason for admission (e.g. standard post-operative care pathway) and the number and complexity of emergency admissions. The night-time ratio cannot be defined.
2.1.4	The daytime intensive care resident to patient ratio should not normally exceed 1:8. The ratio may be need to be reduced if local arrangements dictate that the intensive care resident is expected to provide emergency care outside of the critical care unit (e.g. wards and emergency department). The night-time resident to patient ratio should not normally exceed 1:8.
2.1.5	All staff that contribute to the resident rota must have basic airway skills. All critical care units must have immediate 24/7 on-site access to a doctor or ACCP with advanced airway skills.
2.1.6	There must be a designated Clinical Director and/or Lead Consultant for Intensive Care Medicine.
2.1.7	A consultant in Intensive Care Medicine must be immediately available 24/7. The consultant responsible for intensive care out of hours must be able to attend within 30 minutes.
2.1.8	A small number of units that remain staffed overnight by an anaesthetic consultant without daytime ICM sessions, by a necessity dictated by the unit's size and remoteness, must also have a consultant in Intensive Care Medicine available for advice 24/7, either by local agreement or from within the Critical Care Network.
2.1.9	A consultant in Intensive Care Medicine must undertake ward rounds twice a day seven days a week.
2.1.10	The ward round must have daily input from nursing, microbiology, pharmacy and physiotherapy and regular input from dietetics, speech and language therapy, occupational therapy and clinical psychology to assist decision making. The nurse in charge should be present in person for the ward round.
2.1.11	Rotas for consultants and resident staff must be cognisant of fatigue and the risk of burnout.
Recommendations	
2.1.1	The consultant rota should seek to avoid excessive periods (> 24 hours) of direct patient consultant responsibility. A consultant rota with fewer than eight participants is likely, with the frequency of nights and weekends, to be too burdensome over a career.
2.1.2	The resident rota should be compliant with working time directives (i.e. Working Time Directive 2003).

CHAPTER 2.2: REGISTERED NURSING STAFF	
Standards	
2.2.1	Level 3 patients must have a registered nurse/patient ratio of a minimum 1:1 to deliver direct care.
2.2.2	Level 2 patients must have a registered nurse/patient ratio of a minimum of 1:2 to deliver direct care.
2.2.3	Each designated critical care unit must have an identified lead nurse who has overall responsibility for the nursing elements of the service e.g. a Band 8a Matron.
2.2.4	There must be a supernumerary (i.e. not rostered to deliver direct patient care to a specific patient) senior registered nurse who provides the supervisory clinical coordinator role on duty 24/7 in critical care units. Units with fewer than six beds may consider having a supernumerary clinical coordinator to provide the supervisory role

	during peak activity periods, e.g. early shifts.
2.2.5	Units with greater than ten beds must have additional supernumerary senior registered nursing staff over and above the supervisory clinical coordinator to enable the delivery of safe care (i.e. 11-20 beds +1, 21-30 beds +2, etc.). The number of additional staff per shift will be incremental depending on the size and layout of the unit (e.g. multiple pods/bays, single rooms). Consideration for the need of additional staff also needs to be given during events such as infection outbreak.
2.2.6	Each critical care unit must have a dedicated Clinical Nurse Educator responsible for coordinating the education, training and CPD framework for intensive care nursing staff and pre-registration student allocation. This should equate to a minimum of 1.0 WTE per 75 nursing staff.
2.2.7	All nursing staff appointed to intensive care must be allocated a period of supernumerary practice to enable achievement of basic specialist competence.
2.2.8	A minimum of 50% of registered nursing staff must be in possession of a post-registration academic programme in Critical Care Nursing.
2.2.9	Units must not utilise greater than 20% of registered nurse from bank/agency on any one shift when they are NOT their own staff.
2.2.10	Where direct care is augmented using support staff (including unregistered nursing roles), appropriate training and competence assessment of those staff is required.
2.2.11	In addition to leadership competencies the lead nurse/matron (terms are synonymous for this purpose) for the critical care unit must meet, as a minimum, the same specialist critical care nurse educational standards as the staff caring for Level 3 patients.
Recommendations	
2.2.1	Step 1 of National Competencies for Adult Critical Care Nurses should commence when a nurse with no previous experience of the specialty begins working in Intensive Care Medicine.
2.2.2	Steps 2 and 3 of National Competencies for Adult Critical Care Nurses should be incorporated into academic intensive care programmes.
2.2.3	Post-registration adult intensive care nursing courses should be awarded a minimum of 60 credits at Level 6. To meet the requisite standard, courses must adopt the core curriculum described in the National Standards for Critical Care Nurse Education (2016).
2.2.4	Additional Clinical Nurse Educators will be required for larger units, i.e. 1.0 WTE for approximately 75 staff. Clinical Nurse Educators should be senior intensive care nurses who have attained Step 3 competence, have completed a post-registration intensive care academic programme and be in possession of a post-registration teaching qualification.
2.2.5	Registered nurses supplied through an agency to work in intensive care should provide evidence of appropriate experience and competence to care for critically ill patients.
2.2.6	The Best Practice Principles to Apply When Considering Moving Critical Care Nursing Staff to a Different and Unfamiliar Clinical Care Area should be followed at all times to enable staff to achieve and maintain competence in intensive care nursing. The potential adverse effects on staff morale, recruitment and retention should be considered, particularly when this is recurrent. Executive Directors of Nursing should take requisite steps to minimise this.
2.2.7	Supernumerary clinical coordinators should have completed Step 4 competencies in addition to their post-registration academic programme in intensive care nursing.

CHAPTER 2.3: WORKFORCE, INDUCTION & TRAINING OF MEDICAL AND NURSING STAFF	
Standards	
2.3.1	Each critical care unit must have a dedicated supernumerary Clinical Nurse Educator (1 WTE per approximately 75 staff), responsible for coordinating the education and training and CPD framework for intensive care nursing staff and pre-registration students.
2.3.2	All nursing staff appointed to intensive care must be allocated a period of supernumerary practice to allow adequate time for registered nurses to develop basic skills and competencies assessed to ensure they can safely care for a critically ill patient.
2.3.3	All registered nurses commencing in intensive care must be working towards Step 1 of the National Competency Framework for Adult Nurses in Critical Care.
2.3.4	A minimum of 50% of registered nursing staff must be in possession of a post-registration academic programme in intensive care nursing.
2.3.5	Where direct care is augmented using non-registered support staff, appropriate training and competence assessment must be provided.
2.3.6	All non-consultant medical staff commencing a post in the critical care unit must have a consultant-led departmental induction to the unit with a formal published programme. This must take place prior to commencing any clinical duties, and must include, but is not limited to: h. Instructions on how to raise patient safety concerns. i. Instructions on how to raise issues of bullying and undermining. j. Introduction to key members of medical, nursing, allied professional and operational support staff. k. Highlighting key departmental guidelines and how to access all departmental guidelines. l. Explanation and distribution of the doctor's rostered work pattern, and their roles and responsibilities when rostered to work both during the daytime and out of hours. m. Arrangements for access to all IT systems, including passwords, provision of identification badges and tutorials on the use of any clinical IT systems on the day of induction. Assigning each doctor an Educational Supervisor.
2.3.7	There must be a regular (e.g. weekly), consultant-led teaching programme relevant to all non-consultant grade doctors. Time to attend this must be protected, with attendance mandatory for all non-consultant grade doctors rostered to be on duty. These sessions should be open to all members of the MDT.
2.3.8	There must be regular clinical governance, morbidity and mortality, and literature review meetings open to all members of the MDT. These meetings must be attended by both consultants and non-consultant grade doctors and non-consultant grade doctors must have the opportunity to lead the presentations at these sessions.
2.3.9	All consultants responsible for the educational supervision of trainees must be recognised by the GMC for this role and there must be a sufficient number of Educational Supervisors to allow a maximum supervisor to trainee ratio of 1:4. Supervisors must have adequate time identified in their job plans to meet their educational responsibilities.
2.3.10	All non-consultant grade doctors must have a bespoke personal development plan relevant to their developmental needs, and the doctor must be given the time and opportunity to achieve the objectives within the personal development plan as agreed with their Educational Supervisor.
2.3.11	All staff supplied through an agency to work in intensive care must provide evidence of appropriate experience and competence to care for critically ill patients.

Recommendations	
2.3.1	Clinical Nurse Educators should be in possession of a post-registration academic programme in intensive care and an appropriate postgraduate certificate in education or equivalent.
2.3.2	Nurse education programmes should follow the National Standards for Critical Care Education (2016) and include both clinical competence and assessment.
2.3.3	Study leave should be provided for all members of the MDT for intensive care-related courses and conferences.
2.3.4	A creative learning environment should be provided for all staff offering a range of learning experiences to meet the defined learning outcomes for their continuing professional development.
2.3.5	There should be a regular monthly forum chaired by a senior member of the department, where all members of the MDT can feed back any patient safety, educational or operational issues to the senior medical, nursing and management team.
2.3.6	The hospital and/or departmental library should provide access to relevant and up-to-date Intensive Care Medicine journals and books relevant to nursing, medical and AHP staff.
2.3.7	The critical care unit should provide access to online clinical resources from within the clinical area for all clinical staff.
2.3.8	All consultants should provide regular teaching and feedback to non-consultant grade doctors, nursing staff and allied health professionals.
2.3.9	There should be a regular multidisciplinary educational programme, including simulation involving medical, nursing and allied health professional staff.
2.3.10	Step 4 leadership competencies (or equivalent) (CC3N, 2018) should be completed by all senior nurses who undertake the role of shift leader (including those who lead partial teams in larger units) and those aspiring to such a role.
2.3.11	Specialist step competencies (CC3N, 2018) should be completed whenever relevant to the case-mix of the unit. For example, nurses working in critical care units in major trauma centres should complete the major trauma step competencies.

CHAPTER 2.4: ADVANCED CRITICAL CARE PRACTITIONERS	
Standards	
2.4.1	ACCPs must act within the formal code of conduct of their present statutory regulator. Trainee ACCPs are required to practice within the structure of the FICM curriculum, with the appropriate level of supervision.
2.4.2	Successful completion of the Non-Medical Prescribing module is an essential requirement of an ACCP. Those not eligible to prescribe will not meet FICM requirements for FICM ACCP membership.
2.4.3	ACCPs must acknowledge any limitations in their knowledge and skills and should not perform clinical activities they do not feel skilled or competent to perform. As part of their training and ongoing professional development, they must develop (and continue to develop) a high level of clinical judgment and decision making.
Recommendations	
2.4.1	A FICM-associated ACCP with supervision from an ICM consultant falls within the definition of an intensive care resident and may provide the onsite 24/7 immediate clinical/medical cover for patients.
2.4.2	An ACCP who entered a training post after 5 November 2017 should successfully complete an ACCP specific two-year Postgraduate Diploma (PgDip) which meticulously follows the FICM ACCP curriculum, and register with FICM as a trainee ACCP. ACCPs who

	entered training pre the above date should ensure their training programme adheres to the requirements of the FICM ACCP Membership criteria.
2.4.3	After successful completion of clinical and academic PgDip ACCP requirements, including Non-Medical Prescribing, ACCPs should apply to the FICM for ACCP Membership.
2.4.4	It is recommended that employing units should only appoint FICM-associated ACCPs to ensure a standard knowledge base, minimum skillset and that FICM ACCP curriculum competencies have been met.
2.4.5	While working autonomously, the ACCP will always work within a multi-professional team led by a consultant who is trained in ICM.
2.4.6	It is recommended that critical care units employing ACCPs have transparent ACCP standard operating procedures and outcomes, and that any incidents are reviewed as part of the unit's governance arrangements.
2.4.7	It is recommended that line management of ACCPs forms a tripartite arrangement between an ICM consultant, ICU clinical supervisor and professional lead such as a senior nurse or AHP from the ACCP's base profession.
2.4.8	Continuing professional development (CPD/appraisal) for ACCPs should be undertaken according to the FICM CPD/appraisal guidance on an annual basis.

CHAPTER 2.5: PHARMACISTS	
Standards	
2.5.1	There must be a designated intensive care pharmacist for every critical care unit.
2.5.2	The critical care pharmacist must have sufficient job time within which to do the job. There should be 0.1 whole time equivalent (WTE) pharmacist for every Level 3 bed and 2 for every Level 2 bed for a 5/7 a week service.
2.5.3	Clinical pharmacy services should be available seven days per week. However, as a minimum, the service must be provided five days per week (Monday-Friday) with plans to extend the ward service to seven days a week before 2020[5].
2.5.4	The most senior pharmacist within a healthcare organisation who works on a daily basis with critically ill patients must be competent to at least Advanced Stage II (excellence level) in adult critical care pharmacy.
2.5.5	Other clinical pharmacists who provide a service to intensive care areas and have the minimum competencies to allow them to do so (Advanced Stage I) must have access to an Advanced Stage II (excellence-level) intensive care pharmacist for advice and referrals.
2.5.6	As a minimum, the pharmacist must contribute to daily multidisciplinary ward rounds on weekdays (excluding public holidays).
2.5.7	There must be sufficient patient-facing pharmacy technical staff to provide supporting roles.
Recommendations	
2.5.1	To maintain the continuity of the service during annual leave, sick leave and training leave, additional appropriate resources will be required (20% minimum is recommended).
2.5.2	Intensive care pharmacists should undergo an independent, recognised process to verify competence level.
2.5.3	Senior specialist intensive care pharmacist support should, preferably, be provided within the organisation but may be provided from a critical care network or on a regional basis.
2.5.4	A peer-to-peer practitioner visit should occur at least once a year to ensure training issues are identified and to help maintain the competence of small teams and sole workers. This supports General Pharmaceutical Council (GPhC) revalidation.

2.5.5	Where a team of intensive care pharmacists is in place, there should be a structured range of expertise, from trainee to Fellow level.
2.5.6	Intensive care pharmacists are encouraged to become active independent prescribers.
CHAPTER 2.6: PHYSIOTHERAPISTS	
Standards	
2.6.1	Physiotherapists must participate in opportunities for integrated decision making and dissemination of clinical information. This may include handovers, consultant-led multidisciplinary ward rounds, MDT meetings, team briefings or operational and patient safety briefings.
2.6.2	The critical care MDT must have an identifiable lead physiotherapist who will be accountable for clinical service delivery, provide training and mentorship to junior staff, and oversee clinical governance and quality assurance.
2.6.3	All physiotherapy staff must receive appropriate capability-based training to ensure delivery of high-quality physiotherapy intervention within critical care. Training must extend to non-intensive care staff involved in out of hours/on-call cover.
2.6.4	Physiotherapy staffing must be adequate to provide the respiratory management and rehabilitation components of care, ensuring compliance with both clinical and professional guidelines and standards.
2.6.5	Respiratory physiotherapy must be available to critical care patients 24 hours a day and seven days a week. This includes the provision of an out of hours/on-call service which may utilise specialist and non-specialist intensive care staff[5].
2.6.6	Physiotherapists, as part of the multidisciplinary team, must ensure the completion of a comprehensive clinical assessment of those at risk of or with identified physical and non-physical morbidity within four days of admission to intensive care and before discharge from intensive care. This should include the collaborative setting of individualised, patient-centred rehabilitation goals.
2.6.7	Patients receiving rehabilitation must be offered therapy by the multidisciplinary team across a seven-day week, and of a quantity and frequency appropriate to each therapy in order to meet the clinical need and rehabilitation plan for an individual patient. Rehabilitation plans should be updated accordingly.
2.6.8	Physiotherapists must ensure a formal handover of care to the relevant ongoing physiotherapy team(s) following discharge from intensive care. This should include the holistic individualised structured rehabilitation plan.
Recommendations	
2.6.1	The service provision should be based upon the overall patient case-mix taking into account acuity, dependency and complexity of the clinical case-mix. Staff resources and capability should be appropriately matched both in knowledge, skills, and number to deliver comprehensive respiratory care and holistic rehabilitation. The suggested ratio would be one WTE physiotherapist to four ICU Level 3 beds. However, further work is recommended of paramount importance exploring demand-capacity models to robustly determine physiotherapy staffing ratios in intensive care.
2.6.2	Physiotherapy services should provide assessment and intervention for physical rehabilitation seven days per week.
2.6.3	The value and role of Therapy Support Workers or Rehabilitation Assistants should be considered as part of either the intensive care physiotherapy or multidisciplinary workforce.
2.6.4	Competency/capability frameworks should be in place encompassing all Agenda for Change (AfC) bands applicable to the local service. This should reflect relevant national

	competency and professional development frameworks. A local training and development programme should exist to align with these frameworks.
2.6.5	Clear role specifications should exist for intensive care physiotherapists who have reached the level of Advanced Practice according to the Health Education England Framework.
2.6.6	The intensive care physiotherapy service should have a clear local operational policy and core standards for service provision which reflects both national guidance and standards and local variations.
2.6.7	The intensive care physiotherapy service or, where appropriate, as part of the MDT, should have robust and evidence-based clinical guidelines/standard operating procedures surrounding airway clearance interventions and specialist rehabilitation interventions including early mobilisation of patients in intensive care.
2.6.8	The lead physiotherapist, or appropriate deputy, should participate in all relevant local (and where appropriate, regional) intensive care operational delivery, governance and quality improvement groups. This may include governance meetings, service improvement work-streams, morbidity and mortality review meetings, business continuity meetings, operational or clinical management meetings. This should also include active participation/collaboration with their regional Critical Care Operational Delivery Network.
2.6.9	The physiotherapy intervention(s), as part of the patient's individualised, structured rehabilitation plan, should be matched to the acuity, dependency and complexity of the patient, considering the patient's clinical needs and tolerance to intervention. This should align with the individualised, patient-centred rehabilitation goals and a holistic rehabilitation approach should be taken across a 24-hour period.
2.6.10	Physiotherapists should play a key collaborative role in the coordination and delivery of ventilation and tracheostomy weaning plans, including post-extubation and post-decannulation care. Additionally, physiotherapists should be a core part of the multidisciplinary delivery of non-invasive ventilation in intensive care.
2.6.11	Targeted airway clearance interventions should only be considered in selected patients when clinically indicated. Routine secretion clearance therapy for all invasively-ventilated patients is not recommended.
2.6.12	Where a local intensive care follow-up clinic/services exists, a physiotherapist should contribute to this service.

CHAPTER 2.7: DIETETICS	
Standards	
2.7.1	Critical care units must have access to dietitian five days a week during working hours.
2.7.2	There must be a dietitian as part of the critical care multidisciplinary team. If the critical care dietitian is working alone, they must be at the level of advanced practice. Where more than one dietitian is required, there must be an identifiable lead dietitian of advanced clinical practice level to ensure an appropriate range of expertise within the team and to have overall responsibility for the service provision.
2.7.3	Intensive care dietitian(s) must have satisfied local or national competency requirements and be able to undertake a nutrition assessment and implement an appropriate nutrition support plan for critically ill patients. If working at advanced clinical practice level, dietitians must be able to demonstrate application of the documented capabilities outlined in the multi-professional framework for advanced clinical practice in England.
2.7.4	Intensive care dietitian(s) must work collaboratively contributing to consultant-led ward rounds, MDT meetings, and have regular consultant communication where nutritional

	goals, risks and plans are discussed as per the Nice CG83.
2.7.5	Intensive care dietitian(s) must lead on the development and implementation of any local nutrition support guideline(s).
2.7.6	Intensive care dietitian(s) must contribute to appropriate strategic meetings and clinical governance activities, including leading regular nutrition-related audits and acting on the results, plus undertaking quality improvement projects that demonstrate the impact of dietetics on service delivery, quality and effectiveness.
2.7.7	Intensive care dietitian(s) must provide ongoing education and training for other healthcare professionals.
2.7.8	Intensive care dietitian(s) must provide a structured handover to a ward dietitian when patients are discharged from the critical care unit, considering nutrition-related morbidity as per the NICE Quality Standard.
Recommendations	
2.7.1	A staffing level of 0.05-0.1 WTE per critical care bed is recommended. This level is necessary to meet the capabilities expected of advanced clinical practice including the development of protocols and guidelines, teaching, audit, research and staff development as set out in Standards 3-10.
2.7.2	Intensive care dietitian(s) should consider extended scope practitioner roles such as inserting feeding tubes, using indirect calorimetry to determine energy expenditure and supplementary prescribing where appropriate.
2.7.3	Intensive care dietitian(s) should consider undertaking and disseminating nutrition-related research to widen the evidence base.
2.7.4	Intensive care dietitian(s) should consider joining national (Critical Care Specialist Group of the British Dietetic Association) and international intensive care and nutrition-specific societies (Intensive Care Society, European Society for Intensive Care Medicine, European Society for Parenteral and Enteral Nutrition, etc.).
2.7.5	Intensive care dietitian(s) should represent dietetics on national and international society committees and guideline development groups.
2.7.6	Intensive care dietitian(s) working at an advanced level should have or be working towards a master's level award.

CHAPTER 2.8: SPEECH AND LANGUAGE THERAPISTS	
Standards	
2.8.1	Critical care units must have access to a speech and language therapist five days a week during working hours.
2.8.2	All patients with a tracheostomy must have communication and swallowing impairment assessed by a Speech and Language Therapist.
2.8.3	All critically ill patients who have communication and/or swallowing difficulties (dysphagia) must have timely access to an SLT service.
2.8.4	All Speech and Language Therapists working in intensive care must be appropriately trained, competent and familiar with the use of relevant equipment.
Recommendations	
2.8.1	A minimum staffing level of 0.1 WTE (whole time equivalent) per bed is required in order to deliver a critical care Speech and Language Therapy service. A higher level WTE may be required dependent upon local case-mix, acuity, complexity, new initiatives or delivery of more than a five-day service.
2.8.2	Patients should have access to a communication aid according to individual need in order to facilitate patient interaction and rehabilitation.
2.8.3	Speech and Language Therapists should contribute to a suitable tracheostomy or non-invasive ventilation weaning plan for complex or long-stay patients.

2.8.4	SLT should be available for a minimum of five days a week, ideally seven days.
2.8.5	FEES should be available for Speech and Language Therapists to use in assessment and management of dysphagia in intensive care patients.
2.8.6	Speech and Language Therapists should work as an integral member of the multidisciplinary team on the critical care unit, contributing to all multidisciplinary ward rounds, tracheostomy teams, clinical governance groups, audit, research, education and policy development.
2.8.7	Swallowing and communication recommendations and treatment plans should be included in any medical handover when the patient is transferred from intensive care to another unit or ward.
2.8.8	Patients who are being considered for 'risk feeding' should have access to an SLT assessment in order to clarify their level of aspiration risk and optimum oral feeding consistencies.

CHAPTER 2.9: OCCUPATIONAL THERAPISTS	
Standards	
2.9.1	Critical care units must have access to occupational therapy services 5 days a week during working hours.
2.9.2	Patients receiving rehabilitation must be offered therapy by the multidisciplinary team, across a seven-day week, and of a quantity and frequency appropriate to each therapy in order to meet the clinical need and rehabilitation plan for an individual patient; rehabilitation plans should be updated accordingly.
2.9.3	All occupational therapy staff working in a critical care environment must adhere to the Royal College of Occupational Therapists' Code of Ethics and Professional Conduct (COT 2015) and the Professional Standards for Occupational Therapy Practice (COT 2017).
Recommendations	
2.9.1	There should be an identifiable lead occupational therapist with appropriate experience, who will be accountable for service provision and development.
2.9.2	The occupational therapy clinical lead should be responsible for supporting learning opportunities, training and clinical supervision for junior staff providing occupational therapy services in intensive care.
2.9.3	The critical care team should include a senior occupational therapist with sufficient experience to contribute to and develop rehabilitation programmes that address the complex functional, cognitive and psychosocial needs of the patient cohort.
2.9.4	Occupational therapy staff on the critical care unit should be able to assess and provide non-pharmacological treatment for those patients who present with delirium.
2.9.5	Occupational therapists should be involved in intensive care follow-up clinics to assess and facilitate appropriate referrals rehabilitation or specialist services and to address any long-term physical and non-physical impairment affecting occupational performance.

CHAPTER 2.10: PSYCHOLOGISTS	
Standards	
2.10.1	All patients must be screened daily for delirium using a validated instrument.
2.10.2	Non-pharmacological strategies must be in place to prevent and reduce delirium.
Recommendations	
2.10.1	Psychologists should ensure that delirium is accurately assessed by nurses using a validated instrument, and that when delirium is detected, risk factors are reviewed and

	corrected by the MDT. They should advise on non-pharmacological strategies to prevent and reduce delirium at the ward level (by improving the environment) and patient level (to facilitate orientation and engagement).
2.10.2	Psychologists should ensure that patients and relatives receive psychological education to explain the psychological impact of intensive care drugs, procedures and environment. This can be delivered in person or via information leaflets.
2.10.3	NICE CG83 and QS158 stipulate that patients should receive assessments and interventions for psychological as well as physical problems throughout the intensive care pathway. These should be delivered or supervised by qualified psychologists.
2.10.4	Psychologists should organise short psychological assessments for all awake, alert patients in intensive care using a validated measure such as the Intensive Care Psychological Assessment Tool.
2.10.5	If a patient is screened as being at risk of future psychological morbidity, psychological support should be offered by psychologists or other appropriately trained staff (e.g. nurses or psychology trainees) to give patients the opportunity to express their needs and feelings, and to have those feelings validated and normalised.
2.10.6	All patients found to be at risk of psychological morbidity (following the short assessment) should receive a comprehensive assessment before discharge from critical care. Psychologists should ensure that psychological needs, support and goals are included in the individualised structured rehabilitation programme that is formally documented and handed over at the time of transfer to general wards.
2.10.7	The psychologist should advocate (in conjunction with hospital outreach and mental health teams) for a system to be in place for at-risk intensive care patients to receive psychological support on general wards.
2.10.8	Psychologists should contribute to the information (verbal and written) patients and relatives receive to help them continue their personal rehabilitation plans and to know who to contact if they need support after leaving hospital.
2.10.9	Psychologists should participate in the follow-up reviews that intensive care patients receive in the community or at outpatient clinics.
2.10.10	As part of the critical care unit MDT, the psychologist should provide: d. Training for staff to increase knowledge and understanding of psychological reactions, delirium, environmental stressors and psychological outcomes of critical illness. e. Consultation with the multidisciplinary team on communication, sleep, effects of sedation, anxiety, stress, mood, delirium, family issues and holistic care plans. f. Psychological support for families. Relatives may need support to cope with the shock of a family member becoming critically ill and being admitted to the critical care unit, as well as stress and exhaustion from caring for a patient during a long-term admission. They may also need bereavement support if their family member dies in the critical care unit.
2.10.11	During patients' rehabilitation and recovery period, the psychologist should provide: e. Consultation with outreach and general ward staff regarding psychological support for intensive care patients. f. Tailored evidence-based interventions for persisting morbidity such as anxiety, depression or PTSD; these should be offered by psychologists in a well-resourced follow-up service and should include trauma-focused cognitive behavioural therapy. g. Where funding for the above is not available, referrals of patients directly to psychological therapy services, or recommendations for GPs to make referrals to these services, or advice to patients on how to access local psychosocial services

	h. Drop-in support groups for intensive care patients and their families after discharge from hospital, held in the hospital or community.
2.10.12	Employers have a duty of care to support staff working in a stressful environment such as intensive care, where burnout is highly prevalent. Workplace stress should be addressed at organisational, team and individual levels. Psychologists should consult with intensive care leadership on systemic issues influencing staff well-being. Additionally, psychologists should run or oversee staff support programmes including one-to-one sessions, drop-in groups or reflective rounds according to staff wishes and availability, as well as coaching sessions for senior managers.
2.10.13	To develop this coordinated service for patients, families, and staff, critical care units should employ a senior HCPC-registered practitioner psychologist. Large critical care units should have access to a WTE, and smaller units should have access to a psychologist with dedicated time for intensive care to deliver the points above.

CHAPTER 2.11: HEALTHCARE SCIENTISTS SPECIALISING IN CRITICAL CARE	
Standards	
2.11.1	Critical Care Scientists must comply with the professional standards of behaviour and practice set out in *Good Scientific Practice (GSP)*.
2.11.2	Critical Care Scientists responsible for management of medical devices and point of care diagnostic services must comply with the standards set by the Medicines and Healthcare Products Regulatory Agency (MHRA) and the International Organisation for Standardisation (ISO) standard (22870:2016).
2.11.3	Critical Care Scientists voluntarily registered with the Health and Care Professions Council (HCPC) must meet the Standard of Proficiency and comply with the Standards of Conduct, Performance and Ethics.
2.11.4	Critical care units receiving trainee healthcare scientists for training in intensive care must comply with the requirements for training set for them by the National School of Healthcare Scientist (NSHCS).
Recommendations	
2.11.1	The Critical Care Scientists should successfully complete an approved training programme, either via accredited specialist training or as part of the Scientist Training Program (STP) commissioned by the National School of Healthcare Science (NSHCS) and should be registered with the HCPC.
2.11.2	The Critical Care Scientists should work collaboratively to be a dynamic member of the multidisciplinary team, assisting in the provision of high quality, patient-centred care within the critical care environment.
2.11.3	The Critical Care Scientists should draw on specialist knowledge to provide advice to medical, nursing and wider multidisciplinary team working in a critical care setting about the safe and effective use of medical devices used within the critical care environment, including monitoring, diagnostic and therapeutic technologies supporting critically ill patients.
2.11.4	The Critical Care Scientists should develop and support research activities, including facilitating evidence based practice and Implementation of the latest technologies and software to the critical care environment.
2.11.5	The Critical Care Scientists should provide effective management and support for medical devices, including advising on optimal clinical settings and troubleshooting, resulting in focused, efficient and high-quality care.
2.11.6	The Critical Care Scientists should contribute to the educational needs of the multidisciplinary team, including delivering training, mentorship and educational

	support.
2.11.7	The Critical Care Scientists should demonstrate flexibility and adaptability to work across diverse pathways of patient care and clinical services that are both routine and highly specialised.
2.11.8	The Critical Care Scientists should work safely and effectively within their scope of practice and ensure they do not practise in areas where they are not proficient.
2.11.9	As part of the multidisciplinary team, the Critical Care Scientists should contribute to the strategic direction, planning and delivery of critical care services.
2.11.10	The Critical Care Scientists should engage with the Society of Critical Care Technologies (SCCT) as their professional body in order to work in collaboration with the Academy for Healthcare Science and the NSHCS.

CHAPTER 2.12: SUPPORT STAFF	
Standards	
2.12.1	All support staff must have clearly identifiable roles with specific competencies.
2.12.2	All support staff must have a period of induction and supernumerary status.
2.12.3	All support staff must be appropriately trained, competent and familiar with the use of equipment.
2.12.4	All support staff must be included within the intensive care team and be updated on key unit issues and developments.
2.12.5	Support staff roles must be clearly identifiable to colleagues, patients and visitors to the department, either by uniform and/or name badges.
2.12.6	Intensive care areas must develop healthcare support worker roles to assist registered nurses in delivering direct patient care and in maintaining patient safety.
2.12.7	Healthcare support workers must complete the Care Certificate and adhere to the Code of Conduct for healthcare support workers.
2.12.8	Administrative roles must be developed to ensure all clinical staff are free to give direct patient care, and supported with essential data collection.
2.12.9	Each intensive care area must have sufficient staff responsible for the cleanliness of the environment.
2.12.10	Where direct care is augmented using support staff (including unregistered nurses), appropriate training and competence assessment of those staff are required.
Recommendations	
2.12.1	All staff should be encouraged to attend further training and/or education to support their development.
2.12.2	Each critical care area should have healthcare support workers 24/7 to assist nursing staff in delivery of direct patient care.
2.12.3	Each critical care area should have ward clerk/receptionist cover seven days per week.
2.12.4	Each critical care area should have a dedicated housekeeper/cleaner seven days per week.
2.12.5	Each critical care area should have a data clerk or dedicated time allotted to a suitable member of staff for data entry to a nationally recognised audit programme (such as ICNARC or SICSAG) and responsibility for the validation of these data. The Intensive Care National Audit and Research Centre (ICNARC) 'advise that a unit with approximately 600 admissions a year need one full-time member of staff (or equivalent) to keep up with the demands of validation within the prescribed timescales for active participation'.

CHAPTER 2.13: SMALLER REMOTE AND RURAL CRITICAL CARE UNITS	
Standards	
2.13.1	Network support must be in place to ensure smaller, remote and rural critical units meet these standards and recommendations.
2.13.2	The critical care service must be led by consultants trained in Intensive Care Medicine (ICM).
2.13.3	There must be access to appropriate advice from a consultant in ICM at all times.
2.13.4	Dedicated daytime critical care must be provided by a consultant trained in ICM with no other commitments.
2.13.5	There must be a doctor or ACCP with advanced airway skills resident within the hospital 24/7.
2.13.6	There must be a 24/7 dedicated resident on the critical care unit.
2.13.7	There must be structured handover between day-time and night-time staff supported by standardised policies for practice.
2.13.8	Appropriate CPD must be supported by the employer and undertaken by all professionals who deliver intensive care.
2.13.9	Regional transport arrangements (road and air) must be put in place to allow timely, safe transfer of patients with an appropriate level of monitoring, staffing and skills.
2.13.10	All critical care units, including Level 2 units, must enter data into national databases such as ICNARC or SICSAG.
Recommendations	
2.13.1	Network support should be explicit, resourced and supported by all the Healthcare Organisations, Boards, networks and regions involved, and recognised in job planning.
2.13.2	Units should consider the development of telemedicine techniques for clinical decision making and educational support, in conjunction with their regional network.
2.13.3	Remote critical care units should implement appropriate joint clinical governance procedures with both networked units and transfer services to include case-based review, critical incident analysis, and joint educational sessions.
2.13.4	Where an intensive care pharmacist or healthcare professional, such as a physiotherapist or dietician, cannot be effectively delivered locally in a small unit, advice should be accessible from specialist colleagues through network support. Appropriate training bodies should devise and support remote and rural training posts in critical care.

CHAPTER 3.1: ADMISSION, DISCHARGE AND HANDOVER	
Standards	
3.1.1	The decision to admit to the critical care unit and the management plan must be discussed with the duty consultant in Intensive Care Medicine.
3.1.2	There must be documentation in the patient record of the time and decision to admit to critical care.
3.1.3	Unplanned admissions to the critical care unit must occur within four hours of making the decision to admit.
3.1.4	Patients must have a clear and documented treatment escalation plan.
3.1.5	Patients must be reviewed, in person, by a consultant in Intensive Care Medicine as urgently as the clinical state dictates and always within 12 hours of admission to critical care.
3.1.6	Transfer to other critical care units for non-clinical reasons must be avoided where possible.
3.1.7	Consultant in Intensive Care Medicine-led ward rounds must occur twice a day (including weekends and national holidays). The ward round must have daily input from nursing,

	microbiology, pharmacy and physiotherapy, and regular input from dietetics, SLT, OT and clinical psychology to assist decision making. The nurse in charge should be present in person for the ward round.
3.1.8	Patients discharged from critical care must have access to an intensive care follow-up programme which can include review of clinical notes, patient questionnaires to assess recovery and an outpatient clinic appointment two to three months' post hospital discharge if required for specific patients.
3.1.9	Discharge from critical care to a general ward must occur within four hours of the decision and must occur between 0700hrs and 2159hrs.
3.1.10	There must be a standardised handover procedure for medical, nursing and AHP staff for patients discharged from critical care units with a formalised transfer process. This must include their structured rehabilitation prescription. Units must monitor and review the causes for unplanned readmissions with a view to minimising their occurrence.
3.1.11	Patients undergoing specialist care must be repatriated to a healthcare organisation closer to their home when clinically appropriate to continue their rehabilitation, and this must occur within 48 hours of the decision to repatriate.

CHAPTER 3.2: CAPACITY MANAGEMENT	
Standards	
3.2.1	Hospital management teams must optimise the use of critical care capacity at all times. The admission and discharge of critical care patients must be prioritised, such that patients requiring critical care support are admitted without delay (within four hours after decision to admit and completion of essential resuscitation/imaging) and patients no longer requiring critical care are discharged within four hours.
3.2.2	The final decision on utilisation of critical care beds and staff (which includes moving staff to help in other areas of the hospital at times of need) rests jointly with the duty consultant and the duty nurse in charge of the critical care unit. Under no circumstances should clinical decisions be over-ridden by non-clinical operational management teams.
3.2.3	Critical care units must have documented escalation plans suitable for their hospital facilities and must audit and review the usage of these plans.
3.2.4	Hospital boards must demonstrate regular oversight of the use of critical care escalation and the provision of intensive care outside of the critical care unit.
3.2.5	Escalation plans must balance risks of non-clinical transfer against risk of care outside of the critical care unit.
3.2.6	Escalation plans must differentiate between escalation during 'normal' operation and escalation during major incidents or pandemic scenarios.
3.2.7	Regional Intensive Care Networks must have escalation plans documented and agreed at medical director and chief executive level to allow the duty intensive care consultants and duty nurses in charge to coordinate the usage of intensive care beds across the network.
3.2.8	Regional pandemic escalation plans must include trigger levels for agreed critical care admission criteria and thresholds for restriction of planned activity to assist neighbouring critical care units.
3.2.9	Regional Intensive Care Networks must have an agreed policy on escalation of care and repatriation between secondary and tertiary units to include escalation and, if required, prioritisation of transfers over local elective activity.
3.2.10	Regional Intensive Care Networks must ensure that a system to record capacity across the network is in use, and that this is updated regularly.
3.2.11	Transfer to other critical care units for non-clinical reasons must be avoided where possible.

Recommendations	
3.2.1	Critical care units should determine the emergency capacity they require to meet Standard 1 locally, based on their admission and occupancy data. The capacity to cope with the predicted emergency workload can then be managed by ensuring an appropriate number of beds available for emergency admissions before accepting elective admissions.
3.2.2	Acute hospitals will require at least one critical care bed per 35 acute hospital beds; hospitals undertaking a large amount of complex major surgical procedures are likely to need significantly more than this.
3.2.3	Training should be provided to nursing staff in areas used for critical care escalation.
3.2.4	When using alternative areas of the hospital to provide critical care capacity, there should be adequate senior nursing and medical input such that the standards of care provided to those patients meet the standards provided to the patients within the critical care unit.
3.2.5	Decisions to proceed with major elective surgery should take into account current occupancy, provision of emergency capacity over the next 24 hours and, at times of regional network escalation, the emergency capacity in neighbouring units.
3.2.6	Critical care units may find it useful to develop a statistical model locally that provides predictable data on the number of emergency admissions they should plan to accommodate in each 24-hour period, and use this model to assist decision making on when it is safe to proceed with planned elective work.

CHAPTER 3.3: CRITICAL CARE OUTREACH AND RAPID RESPONSE SYSTEMS	
Standards	
3.3.1	There must be a hospital wide, standardised approach to the detection of the deteriorating patient and a clearly documented escalation process.
3.3.2	All hospitals must use a validated track and trigger early warning score system that allows rapid detection of the signs of early clinical deterioration in all non-pregnant adult patients over 16 years. The National Early Warning Score (NEWS-2) is the recommended for call systems as the more efficient and effective. Using a common score ensures that staff operate the same language across the patient pathway and enhances the benefits of an early warning system. As part of a multi-trigger system, other triggers such as urine output/ acute kidney injury alerts, cause for concern and patient/carer *Call for Concern*, should be considered as they will enhance the recognition of the deteriorating patient.
Recommendations	
3.3.1	Each hospital should have a graded clinical response strategy consisting of three levels: low, medium and high. Each level of response should detail what is required from staff in terms of observational frequency, skills and competence, interventional therapies and senior clinical involvement. It should define the speed and urgency of response, including a clear escalation policy to ensure that an appropriate response always occurs and is available 24/7.
3.3.2	Each organisation should ensure patients receive care from appropriately trained critical care outreach, rapid response or equivalent teams. The critical care outreach (CCO)/Rapid Response staff should have annual competency-based assessment of core and additional specific competencies from a local or regional programme. This should

	relate to first line clinical assessment and intervention, be clearly outlined and closely reflect the Department of Health (DH) competencies for the recognition and response to the acutely ill patients in hospital.
3.3.3	There should be accessible educational support for registered and non-registered ward staff in caring for the acutely ill ward patient in line with recorder and first responder level as outlined in the DH competencies for the recognition and response to the acutely ill patients in hospital. Staff looking after Level 1 and enhanced care area patients should be trained following the National Competency Framework for Level 1 and Enhanced Care Areas.
3.3.4	Organisations should aim to deliver Comprehensive Critical Care Outreach as outlined by the seven core elements and have an operational policy that defines the remit of the CCO/Rapid Response or equivalent team within the organisation, in regard to these seven core elements.
3.3.5	All patients should be reviewed by the CCO team (or equivalent) following discharge from the critical care unit to the ward.
3.3.6	All CCO teams should participate in the National Critical Care Outreach Activity Outcome Dataset. In addition, each organisation should develop audit tools to assess utilisation of their track and trigger and graded response system with clear governance procedures for action of poor compliance healthcare organisation-wide. This should be undertaken in combination with an audit of compliance against the standards within NICE CG50 and must be fed back to healthcare organisation Boards and Critical Care Networks where relevant.
3.3.7	Each hospital should be able to provide a CCO/rapid response team, or equivalent, that is available 24 hours per day, seven days a week. There should be regular review of service provision to facilitate proactive approaches in order to match service configuration against local demands and activity. These should be reflected in the operational policy. There should be a nominated lead of service at healthcare organisation Board level with appropriate communication cascade.

CHAPTER 3.4: INFECTION CONTROL	
Standards	
3.4.1	Staff must follow safe insertion and maintenance procedures for intravascular and urinary catheters, and remove them when not required to minimise the risk of infection.
3.4.2	Infection control procedures must be documented and agreed by the multi-professional team.
3.4.3	The WHO *Five Moments of Hand Hygiene* must be observed. Hand contamination is often due to contact with the environment rather than directly with the patient.
3.4.4	Cleaning of the environment must be undertaken by trained staff and subject to audit and quality control, with particular attention to high-contact surfaces. Duties of cleaning and nursing staff, in cleaning specific surfaces, should be clearly defined.
3.4.5	There must be surveillance systems in place for audit and feedback of nosocomial infection, reporting to the national scheme where applicable, for example, reporting central venous catheter-related bloodstream infection to the Public Health England Infection in Critical Care Quality Improvement Programme ICCQIP).
3.4.6	The principles of antibiotic stewardship must be adhered to in consultation with the microbiology team.
Recommendations	
3.4.1	Patients should be screened for carriage of MRSA and/or carbapenemase-producing organisms according to locally determined prioritisation. Sensitivity of risk factor algorithms is generally low and universal screening is preferable in highly endemic regions.

3.4.2	Patients with MRSA carriage or infection should receive topical suppression to reduce shedding and, if possible, single-room isolation.
3.4.3	Patients with diarrhoea and airborne infections should take precedence over others in allocation of single-room isolation. Patients with suspected or confirmed influenza should be placed in single rooms appropriate for respiratory isolation[5].
3.4.4	Design of new units should include infection control specialists as part of the planning team. In particular, the bed spacing, proportion of single rooms and provision of sinks should be considered according to patient case-mix, national guidelines and prevalence of multi-resistant infections.
3.4.5	The intensive care team should have access to an infection control and prevention team led by a microbiologist who can offer timely review and advice. Ideally, this should be part of timetabled microbiology rounds during the week. The microbiologist will advise on the choice and duration of antimicrobial chemotherapy in accordance with local formularies as a part of antibiotic stewardship.
3.4.6	Infection control nursing staff or intensive care nurses with infection control training should be available to provide day-to-day advice on prevention of spread of infection, isolation priority and procedures and decontamination. Allocation of patients to single-room isolation for known or suspected infection should be reviewed on admission and frequently thereafter.
3.4.7	There should be a means of continuous improvement in infection prevention and control, for example using surveillance and feedback.

CHAPTER 3.5: INTERACTIONS WITH OTHER SERVICES	
Standards	
3.5.1	There must be daily input from microbiology.
3.5.2	There must be local antimicrobial prescribing guidelines in accordance with the principles of antimicrobial stewardship.
3.5.3	Clear protocols must be in place for management of massive haemorrhage including the role of laboratory services.
3.5.4	Acutely ill patients must have access to diagnostic radiology services at all times including timely access to a radiologist.
3.5.5	All imaging investigations must be reported within an agreed timeframe relevant to the investigation by someone appropriately trained. All imaging investigations need to be accompanied by a formal, permanently recorded report covering the entirety of the investigation.
3.5.6	There must be seven-day availability of radiology services, appropriate to the specialties being cared for, to allow timely investigation of critically ill patients. This would include, for example, ultrasound and CT-scanning to aid sepsis diagnosis and source control; and in neurocritical care units, access to interventional neuroradiology.
Recommendations	
3.5.1	Microbiology advice should be from an adequately senior clinician, and onsite, face-to-face interaction is encouraged.
3.5.2	Critical or unexpected results of clinical pathology, microbiology or radiological investigations should be actively communicated to a responsible clinician according to local fail-safe policies.
3.5.3	Urgent clinical chemistry and haematology advice should be available within 60 minutes from an appropriate specialist and a radiologist should be immediately contactable to support the management of acutely ill patients at all times.
3.5.4	All point of care laboratory devices used to assist clinical decision making should be subject to appropriate quality assurance mechanisms, agreed by laboratory

	and end users.
3.5.5	Clear protocols for access to radiology services that are not available on site (e.g. interventional radiology, MRI in ventilated patients) should be available.
3.5.6	Liaison psychiatry services should be available in all acute hospitals with a single point of referral. Emergency mental health referrals should be seen within one hour of referral and urgent mental healthcare referrals within 24 hours of referral (within the liaison team's usual operating hours).
3.5.7	Patients who have self-harmed, irrespective of the apparent motivation, should have a comprehensive psychosocial assessment. This should generally be the responsibility of the liaison psychiatry service and should not be delayed until after medical treatment is complete unless life-saving treatment is necessary, or the patient is unconscious or otherwise incapable of being assessed.
3.5.8	Liaison professionals should be available to advise on issues around mental capacity and there should be working arrangements detailing who is responsible for assessing patients who may need to be detained under mental health legislation.

CHAPTER 3.6: REHABILITATION	
Standards	
3.6.1	The rehabilitation needs of all patients must be assessed within four days of admission to intensive care (or on discharge if sooner) and a rehabilitation plan outlined by all relevant therapy professions as clinically indicated; depending on illness acuity this may initially focus broadly on minimisation of harm and avoidance of morbidity, followed by more specific rehabilitation strategies. Where feasible and appropriate, rehabilitation goal setting should involve the patient.
3.6.2	Patients receiving rehabilitation must be offered therapy by the multi-professional team across a seven-day week and of a quantity and frequency appropriate to each therapy, in order to meet the clinical need and rehabilitation plan for an individual patient. Rehabilitation plans should be updated accordingly.
3.6.3	All patients must be screened for delirium at least daily, and when changes or fluctuations in behaviour occur; in the event of a positive delirium screen, family should be informed, strategies to facilitate patient orientation implemented and medical review of risk factors completed.
3.6.4	All patients with a tracheostomy must have communication and swallowing impairment assessed by a Speech and Language Therapist.
3.6.5	Patients who stay in critical care for more than four days and are at risk of morbidity must have their ongoing rehabilitation needs addressed at post discharge follow-up, or in the community setting, at two to three months after discharge from critical care. At this point, additional referrals to any necessary services can be made.
3.6.6	Adults at risk of poor quality recovery must have an individualised rehabilitation plan documented in their formal handover of care when transferred from critical care to a general ward. All members of the care team must be aware of this. Patient involvement in setting this rehabilitation plan should occur as soon as feasible and appropriate.

3.6.7	Adults who were in critical care and at risk of poor quality recovery must be given information to explain what they can do to help their recovery. This information should be provided, at the latest, before discharge from hospital.
Recommendations	
3.6.1	Physiotherapy services should provide assessment and intervention for both acute respiratory and physical rehabilitation seven days per week; provision should be made for other therapy services to be provided as needed at weekends.
3.6.2	Specialist rehabilitation co-ordinator roles should be considered to facilitate the oversight of the rehabilitation pathway for patients, and to ensure that assessments, referrals and documentation are completed and transferred to ongoing services and teams.
3.6.3	The role of therapy support workers or rehabilitation assistants should be considered as part of the rehabilitation team; these roles may be uni-professional or multi-professional in nature and recruited from nursing or allied health backgrounds. These may enable enhanced delivery and increased efficiency of rehabilitation service delivery, as well as ongoing rehabilitation to be delivered following discharge from critical care. Further work is required to determine the appropriate grading of these roles.
3.6.4	Rehabilitation outcomes should be monitored and progression made using outcome measures appropriate for the stage of recovery, individual therapy, and dependent on local resources (including personnel, equipment, and finance).
3.6.5	The rehabilitation plan that forms part of the handover of care on discharge from critical care should address all relevant domains for individual patients including, but not restricted to, physical, functional, communication, social, spiritual, nutritional and psychological.
3.6.6	To facilitate the rehabilitation component of the formal handover of care on discharge from critical care to a general ward, weekly multidisciplinary rehabilitation ward rounds should be led by a senior member of the critical care multi-professional team and result in an update to the rehabilitation goals. These should be set in conjunction with the patient and/or carer where appropriate.
3.6.7	Expectations of both patients and families should be identified regularly and addressed in a consistent manner by the most appropriate senior member of the team; all patient and family communication should be centrally documented to ensure that it can be accessed easily by all team members.
3.6.8	For high-risk/complex patients, capturing the experience for the patient and family in a manner that they can reflect upon and engage with during the time spent in hospital should be considered. This may take the form of diaries, either paper or electronic, and may include photos, videos and written information. This material may be collected prospectively or retrospectively depending on the desire of patient and family.

CHAPTER 3.7: FOLLOW UP	
Standards	
3.7.1	Patients with higher risk of morbidity related to critical illness must be given information about ongoing rehabilitation goals in the community.
3.7.2	Patients discharged from the critical care unit must have access to an intensive care follow-up programme which can include review of clinical notes, patient questionnaires to assess recovery and an outpatient clinic appointment two to three months' post hospital discharge if required for specific patients.
Recommendations	
3.7.1	The follow-up programme should be formally and clearly communicated to the patient and their relatives on discharge from critical care, and again on discharge from hospital.

	Primary care should also be informed through the discharge summary.
3.7.2	The follow-up programme should ensure the delivery of structured and supported self-directed rehabilitation to all patients at critical care discharge and at hospital discharge.
3.7.3	A minimum 20-30 minute follow-up appointment should be offered two to three months after hospital discharge if appropriate. The follow-up team should include an intensive care consultant, intensive care nurse, clinical psychologist, physiotherapist, dietician and occupational therapist according to the individual patient's needs.
3.7.4	Selection of patients for follow up should be based on length of stay (more than three days) or at increased risk (e.g. following anaphylaxis, or post-partum intensive care). Self-selection of patients should also be facilitated.
3.7.5	Follow up should involve actively seeking common physical sequelae, such as weakness, weight loss and sexual dysfunction, and the consequences of critical care unit-related procedures (e.g. tracheostomy).
3.7.6	Review of current medication should be performed and rationalised with input from pharmacy if required.
3.7.7	Psychological sequelae (such as anxiety, depression, nightmares and post-traumatic stress disorder) should be sought via screening tools e.g. Hospital Anxiety Depression Scale (HADS), and UK Post Traumatic Stress Syndrome score (UK PTSS-14). This could be facilitated by review of clinical notes with patients and family or patient diary, use of screening questionnaires and review by a clinical psychologist.
3.7.8	Following structured review, appropriate referrals to other services may be required and should be arranged where required.
3.7.9	A bereavement follow-up service should be offered where explanations of diagnoses, treatments and support can be provided.
3.7.10	The establishment of a critical care patient and relatives support group should be encouraged.
3.7.11	Patients and relatives should be surveyed regularly and this information should be utilised to assess rehabilitation and follow-up services.

CHAPTER 3.8: THE PATIENT AND RELATIVE PERSPECTIVE	
Standards	
3.8.1	All patients must be regularly assessed for the presence of pain which should be managed with a protocolised multimodal analgesic regimen. The effects of delirium must be explained to patients and their families and this should be emphasised in follow-up visits post critical care. Written information about delirium must be provided.
3.8.2	When patients are sedated or unconscious or have delirium and require any intervention or nursing care, staff must explain to them in simple terms what they are doing. These patients need frequent and repeated reorientation (time of day, reminding that they are in hospital, etc.) as they may be confused and find it difficult to retain information.
3.8.3	Critical care staff must offer patients ways to help improve the quality of their sleep, for example eye masks and ear plugs. Staff must try to minimise light and noise during the night.
3.8.4	Patients and families must be given high quality verbal and written information while the patient is in critical care (such as information about the patient's treatment, what the patient might experience and how they might feel) and when they leave the unit (to help explain what has happened to the patient and what might help them in their recovery). Each unit must have such documents readily available and ready for patients and relatives. Young visitors and their parents will need specific support.
3.8.5	Patients must be given help to communicate (e.g. speaking valves (for patients with a tracheostomy, wipe boards or flash cards). Speech and language therapists can help

	patients with more complex communication needs, and technology to help communication may be used. Critically ill patients also need effective communication; this needs to be simple to understand, repeated frequently and appropriate to their needs. Staff need to check patients' comprehension and not assume information has been understood or retained. Relatives should be encouraged to talk with patients as a familiar voice will provide comfort and reassurance.
3.8.6	Critical care units must have policies about how to safeguard vulnerable adult patients.
3.8.7	Units must obtain regular feedback about the care that patients and relatives received during their critical care admission in order to learn from and act on the feedback received.
Recommendations	
3.8.1	Intensive care patients should have a patient diary. Intensive care patients have an increased risk of developing post-traumatic stress disorder (PTSD), anxiety and depression, and the provision of a patient diary has been shown to reduce the incidence. Staff and relatives should be encouraged to write in the diary. Units may find it helpful to have a designated Patient Diary Lead to help with their implementation.
3.8.2	Understanding the individual who has become critically ill is important to help their treatment and recovery. A 'This Is Me' board or document for each patient is very beneficial and should be used if possible. This can have information about a patient's character and preferences, photographs of them at home, what they like to be called, if they are hearing or visually impaired, and their interests or hobbies. This helps staff know more about the patient and about their lives before intensive care. This will help with their care and rehabilitation, and is comforting for the patient.
3.8.3	Intensive care and ward staff should have training in what intensive care is like for patients and relatives and what challenges patients face while in intensive care and during their rehabilitation. Asking former patients and relatives to help with this training is beneficial.
3.8.4	Intensive care staff should let relatives know how they can help the patient, for example by talking to or reading to the patient (even if the patient is unconscious or sedated), as a familiar voice can be reassuring. Relatives should also be allowed to help with simple aspects of caring for the patients, if they would like to, such as applying hand cream or brushing hair. Written information should be provided for relatives.
3.8.5	Intensive care staff should spend time talking to the patient and relatives, seeing how they feel, asking about any worries they have and checking their understanding of any information that has been given. Clear information should be given to relatives regarding when they can visit.
3.8.6	A room should be provided for relatives to wait in or have time away from the unit. This room should be comfortable and its facilities regularly reviewed. Feedback should be sought from families whether additional facilities and support are required.
3.8.7	On discharge from the critical care unit, patients should be given the contact details of the healthcare professionals who are co-ordinating the patient's rehabilitation pathway.
3.8.8	The step down from the critical care unit to a ward is often a stressful time for intensive care patients and their families. All patients should be visited by a critical care outreach

	team, who can help with this transition. They can screen for ongoing post intensive care issues and provide support and information to the patient, relatives and ward team.
3.8.9	Intensive care patients should have access to formal support provided by the critical care service after they leave. This could be a follow-up service, a support group or another equivalent initiative. These services provide vital support to the patient and their family during the long rehabilitation period. A follow-up service provides a telephone number for patients and relatives to call if they have any concerns, offers a follow-up meeting once the patient is discharged, and referrals and additional support as required. A support group consists of former patients and relatives and healthcare professionals who meet and talk with newly discharged patients and relatives.
3.8.10	Critical care units should provide relatives of patients who died in intensive care the opportunity of a follow-up meeting with an ICU staff member to discuss any questions they may have about their relative's time on the unit. Families may be given a leaflet after their relative dies in order that they can arrange a meeting at a later date if they wish to. It can also include other sources of support. Some units hold memorial services for relatives.

CHAPTER 3.9: STAFF SUPPORT	
Standards	
3.9.1	All units must have policies in place to support staff engagement and retention.
3.9.2	Induction and escalation policies must be clearly identified for all staff groups.
3.9.3	100% of new staff must receive a job-specific induction to the unit.
3.9.4	Workplace equity within staff groups must be transparent (e.g. rostering, annual leave policies, job plans). Staff must be aware of the policies.
3.9.5	Staff well-being is an organisational priority. Units must monitor and regularly review metrics of staff well-being as quality indicators (e.g. sickness rates).
3.9.6	All staff must have opportunities for personal development reviews including annual appraisals.
3.9.7	All staff working in critical care must be able to access the Freedom to Speak Up Guardian.
3.9.8	Staff must be provided with adequate resources consistent with other GPICS standards to deliver their job role, e.g. adequate staffing ratios, access to facilities for nutrition and hydration, adequate equipment.
3.9.9	Staff rostering must comply with Health and Safety Executive recommendations for sleep and rest.
3.9.10	Units must provide adequate workplace facilities for staff breaks, which are separated from areas for relatives.
Recommendations	
3.9.1	All staff engaged in a managerial or leadership role should have access to appropriate mentoring and/or coaching services to support them in their role.
3.9.2	All units should promote healthy rest and sleep policies for staff required to work overnight.
3.9.3	All staff members should have access to an independent, professional psychological support service, which provides counselling services.
3.9.4	All staff members should have self-referral access to an occupational health service and rapid access physiotherapy services.
3.9.5	All units should provide frequent opportunities for shared learning, clinical communication, and reflection, to reduce professional isolation. This includes routine

	clinical practice (e.g. multidisciplinary rounds, mortality and morbidity meetings), as well as specific reflective events (e.g. Schwartz Centre Rounds, debriefing following medical emergencies).
3.9.6	All staff should have ergonomic clinical work areas with appropriate access to light and control of noise.
3.9.7	All staff should be supported to maintain a healthy lifestyle, e.g. provision of advice on diet and exercise.
3.9.8	All units should conduct regular (at least annual) reviews of organisational policy on staff health and well-being.

CHAPTER 3.10: INTER AND INTRA HOSPITAL TRANSFER	
Standards	
3.10.1	Transfer to other critical care units for non-clinical reasons must be avoided where possible.
3.10.2	Appropriate equipment must be available to undertake a safe transfer and to manage complications/adverse events which may occur during a transfer. All equipment used for patient transfers must conform to the relevant safety standards, be regularly serviced, and checked immediately before use.
3.10.3	All staff involved in a patient transfer must be trained, competent and familiar with the use of equipment. Patients must only be transferred by staff members of appropriate seniority who have been formally trained in the transfer of critically ill patients. Air transfers should only be conducted by staff who have received specific training and experience. The makeup of the team transferring the patient should be determined by how sick the patient is, and how much support they require. Protocols should be in place to manage likely or serious adverse events which may occur during a transfer.
3.10.4	Where patient transfers result in a change of team managing the patient during or following a transfer, an appropriate and documented handover must be undertaken between the teams to ensure good continuity of care. This should include providing copies of the clinical record.
3.10.5	A named intensive care consultant must take overall responsibility for the decision to transfer a patient and the level of support required, but does not necessarily have to undertake the transfer.
3.10.6	Inter-hospital transfers must be undertaken in a timely fashion according to the patient's clinical condition.
3.10.7	For inter-hospital transfers, there must always be a named consultant who will take responsibility for the patient on arrival at the receiving hospital. This must be agreed prior to the transfer being undertaken.
3.10.8	Where patients have completed specialist care and ongoing intensive care needs can be provided in the patient's home, hospital transfer must take place within 48 hours of referral to the receiving hospital.
Recommendations	
3.10.1	Transfers should follow the advice and protocols presented in the latest ICS transfer guidance**.**
3.10.2	The reason for any transfer should be documented in the patient's notes. This should include an assessment of potential benefits against risks. Transfer decisions should only be made by consultant intensive care team members, and this information should also be documented.
3.10.3	An adequately stocked and regularly checked, dedicated transfer bag should be available for use during all patient transfers. This bag should contain appropriate drugs and equipment for interventions that might be required in transit. The transfer bag

	contents should be checked routinely (ideally daily and a log of checks maintained) or, if sealed with a tag, then a daily check that the seal is unbroken. The transfer bag must be restocked between uses to avoid delays when it is needed. Staff carrying out patient transfers should be familiar with bag layout and content.
3.10.4	The patient's vital signs should be documented at appropriate intervals while in transit. Where possible, action should be taken to remedy any physiological deterioration during the transfer.
3.10.5	Standardised transfer documentation should be completed for all intensive care patient transfers. Transfer documentation should be scrutinised within a robust audit system, allowing eventful or substandard transfers to be investigated and lessons learnt to be shared widely, as well as numbers and reasons for transfers.
3.10.6	Where an adverse event occurs during a transfer, this should be reported and investigated using the healthcare organisation incident reporting system at the transferring unit. All learning should be widely shared.
3.10.7	Every acute healthcare organisation should have a designated consultant and nurse who are responsible for maintaining standards of transfer of critical care patients, guideline production, training, governance, audit and reporting.
3.10.8	Training in transfer medicine should be an integral part of Intensive Care Medicine training for doctors and nurses.
3.10.9	Where multiple teams are involved in a patient's care, appropriate handover should be undertaken between the teams prior to transfer. This should not delay the transfer.
3.10.10	The patient, where possible, and their next-of-kin should be informed of the decision to transfer and an explanation given to them of the need for transfer. This discussion should be documented.
3.10.11	There should be a clear agreed escalation process for any delayed transfer across an operational delivery network geographical area. The definition of 'delay' will vary according to the reason for the transfer. For patients being transferred from a specialist critical care unit to a general critical care unit at the completion of specialist care, a delayed transfer is one that has not been undertaken 48 hours after the time of referral to the general critical care unit.
3.10.12	Appropriate infection control precautions, including isolation, must be made available for patients with known high-risk infections or who are at a high risk of harbouring such infections both during transfer and in the receiving hospital; their availability should be such that this does not delay a patient transfer. Similarly, isolation facilities must be available for immunocompromised patients who require them.
3.10.13	Critical care units should have an agreement with their local ambulance providers in relation to the contracted transport provision for intensive care services, and to ensure these standards are met throughout the entire patient pathway.
3.10.14	There should be a system for monitoring the quality of inter hospital transfers and governance arrangements which includes capture of numbers, indication for transfer, incidents, delayed transfers and outcomes. Audit measures and learning should be widely shared.
3.10.15	There should be standardised network wide transfer documentation and training programmes.
3.10.16	Consideration should be given to the formation of specialist transfer teams, as these may reduce the incidence of adverse events[2] and prevent the adverse impact of transfers on the transferring unit due to loss of key staff.

CHAPTER 3.11: CARE AT THE END OF LIFE	
Standards	
3.11.1	Decision making surrounding care at the end of life, including the rationale for any decisions, must be documented clearly and communicated to patients and their loved ones. The latter being of particular relevance if patients lack capacity (below).
3.11.2	Decision making surrounding end of life care (EoLC) must be performed in accordance with relevant statutory requirements and professional guidance: f. *Mental Capacity Act 2005* (MCA 2005), England and Wales g. *Adults with Incapacity Act (2000)*, Scotland h. *Mental Capacity Act (Northern Ireland) 2016* i. *Human Tissue Act*, England j. General Medical Council's *Good Medical Practice*; specifically *Treatment and Care Towards the End of Life: Good Practice in Decision Making*.
3.11.3	Declaration of death by cardiorespiratory or neurological criteria must be done in accordance with professional guidance.
3.11.4	Consideration must be made as to whether organ and tissue donation can be offered to every dying patient, and where appropriate the specialist nurse-organ donation (SNOD) should be contacted.
3.11.5	In order to identify dying patients and respond to changes in their condition, those at high risk of dying must have their condition regularly reviewed to assess whether they are improving or deteriorating, enabling early and appropriate organisation of treatment and care.
Recommendations	
3.11.1	Patients with capacity should be kept informed of their clinical condition, and of the possibility that they may be dying. Best practice dictates that those close to the patient should also be informed.
3.11.2	Decision making related to care at the end of life should, wherever possible, involve patients and people close to them, as well as medical professionals. If the patient lacks capacity and there is no individual with Lasting Power of Attorney, responsibility for determining treatments rests with treating clinicians. Previous decisions should also be taken into account e.g. treatment escalation plans (TEP), ReSPECT (Recommended Summary Care Plan for Emergency Care and Treatment).
3.11.3	At least two consultants, supported by senior ICU nursing agreement, should contribute to the process of recommending withdrawal or withholding treatments. Such processes are decided on a case-by-case basis and clarity of communication can be improved by outlining likely burdens and benefits of acts or omissions.
3.11.4	Once patients are recognised as being in their final days/hours of life, therapeutic goals should be reviewed and accordingly altered to focus on comfort and dignity. Interventions which do not contribute towards this should be withdrawn. The discussion of *Do Not Attempt Cardiopulmonary Resuscitation* (DNACPR) is intrinsic to palliative care in critically ill patients. This should be discussed with patients and families within that context. If instituted in emergent situations for incapacitated patients, DNACPR decisions should be discussed with patients' surrogates (as defined by the MCA or equivalent) at the earliest opportunity. The British Medical Association, Resuscitation Council-UK and Royal College of Nursing issue regularly updated guidance on DNACPR.

3.11.5	Dying patients should be managed by multi-professional teams that include senior medical and nursing staff from intensive care and referring teams. It may also include specialist palliative care teams.
3.11.6	Therapeutic plans should be made and anticipatory medications prescribed for all patients in their final hours/days of life, enabling prompt symptom control. This includes therapeutic options for analgesia, dyspnoea, anxiety and agitation. Doses should be titrated for symptom relief based on explicit assessments. Where appropriate, the double effect of drugs used should be transparent to patients, staff and family.
3.11.7	Care should address dying patients' need for spiritual and emotional support, and include that of their families and others close to them. The needs of loved ones to be with, care for and otherwise attend to dying patients should be met as far as is possible. If appropriate, religious or secular expertise should be sought (e.g. referral to chaplaincy, psychological services or patients' GPs). Staff should also have access to these support services.
3.11.8	If death is considered to be very close, patients should not normally be transferred out of the critical care unit unless it is to facilitate (via discussion with patients and loved ones) significant improvements in care. If practical to do so, patients should be given the opportunity to die at home or in a hospice. All transfers should involve a handover of plans and goals of care.
3.11.9	Intensive care clinicians often have a responsibility for decision making and care of acutely unwell and deteriorating patients outside of the critical care unit. When reviewing such patients for potential treatment escalation, they should work with patients' clinical teams to ensure that decisions and communication regarding care at the end of life are made to the same standards as on the critical care unit.

CHAPTER 3.12: ORGAN DONATION	
Standards	
3.12.1	If a patient is close to death, doctors must explore with those close to them whether they had expressed any views about organ or tissue donation. Doctors must follow any national procedures for identifying potential organ donors and, in appropriate cases, for notifying the Specialist Nurse-Organ Donation (SNOD).
3.12.2	The National Institute for Health and Care Excellence guidance requires that the intensive care team caring for the patient should initiate discussions about potential organ donation with the SNOD whenever a patient meets the criteria for undertaking the tests, to confirm death using neurological criteria or when there is an intention to withdraw life-sustaining treatment in patients with a life-threatening or life-limiting condition which will, or is expected to, result in circulatory death.
3.12.3	Critical care units must comply with the criteria for diagnosing death using neurological or circulatory criteria as set by the Academy of Medical Royal Colleges.
3.12.4	All units must contribute data to the national potential donor audit.
Recommendations	
3.12.1	Each acute hospital should have an Organ Donation Committee to oversee all aspects of deceased organ donation as recommended by the Department of Health's Organ Donation Taskforce. Funding for the committee's activities is provided by NHS Blood and Transplant (NHSBT).
3.12.2	Each acute hospital should have a clinical lead for organ donation (CLOD) funded by NHSBT, with responsibility to implement organ donation policies, promote the adoption of best practice guidelines and to address any local barriers to donation.

3.12.3	Each critical care unit should have an embedded or assigned SN-OD employed by NHSBT to provide advice on all issues relating to donation, organise donor coordination, support the intensive care staff in donor management, complete the potential donor audit, engage in teaching and training and support donor families.
3.12.4	Guidelines on end of life care and withdrawal of life-sustaining treatments (WLST) should be compliant with the Mental Capacity Act 2005, and based on the guidance provided by the General Medical Council, and should be followed irrespective of any potential for organ donation. c. Determining best interests at the end of life should include an assessment of a patient's preferences and wishes regarding organ donation. d. Guidance on decisions regarding WLST in patients with devastating brain injury (DBI) should be based on the recommendations of FICM/ICS and other professional bodies.
3.12.5	A planned and collaborative approach to the family for organ donation between the intensive care team and the SN-OD team should be routine practice as recommended by NICE in 2016.
3.12.6	Consultants in Intensive Care Medicine should actively manage brain stem dead consented donors to optimise organ quality and increase the number of organs successfully retrieved and transplanted. Donor optimisation care bundles or protocols should be available and used.
3.12.7	The intensive care team should manage resources flexibly to facilitate organ donation and/or end of life care for patients outside the critical care unit whenever appropriate.

CHAPTER 3.13: LEGAL ASPECTS OF CAPACITY AND DECISION MAKING	
Standards	
3.13.1	Units must have regular, minuted, multidisciplinary team meetings to review cases where dispute have or may have arisen.
3.13.2	All patients must be presumed to have capacity to consent or withhold consent.
3.13.3	If the patient has made a valid and applicable Advance Decision Refusing Treatment (ADRT), it must be respected (although an ARDT does not have formal legal standing in Scotland, they are likely to be highly persuasive to the court).
3.13.4	Final determination of capacity for a specific treatment must be made by the treating clinician and documented.
3.13.5	If a patient has capacity, their decision must be respected, even if the treating clinician considers the decision to be unwise.
3.13.6	Patients who lack capacity must only be treated in their best interests (England & Wales) or if it is of benefit to the patient (Scotland).
3.13.7	Determination of best interests/benefit must involve consultation between the treating consultant and individuals close to the patient (family and friends).
3.13.8	The aim is to achieve consensus between team and family/friends as to what is in the best interests/benefit to the patient. When there is continued disagreement about best interests/benefit, the treating clinician must not act unilaterally.
3.13.9	If, at the end of the medical process, it is apparent that the way forward is finely balanced, or there is a difference of medical opinion, or a lack of agreement to a proposed course of action from those with an interest in the patient's welfare, a court application must be made.
Recommendations	
3.13.1	A written departmental protocol for resolution of disagreements should be in place. Disagreements may be within the team, between different clinical teams or between team and family/friends.

3.13.2	An ADRT that does not meet the criteria to be formally legally binding should nevertheless be taken into account as part of the best interests assessment as a strong indication of the patient's wishes and opinions.
3.13.3	In situations of intractable disagreement, mediation should be considered prior to approaching the Court of Protection (England & Wales)/Court of Session (Scotland). NHS Resolution or the Civil Mediation Council provide access to individual mediators or recognised groups.
3.13.4	Independent Mental Capacity Advocates (IMCA) should be consulted (in England and Wales) when a patient is 'unbefriended'. This only applies when there is no one who can be consulted about best interests, i.e. no family or friends. IMCAs should not be consulted because there is dispute about best interests between the medical team and family.

CHAPTER 4.1: RESPIRATORY SUPPORT	
Standards	
4.1.1	Units must have access to sufficient modern invasive and non-invasive ventilators which will support pressure/volume controlled ventilation, titration of inspired oxygen concentration, support spontaneous ventilation and allow application of PEEP.
4.1.2	Pulse oximetry, capnography, ECG, blood pressure monitoring and ventilator alarms must be used for all ventilated patients whose trachea is intubated.
4.1.3	An accurate height must be measured on admission for every patient requiring invasive mechanical ventilation to calculate predicted body weight (PBW) and corresponding target tidal volume to allow protective ventilation (6ml/kg PBW in those with ARDS or at risk of ARDS).
4.1.4	Units must have evidence-based, written guidelines covering the use of non-invasive ventilation, the management of ARDS, prevention of ventilator-associated pneumonia and weaning from ventilation (including the use of sedation).
4.1.5	Referral pathways for patients with severe but potentially reversible acute hypoxaemic respiratory failure must be in place with Regional Extra-corporeal Membrane Oxygenation-capable (ECMO) Centres.
4.1.6	Units must have written guidelines on the indication, risks and practice of prone positioning in hypoxaemic respiratory failure.
4.1.7	Units must have immediate access to point-of-care testing to enable arterial blood gas analysis.
4.1.8	Standard operating procedures, including checklists, should be developed for intubation, extubation, bronchoscopy, prone positioning, tracheostomy and any high risk/invasive procedures.
4.1.9	Non-invasive ventilation must be considered and available for patients with acute hypercapnic respiratory failure.
4.1.10	High flow nasal oxygen must be available for the management of patients with acute hypoxaemic respiratory failure.
Recommendations	
4.1.1	Tidal volume (ml/kg PBW), plateau airway pressures and cumulative fluid balance should be monitored and recorded daily in all patients requiring invasive ventilation.
4.1.2	Audit of compliance with ARDS, ventilator=associated pneumonia and weaning guidelines should be undertaken quarterly.
4.1.3	Units should have standardised systems to monitor VAP rates and antibiotic resistance patterns.
4.1.4	There is insufficient evidence at present to inform clinicians about the role of Extracorporeal Carbon Dioxide Removal ($ECCO_2R$) in acute hypoxaemic respiratory

	failure and ARDS. Patients should only receive $ECCO_2R$ within the governance framework set out in NICE Guidance[4].

CHAPTER 4.2: WEANING FOR PROLONGED MECHANICAL VENTILATION AND LONG-TERM HOME VENTILATION SERVICES	
Standards	
4.2.1	Level 3 units must have access to a regional home ventilation and weaning unit. Arrangements must be in place to collaboratively manage patients with weaning difficulties and failure, including the transfer of some patients with complex weaning problems to the Regional Centre.
4.2.2	Units must hold multi-professional clinical governance meetings, including analysis of mortality and morbidity.
Recommendations	
4.2.1	Patients with potential weaning problems should be identified at an early stage of admission. Most will have significant respiratory or neurological co-morbidities. Patients with slowly deteriorating neurological conditions are at particular risk of weaning failure.
4.2.2	Patients should be managed by a multi-professional intensive care team with specialist expertise and experience in managing patients with weaning problems and consisting of senior medical, nursing, physiotherapy, speech and language therapy, and dietitian members.
4.2.3	These patients should be managed in a consistent manner by the use of structured weaning plans, including sedation management, based on agreed protocols. The majority of these patients will require a tracheostomy.
4.2.4	Early mobilisation and rehabilitation are likely to prevent weaning delay and failure. Units should have protocols in place and resources to provide these services as described in the section of this document on rehabilitation (Chapter 4.5).
4.2.5	The use of non-invasive ventilation (NIV) as a bridge to spontaneous breathing should be considered in selective groups. Resources and skill in NIV should be available in all units managing patients with prolonged ventilatory needs.
4.2.6	Early discussion with regional domiciliary ventilation services should occur in any patient with chronic neuromuscular impairment, and in those requiring more than 21 days of ventilation. Regional weaning centres should offer advice to referring units to assist with weaning.
4.2.7	The transfer of some patients with weaning delay and failure should be discussed with regional weaning/home-ventilation centres and protocols should be in place to aid these decisions.

CHAPTER 4.3: RENAL SUPPORT	
Standards	
4.3.1	Critical care units must have the necessary facilities and expertise to provide acute RRT for patients with AKI on a 24/7 basis.
4.3.2	Patients receiving acute RRT, where the cause of AKI is unclear or where RRT will be needed on intensive care discharge, must be discussed with the local renal team as per the NICE guideline.
4.3.3	Patients receiving acute RRT must be cared for by a multi-professional team that is trained and experienced in delivering and monitoring RRT.
4.3.4	Acute RRT for patients with progressive or severe AKI must be started before the onset of life-threatening complications associated with renal dysfunction.

Recommendations	
4.3.1	The decision to initiate RRT should be based on the condition and prognosis of the patient as a whole, and not on isolated urea or creatinine values as per Kidney Diseases Improving Global Outcomes (KDIGO) recommendations and the NICE guideline.
4.3.2	Where life-threatening complications of AKI occur, such as intractable hyperkalaemia, RRT should be started emergently unless a decision has been made not to escalate therapy.
4.3.3	Patients with end-stage renal failure who are not in a renal unit/dialysis centre and require urgent RRT may require critical care admission. In such cases, there should be close liaison with the regional renal service regarding transfer and vascular access.
4.3.4	Continuous and intermittent RRT should be considered as complementary therapies for AKI. The choice of therapy should be based on patient status, expertise of the clinical staff and availability of machines.
4.3.5	The dose of RRT should be prescribed at the beginning of the RRT session. It should be reviewed daily and tailored to the needs of the patient.
4.3.6	The decision to use anticoagulation to maintain circuit patency and the choice of anticoagulant should be based on the potential risks and benefits in an individual patient, the expertise of the clinical team and the options available. KDIGO guidelines suggest using regional citrate anticoagulation for CRRT rather than heparin in patients who do not have contraindications for citrate.
4.3.7	Bicarbonate, rather than lactate should be used as a buffer in dialysate and replacement fluid for acute RRT.
4.3.8	Drug dosing may need adjusting whenever RRT is started or the RRT prescription is altered. Close collaboration with an intensive care pharmacist with suitable experience in AKI and the effects of RRT is essential.
4.3.9	Patients treated with acute RRT should receive standard enteral nutrition as long as there are no significant electrolyte abnormalities or fluid overload refractory to RRT.
4.3.10	When discharged from critical care, the accepting team and GP should be informed that the patient had received RRT for AKI while in intensive care so that appropriate follow-up arrangements can be made.

CHAPTER 4.4: GASTROINTESTINAL SUPPORT AND NUTRITION	
Standards	
4.4.1	The type and position of nasogastric feeding tubes (NGTs) used for enteral feeding, hydration and/or drug administration, must comply with NHS Improvement guidelines.
4.4.2	Intensive care services must have a nutrition support guideline with institutional strategies to promote nutrition delivery and to overcome EN intolerance. It is suggested that it should include: g. Measures to minimise the risk of EN aspiration h. Criteria for the use of prokinetic medications i. Criteria for naso-jejunal feeding j. Criteria for use of parenteral nutrition k. Consistent times for stopping and restarting EN around anaesthetic, surgical or bedside procedures l. A protocol for initiation of nutrition without waiting for a dietitian's plan.
4.4.3	Intensive care services must have guidance in place relating to the identification of, and nutrition support for, those at risk of re-feeding syndrome.
4.4.4	Intensive care services must ensure that there is access to a range of parenteral nutrition bags which include vitamins, trace elements and minerals. A 'standard' bag of parenteral nutrition must be available within 24 hours.

4.4.5	Intensive care services must have access to a range of enteral nutrition products to include: e. Low electrolyte f. High protein g. Fluid restricted h. 'Tolerance' (semi-elemental).
Recommendations	
4.4.1	Nutritional status and risk should be assessed on admission, and energy, protein and micronutrient needs determined by a critical care dietitian or clinician with appropriate specialist training or experience. Consideration should be given to recent changes in weight, food intake (quality and quantity) and absorption; causes of altered intake (e.g. appetite, swallow, obstruction, and nausea) and how and when these might change; and to the possibility of specific micronutrient deficiencies.
4.4.2	It is recommended that nutrition support (PN if EN is not possible) should be instigated within 48 hours in patients expected not to be on a full oral diet within three days.
4.4.3	Nutritional intake targets should be set and compared daily with actual intake. Deficits should be monitored and steps taken to remedy them.
4.4.4	Efforts need not be made to cover full energy targets with EN or PN until clinical stability has been achieved. Delivering a calorie load which exceeds energy expenditure appears harmful and should be avoided, whereas hypocaloric nutrition may be safe initially.
4.4.5	The energy content from certain drugs (e.g. Propofol, IV glucose and citrate anti-coagulation renal replacement therapy) should be accounted for to avoid overfeeding.
4.4.6	Feeding plans should be adjusted for those with a BMI > 30 kg/m^2 according to international guidelines.
4.4.7	Volume-based or 'catch up' feeding should be used to allow nursing staff to adjust the hourly infusion rate of EN to optimise delivery after interruptions.
4.4.8	There should be access to nasal bridles to secure NGTs in agitated patients and guidelines for their use and aftercare.
4.4.9	Nutrition support targets should be included in the rehabilitation of critically ill patients.
4.4.10	There should be bowel management guidelines which include: f. Regular monitoring and documentation of bowel habits (frequency & type) g. Minimising the use of drugs that can cause constipation or diarrhoea h. The need for rectal examinations and treating faecal loading/impaction i. When to use laxatives, enemas and suppositories j. Management of ileus.

CHAPTER 4.5: LIVER SUPPORT	
Standards	
4.5.1	Contact with regional liver and or liver transplant centre must be made early following admission to a critical care unit of a patient with liver failure. Advice about management, prognosis and possible transfer can be discussed.
4.5.2	Patients with ALF must be managed in a liver transplant centre if liver transplantation is clinically indicated.
Recommendations	
4.5.1	Patients with liver failure plus any other organ dysfunction should be managed in a critical care environment. Attention should be made to cardiovascular support, rapid correction of actual or relative hypovolaemia, early renal and metabolic support.
4.5.2	Sepsis is very common in patients with liver failure and intravenous antibiotics should be prescribed in any patient with a suggestion of sepsis on admission to critical care. The choice of antibiotic will be driven by knowledge of local

	microbiological flora and resistance patterns.
4.5.3	The use of prophylactic blood products and other procoagulants products prior to interventions should be avoided. In general, patients with liver failure develop a balanced coagulation disorder. Both pro- and anti-coagulant protein production is reduced. Viscoelastic tests, such as thrombo-elastography or ROTEM, may help in management.
4.5.4	Patients with ALF should have access to plasma exchange therapies.
4.5.5	Patients with ALF should have access to techniques used to assess intracranial pressure and/or cerebral perfusion, with intracranial hypertension being a recognised complication in patients with ALF. Strategies to monitor and manage ICH should be available in centres managing this group.
4.5.6	Advice should be sought from a specialist hepatologist for help with diagnosis, specific therapies and prognosis.
4.5.7	Centres managing liver failure and liver trauma should have access to interventional radiologists.
4.5.8	Links should be made with regional centres providing transjugular intrahepatic portosystemic shunt (TIPSS) for patients with bleeding varices (AoCLF).
4.5.9	Units that manage patients with liver failure should have 24-hour access to both diagnostic and therapeutic upper GI endoscopy service.
4.5.10	Drug dosing may need adjusting in patients with liver failure. Close collaboration with an intensive care pharmacist with suitable experience in liver failure is essential.

CHAPTER 4.6: CARDIOVASCULAR SUPPORT	
Standards	
4.6.1	Electrocardiography, chest X-Ray and transthoracic echocardiography must be available at all times at the patient's bedside.
4.6.2	A consultant cardiologist must be available at all times either locally or through a formal network.
4.6.3	Adults with acute heart failure must be reviewed within 24 hours of admission by a dedicated specialist heart failure team (or equivalent), and their management should follow the guidelines detailed in the NICE Quality Standards.
4.6.4	Protocols for immediate transfer to a facility able to provide percutaneous revascularisation of patients presenting a myocardial infarction must be in place.
4.6.5	The intensive care team must facilitate the implementation of national standards, guidelines and pathways pertaining to the patients with a cardiac disease, to be delivered in addition to the other organ support being provided.
4.6.6	The advanced management of patients with acute valvular insufficiency or acute heart failure secondary to valve disease must be guided in consultation with a local cardiologist and the specialist cardiothoracic surgical unit.
Recommendations	
4.6.1	A validated method for advanced haemodynamic assessment with a skilled operator in both the practical use of the device and interpreting the data it provides should be available at all times.
4.6.2	An intra-aortic balloon pump should be available (in consultation with local/regional cardiology team). This may require transfer to another centre.
4.6.3	Local protocols in the use of vasoactive drugs should be in place, although there is little evidence to support the use of any single agent in practice.

CHAPTER 4.7: ECHOCARDIOGRAPHY AND ULTRASOUND	
Standards	
4.7.1	The gold standard investigation is a comprehensive study, performed and reported by a fully trained clinical specialist.
4.7.2	A more limited study, focusing on a specific clinical question, is appropriate in many instances. This must be performed by a trained and competent practitioner.
4.7.3	Individuals who scan and report independently must be trained to a level that is appropriate for their clinical practice.
4.7.4	The service must have a nominated lead consultant with dedicated time in their job plan that is sufficient to reflect the demands of the service and associated governance processes.
4.7.5	Ultrasound equipment must be readily available, serviced regularly and up to date. There must be sufficient equipment to ensure immediate access for ultrasound guided vascular access at all times. Linear, curvilinear and phased array probes are required to provide a comprehensive ultrasound service.
4.7.6	Infection control measures must be adhered to at all times.
4.7.7	The disinfection and storage of transoesophageal echocardiography probes must follow national guidelines. A record must be retained in order to identify and track patients after device usage in the event of future complication/infection.
4.7.8	All images must be securely stored for quality assurance purposes with appropriate data governance. Reliance on the ultrasound machine storage capacity is not a secure method.
4.7.9	Whenever scans are performed to inform clinical decision making, a structured report must be generated and stored in the patient record.
4.7.10	Training scan reports must not be stored in the patient record unless someone suitably trained verifies the document first.
4.7.11	Quality improvement, audit, and peer review activity must occur regularly.
4.7.12	Transoesophageal echocardiography (TOE) must be immediately available in all cardiothoracic critical care units and those units providing extra-corporeal circulatory support.
Recommendations	
4.7.1	All critical care units should be able to ensure the provision of point-of-care ultrasound.
4.7.2	The service should be supported by a fully trained link-person within the cardiology and radiology departments, as appropriate.
4.7.3	Individuals who participate should regularly attend their institutional ultrasound meetings.
4.7.4	Individuals who scan and report independently should keep a personal logbook of their images and reports.
4.7.5	Individuals should not report scans beyond their level of accreditation, but should participate in a training programme, leading to more advanced accreditation.
4.7.6	Images and reports should be uploaded together to the same archive used by the host institution's cardiology or radiology department, as appropriate. Reports should identify the focused nature of the investigation and the clinical context. Scans undertaken as part of training should not be archived before they have been verified by a trainer.
4.7.7	Regional networks and electronic image transfer systems should be created to allow for prompt access to review scans by a specialist with Level 2 accreditation, or equivalent, when this is required.
4.7.8	Consideration should be given to the development of fully qualified physiologists with

	dedicated intensive care commitment and experience under joint supervision to deliver echocardiography services within intensive care.
4.7.9	Regular replacement of ultrasound equipment is required to ensure it remains up to date. Normal guidance states that electrical equipment is replaced every seven years, however ultrasound equipment may need to be updated more frequently to keep up with technological advances.

CHAPTER 4.8: NEUROLOGICAL SUPPORT	
Standards	
4.8.1	Adult patients with refractory convulsive status epilepticus must be admitted to critical care and have EEG monitoring established; the primary endpoint of treatment being the suppression of epileptic activity on EEG.
4.8.2	Adults who are unconscious after (out of hospital) cardiac arrest caused by suspected acute ST segment elevation myocardial infarction must be considered for coronary angiography with follow-on primary percutaneous coronary intervention if indicated.
4.8.3	Following traumatic spinal cord injury, a specialist neurosurgical or spinal surgeon at the major trauma centre or trauma unit must contact the linked spinal cord injury centre consultant within four hours of diagnosis to establish a partnership of care.
4.8.4	Previously fit adults, admitted to critical care following a primary intracerebral haemorrhage, must be referred to specialist neurosurgical centres for consideration of surgical evacuation.
4.8.5	Adults under the age of 60 with middle cerebral artery infarction admitted to intensive must have access to a decompressive craniectomy service at a specialist neurosciences centre.
4.8.6	Declaration of death by neurological criteria must be conducted as per the Academy of Medical Royal College's Code of Practice.
4.8.7	Prognostication in hypoxic-ischaemic brain injury after resuscitation from cardiac arrest must follow professional guidance such as the European Advisory Statement on Neurological Prognostication in comatose survivors of cardiac arrest.
Recommendations	
4.8.1	Protocols should be available to deliver post-resuscitation care to comatose survivors following cardiac arrest as per the Resuscitation Council (UK) guidelines.
4.8.2	The management of traumatic brain injury should follow national and international best practice guidance.
4.8.3	Management of patients with prolonged disorders of consciousness should follow national guidance.
4.8.4	Patients with perceived devastating brain injury should be admitted to the critical care unit to aid prognostication as per national guidance.
4.8.5	Intracerebral haemorrhage should be managed in accordance with international guidance with particular attention to the reversal of anticoagulation and acute control of blood pressure.
4.8.6	The management of suspected viral encephalitis or acute meningitis in adults should follow national guidance.
4.8.7	The management of patients with ventilatory insufficiency due to neuromuscular disease should follow BTS/ICS guidelines.
4.8.8	The management of decompensated acute inflammatory neuropathy should follow best practice guidance.
4.8.9	Autoimmune encephalitis should be suspected and investigated in all adults presenting with the internationally described criteria proposed to identify this disease.
4.8.10	Adults admitted with an acute neurological problem should have access to daily

	consultation or advice from neurology specialists, if necessary by telemedicine.
4.8.11	Critical care units caring for patients with neurological pathology should have agreed venous thromboembolism (VTE) policies that balance the risk of recurrent haemorrhage with the need to provide prophylaxis against VTE.
4.8.12	Fever control to normothermia following traumatic brain injury, aneurysmal subarachnoid haemorrhage, ischaemic stroke, or haemorrhagic stroke may improve outcome.
4.8.13	Appropriate patients with acute ischaemic stroke should be referred for mechanical thrombectomy in accordance with national commissioning policy.

CHAPTER 4.9: BURNS	
Standards	
4.9.1	Staffing models must promote joint care between burn and critical care teams as this may improve safety and confer a significant survival benefit.
4.9.2	A burns theatre must be located in immediate proximity (preferably within 50 metres) to any service providing critical care for burn injured patients.
4.9.3	Burn injured patients who require critical care must be managed by consultants in Intensive Care Medicine who have an appropriate level of training in this field and have acquired and maintain the relevant knowledge and skills needed to care for these patients.
4.9.4	Burn injured patients must be cared for in an appropriate service as determined by the National Burn Care Referral Guidance.
4.9.5	Transfer of critically ill burn patients between services must comply with Intensive Care Society guidelines.
Recommendations	
4.9.1	All burns over 20% total body surface area (TBSA) should have access to thermally controlled single-bedded cubicles.
4.9.2	Fibre-optic bronchoscopy should be used to assess inhalation injury.
4.9.3	Services providing centre level care should be co-located with a major trauma centre. Where this is not the case, mechanisms for ensuring appropriate integration with trauma centre care should be in place.
4.9.4	In specialist centres, clinical guidelines should include: i. Fluid resuscitation and management of associated complications. j. Assessment and management of burns to the face and airway. k. Management of smoke inhalation injury and its sequelae, including carbon monoxide and cyanide poisoning. l. Recognition and management of the acutely unwell and deteriorating burn injured patient, including burn specific criteria for the diagnosis of sepsis. m. Management of hypothermia and hyperpyrexia. n. Management of burn wound infections including antimicrobial stewardship. o. Nutritional assessment. p. Rehabilitation. These guidelines should be subject to periodic review and update.
4.9.5	The implementation of end of life care as a result of burn injury should only be made following assessment by at least two consultants, one of whom should be a specialised burn care surgeon.
4.9.6	There should be a nominated lead consultant for burns, who participates in network and national morbidity and mortality audit meetings.

CHAPTER 4.10: CARE OF THE CRITICALLY ILL PREGNANT (OR RECENTLY PREGNANT)

WOMAN	
Standards	
4.10.1	Any critical care unit that admits antenatal women over 20 weeks' gestation must have rapid access to obstetric and paediatric services able to attend in an emergency. There must be a clear plan and equipment immediately available for performing a peri-mortem caesarean section in the event of maternal cardiac arrest, with appropriate neonatal resuscitation equipment.
4.10.2	An obstetric team (normally a consultant obstetrician, a consultant obstetric anaesthetist and a midwife) must review all pregnant women admitted to critical care at least once in every twenty-four hour period.
4.10.3	In antenatal ICU admissions, when fetal viability is a possibility, a health care professional trained in neonatal resuscitation must be available within 10 minutes and a senior neonatologist or paediatrician must be able to attend within 30 minutes.
4.10.4	All critical care units that admit pregnant or recently pregnant women must have a named lead clinician for maternal critical care (MCC). The main function of this role is to be the point of liaison between critical care and obstetric services (including obstetric anaesthesia).
4.10.5	Breast feeding (including the use of breast pumps) must be encouraged and supported in all post-natal women admitted to critical care.
4.10.6	Women who require care that falls outside EMC must be referred as soon as possible to the general critical care service. The route of escalation to critical care services must be clearly defined.
4.10.7	Critical care outreach or equivalent must be available and provide clinical support and education into EMC.
4.10.8	Critically ill pregnant or recently pregnant women who undergo intra- or inter-facility transfer must be transferred in accordance with standards equivalent to the Intensive Care Society's *Guidelines for the transport of the critically ill adult.*
Recommendations	
4.10.1	Level 3 antenatal ICU admissions and post-natal admissions that are anticipated to last more than 48 hours should be considered for transfer to a regional or supra-regional critical care unit with experience in MCC.
4.10.2	Physical contact between a mother and her baby should be maintained during post-natal critical illness, even if the mother is unconscious. This contact and other events of the admission should be recorded in a critical care diary which can be used in psychological rehabilitation after critical care or in bereavement counselling.
4.10.3	All women admitted to critical care should be offered an appointment in a critical care follow-up clinic or a post-natal review, which includes input from a clinician with experience in critical care follow-up.
4.10.4	Recognition of EMC should be incorporated into midwifery pre & post registration curricula and feature in obstetric, anaesthetic and critical care training programmes.
4.10.5	Healthcare professionals looking after critically ill women should undergo regular, cross-specialty, multidisciplinary team training, to encourage sharing of knowledge and skills and to promote teamwork and effective communication.
4.10.6	Simulation-based learning should be considered to assist healthcare professionals to develop the technical and non-technical skills for EMC.
4.10.7	Critical care networks should consider nominating specific units as the nominated regional or supra-regional unit for MCC.
4.10.8	Obstetric units delivering EMC or level 2 critical care should be members of a regional M network which itself should have a formal relationship with the local Critical C Operational Delivery Network and Strategic Clinical Networks.

4.10.9	MCC quality indicators should be monitored, using data reported through the ICNARC C Mix Programme and the Scottish Intensive Care Society Audit Group and used to impr local performance.

CHAPTER 4.11: CARE OF THE CRITICALLY ILL CHILD ON ADULT INTENSIVE CARE UNIT	
Standards	
4.11.1	Critically ill children under 16 years old must only be admitted to and stay on an adult critical care unit if a PICU bed is unavailable, or when there is an expected short duration of critical care e.g. an older child with overdose or alcohol excess.
4.11.2	Admission must be discussed and agreed by the local consultant in Intensive Care Medicine, local consultant paediatrician and the consultant in paediatric Intensive Care Medicine (this may be the regional paediatric transport team consultant).
4.11.3	A nominated lead intensive care consultant and lead nurse in the adult critical care unit must be responsible for intensive care policies, procedures and training related to the care of children.
4.11.4	An adult critical care unit that may provide care for critically ill children must have an appropriately equipped area for providing paediatric critical care.
4.11.5	Medical staff with responsibility for the resuscitation and airway management of the critically ill child on an adult unit must have up-to-date competencies in advanced paediatric life support and advanced airway management. This medical cover may be provided by anaesthetists or consultants in Intensive Care Medicine according to local arrangements.
4.11.6	Protocols for resuscitation, stabilisation, accessing advice, maintenance and transfer of critically ill children and the provision of paediatric critical care must be available.
4.11.7	Escalation, end of life and organ donation decisions must be discussed in collaboration with the regional consultant in paediatric intensive care (this may be the regional paediatric transport team consultant), under a shared care and shared responsibility model.
4.11.8	There must be collaborative working between the adult critical care unit and the regional PICU to ensure that staff are supported to work outside their normal core competencies. There must be 24/7 access to paediatric medical and paediatric nursing advice.
4.11.9	A local consultant paediatrician and consultant in paediatric Intensive Care Medicine must be available for advice at all times.
4.11.10	There must be 24-hour access for parents/carers to visit their child.
Recommendations	
4.11.1	A registered paediatric nurse should be available at all times to support the care of the child.
4.11.2	The child should be reviewed by a consultant paediatrician twice a day during their stay on the adult unit.
4.11.3	There should be access to specialist paediatric healthcare professional and pharmacy advice at all times.

CHAPTER 4.12: STANDARDISED CARE OF THE CRITICALLY ILL PATIENT	
Standards	
4.12.1	Patients must be assessed daily for risk of thromboembolic disease and receive

	appropriate prophylaxis.
4.12.2	Patients undergoing controlled mechanical ventilation must receive tidal volumes based on predicted body weight (PBW). Patients with ARDS must receive a tidal volume of less than or equal to 6 ml/kg PBW.
4.12.3	Ventilated patients must have respiratory function evaluated daily and undergo spontaneous breathing trials where appropriate.
4.12.4	Sedation must be individualised to patient needs and the appropriateness of a sedation hold considered daily.
4.12.5	All patients must be assessed regularly for evidence of pain, with analgesia optimised to minimise sedation requirements.
4.12.6	All patients must be screened daily for evidence of delirium using a validated method such as the Confusion Assessment Method for the ICU (CAM-ICU) or the Intensive Care Delirium Screening Checklist (ICDSC).
4.12.7	Indwelling intravascular catheters must be inspected daily for evidence of infection using a suitable scoring system e.g. Visual Infusion Phlebitis Score (Jackson 1998) to guide necessity for removal.
4.12.8	The continued need for indwelling catheters (intravascular or urinary) must be considered daily.
4.12.9	Monitoring of invasively ventilated patients must include continuous waveform capnography.
4.12.10	Care bundles must be in place for Intubation Associated Pneumonia (IAP) prevention, Central Venous Catheter (CVC) insertion and maintenance, and Peripheral Venous Cannula (PVC) insertion and maintenance.
Recommendations	
4.12.1	For patients without ARDS, a tidal volume of 4-8 mls/kg PBW and a peak/plateau pressure (depending on mode) of below 30 cmH_20 should be targeted.
4.12.2	A ventilated patient care bundle should be in place with appropriate mechanisms for ensuring adherence.
4.12.3	Ventilated patients should receive H_2 receptor blockade (e.g. ranitidine) or a proton pump inhibitor for gastric protection until established on full enteral nutrition.
4.12.4	Unless clinically contra-indicated, ventilated patients should be nursed in a semi-recumbent position at 30 to 45 degrees.
4.12.5	Where there is no contraindication, enteral nutrition (EN) should be initiated within 48 hours after admission to the ICU.
4.12.6	When EN is not feasible or insufficient, parenteral nutrition should be started as soon as possible in patients with (or at high risk of) malnutrition, (which maybe a combination of cachexia (disease related) and malnutrition (inadequate consumption of nutrients).
4.12.7	All sedated patients should have sedation levels monitored hourly using a scoring system such as the Riker Sedation–Agitation Scale or the Richmond Agitation–Sedation Scale to ensure sedation is minimised.
4.12.8	Noise levels and patient interventions should be minimised overnight to facilitate natural sleep.
4.12.9	A transfusion threshold of 70g/L should be used in general intensive care patients. A higher target Hb may be beneficial in patients with sepsis (in the first six hours), ischaemic stroke, traumatic brain injury with cerebral ischaemia, or acute coronary syndromes.
4.12.10	Critical care units should consider standardisation of drug concentrations in line with FICM/ICS guidance.

CHAPTER 5.1: RESEARCH AND DEVELOPMENT

Standards	
5.1.1	All individuals participating in R&D activity must have completed Good Clinical Practice (GCP) training for research and keep this up to date.
Recommendations	
5.1.1	Critical care units should nominate a lead for R&D activities who should coordinate activity and ensure it is carried out to UK Policy Framework for Research standards.
5.1.2	Critical care units should participate in research networks, which are organised at Local Clinical Research Network (LCRN) level through the regional National Institute of Healthcare Research (NIHR) Critical Care research network lead.
5.1.3	All research studies should be registered on the UK Critical Care Research Portfolio whenever they fulfil eligibility criteria.
5.1.4	Critical care units participating in research should provide information to patients, relatives, and surrogate decision-makers (SDMs) about ongoing research, for example through posters, leaflets, or within generic intensive care information resources.
5.1.5	Critical care units participating in research should have clear procedures for approaching patients, families and SDMs in a manner that minimises stress, but provides adequate information in a timely manner.
5.1.6	Critical care units participating in multiple research studies should have clear co-enrolment policies based on the UK co-enrolment guideline.

CHAPTER 5.2: AUDIT AND QUALITY IMPROVEMENT	
Standards	
5.2.1	Critical care units must have a structured and planned clinical audit programme to compare practice to published standards. There must be an identified lead for the audit programme.
5.2.2	Critical care units must participate in a National Audit Programme for Adult Critical Care, such as the Scottish Intensive Care Society Audit Group (SICSAG) or Intensive Care National Audit and Research Centre (ICNARC) programmes.
5.2.3	Critical care units must have a surveillance system in place for audit and feedback of nosocomial infection, for example, catheter-related bacteraemia and other blood stream infections, reported to the national scheme where applicable. Critical care units should also report the incidence of intubation-associated pneumonia. All units must participate in national audit programmes for nosocomial infections in intensive care, for example, Public Health England Infections in Critical Care Programme (ICCQIP) and Scottish nosocomial infections in ICU audit programme.
5.2.4	Critical care units must measure night-time discharges in order to encourage and support local improvement to reduce night-time intensive care discharges.
5.2.5	Critical care units must obtain regular feedback about the care that patients and relatives receive during their critical care admission in order to learn from and act on the feedback received.
Recommendations	
5.2.1	Units should have nominated medical and nursing leads for quality improvement and audit. Appropriate time should be made available in job plans for these duties. Time to participate in audit and quality improvement programmes should also form part of the job plans of all intensive care staff (medical, nursing, pharmacists, healthcare professionals and ancillary staff).
5.2.2	Hospitals should have a quality improvement (QI) programme in place for each critical care unit in their organisation. The programme should aim to deliver safe, efficient, effective, patient-centred, timely and equitable patient care, which is evidence based, and should follow recognised quality improvement methodology.

5.2.3	Staff should be encouraged and supported to train in quality improvement methodology and all projects should be multidisciplinary, recognising the necessity for a team approach and the contribution of all staff groups.
5.2.4	Audits should be linked to QI programmes. Units should have robust data-collection systems in place that support the collection of activity and quality data for local and national audit programmes.
5.2.5	Critical Care Networks should have a formal, multi-professional, peer-review programme in place for the units in their jurisdiction. Peer reviews should be based on published national standards, but are likely to include other areas that are agreed locally.
5.2.6	All critical care units must measure and report their delayed discharge, out of hours discharges, non-clinical transfers and readmissions within 48 hours of discharge, as a potential indicator of resource pressures. It is recommended that units should also measure early discharges as they may be a marker of insufficient resources.

CHAPTER 5.3: CLINICAL GOVERNANCE	
Standards	
5.3.1	There must be an appropriately trained consultant and senior nurse identified as leads for clinical governance. The consultant must not be the clinical lead or clinical director for critical care.
5.3.2	There must be a robust system in place for reporting, investigating, and learning from all patient safety incidents. Appropriate action plans must be formulated in response to incidents. Units should also learn from things that go well, a process described in excellence reporting.
5.3.3	Units must hold regular structured multidisciplinary clinical governance meetings, where they discuss unit morbidity and mortality, including all deaths, critical incidents and near misses. A written record of actions taken and lessons learnt should be kept and a timely and reliable method for dissemination of shared learning should be in place. There should be clear structures in place for disseminating findings to staff, and deficiencies in care should lead to measurable change.
5.3.4	Regular feedback must be obtained from service users and staff about the quality of care delivered, for example by the use of safety surveys[4] and relatives' questionnaires.
5.3.5	Critical care units must participate in a mortality review programme using appropriate methodology to maximise learning and improvements in care. Appropriate actions must be taken whenever preventable factors are found.
5.3.6	All units must maintain a risk register that is regularly reviewed and updated by both senior managerial and clinical staff.
5.3.7	The unit must have processes to ensure clinical staff are aware, in a timely fashion, of key learning points from national safety alerts and local learning (for example from patient safety incidents, excellence reports, patient concerns and compliments). Staff must also be able to easily access important information to inform patient care (for example information about medications and unit policies) whenever needed.
5.3.8	Staff who have to conduct reviews of patient safety incidents, root cause analysis and appreciative enquiry must be trained in the management of these processes so that the reviews are conducted sensitively and constructively. Similarly, effective quality improvement requires staff that are trained in quality improvement methodology.
5.3.9	Each unit must have local safety standards for invasive procedures (including tracheostomy, bronchoscopy, central line and chest drain insertion and lumbar puncture). They must also have safe standards for the handover of information for patients going to have invasive procedures in other departments. These standards should include documentation of invasive procedures, handovers and information transfer, procedural verification, a safety briefing and time out, and a sign out and

	debriefing. An example of this process is the NHS England *Safety standards for invasive procedures*.
5.3.10	Critical care units must comply with reviews and visits by national organisations, (for example the CQC in England)
Recommendations	
5.3.1	Intensive care staff should work with other clinical teams in the hospital with respect to joint learning from morbidity and mortality review and ensuring best practice around handovers of care.
5.3.2	Units should regularly review guidelines from professional organisations and other sources of evidence to ensure that the unit complies with best practice. These evidence sources should be translated into comprehensive locally agreed guidelines or Standard Operating Procedures.
5.3.3	The unit should identify key performance indicators (KPIs) that describe outcomes of their service. Such KPIs may be generic and common to most units, such as complication rates, e.g. delirium rates, pain scores or pressure sores. Alternatively, these may be unit specific, for example rates of emergency thoracotomy on cardiac critical care units.
5.3.4	Staff should be recognised as the key resource in intensive care. A fully engaged, well-motivated well-trained and well-led workforce is essential to allow excellence in clinical care to flourish. Staff sickness rates, turnover rates and information from appraisal, staff feedback and exit interviews should all be monitored to ensure staff welfare.
5.3.5	Units should work with other units within their network, and nationally, to share learning, disseminate best practice, quality improvement and for benchmarking and peer review purposes. The governance of critical care units is rightly audited by outside agencies, including intensive care networks. The external responsibility for the oversight of governance arrangements varies between the devolved nations.
5.3.6	The unit should be able to demonstrate that it is continuously working to improve patient care using recognised quality improvement techniques delivered by appropriately trained staff.

CHAPTER 5.4: CRITICAL CARE NETWORKS	
Standards	
5.4.1	Critical care ODNs must support the activity of provider healthcare organisations in service redesign and delivery of the commissioned pathway, quality improvements, innovation and standardisation of clinical practice. They provide a mechanism for peer review and benchmarking self-assessment in the network.
5.4.2	Critical care ODNs must support commissioners in the delivery of their commissioning functions, through creating and delivering innovation, quality improvements and efficiency across the pathway, and developing, devising and supporting local strategies for adult critical care services across the geographical footprint, including advice on improvement.
5.4.3	Critical care ODNs must support delivery of a resilient critical care service within a geographical area to meet emergency preparedness requirements.
5.4.4	Each provider of adult critical care must engage, contribute and participate in activities of their local critical care ODN and will contribute to the funding of their local ODN through a nationally agreed mechanism; this is currently a 0.1% CQUIN top slice, but may be supplemented by local agreements made in conjunction with key stakeholders through the ODN Executive/Oversight Group/Board.
5.4.5	The intensive care team in provider organisations must engage, contribute and participate in a critical care ODN, including audit activity, peer review and quality

	improvement processes.
Recommendations	
5.4.1	ODNs should take a whole-system, collaborative-provision approach to facilitate the delivery of safe and effective services across the patient pathway, with an emphasis on the quality and equity of access to service provision.
5.4.2	ODNs should aid cross-organisational, multi-professional clinical engagement for the sharing of best practice and knowledge. They should both identify and implement improvements to enhance patient care, enabling the design of effective clinical flows and pathways of care for networked provision of services. This will allow for more local determination, innovation and efficiency across the pathway.
5.4.3	ODNs should focus on quality and effectiveness through facilitation of comparative benchmarking and auditing of services, with implementation of required improvements. This should span the wider hospital system, to include dedicated critical care units, as well as resources to support acutely unwell patients on general wards. This includes rehabilitation of patients recovering from critical care in hospital and in the community.
5.4.4	ODNs should create an operational model that allows effective work programmes for the delivery of local and regional priorities, service specification standards, national programme of care outcomes and outcome framework targets.
5.4.5	ODNs should have robust governance arrangements that ensure functionality, working with both providers and commissioners, to enable the development of improved service standards to continually enhance the patient, family and carer experience.
5.4.6	ODNs should have a core management team capable of delivering the work of the network according to local requirement. They should provide clinical and executive management/leadership to support the delivery of established network plans, enabling action in response to adverse situations or outlying practices. As a minimum, this would include senior management, lead medical and nursing roles and administrative support. These roles are independent of both the host organisation and the substantive employer (where this is not the host).
5.4.7	Each participating member organisation should ensure appropriate representation at critical care ODN meetings, task groups and other forums in accordance with the network's terms of reference. Through the baseline contract agreement (local or national), member organisations should comply with ODN standards, policies and guidelines.
5.4.8	Each adult critical care provider should adhere to requirements to measure and evaluate quality indicators and service delivery, in line with the national Adult Critical Care Service Specification (D05)[3]. This specification may be supplemented by additional requirements by the local ODN (for example GPICS V2 standards and recommendations). Such supplemental standards should be approved by the ODN through their local governance structure.
5.4.9	ODNs should provide leadership support in network-wide emergency preparedness, have a role in clinical contingency planning and respond to increased demand through national, regional and local determination. ODNs should act on identified challenges as they emerge, e.g. a local critical care bed crisis or large-scale major incidents.
5.4.10	ODNs should encourage the positive engagement of adult critical care providers in their networks and support critical care units in developing their service to its maximum potential by implementing the recommendations outlined above.

CHAPTER 5.5: CRITICAL CARE COMMISSIONING	
Standards	
5.5.1	All units must comply with national commissioning arrangements in place in England, Wales, Scotland and Northern Ireland.

5.5.2	CCMDS must be collected and reported in all designated Adult Critical Care locations in England.
5.5.3	Data collection must commence from the date and time that the patient first occupies a designated critical care bed or, if in a non-designated critical care location (theatre recovery/ward), data entry should only occur when a patient has received critical care for a period of time in excess of four hours. The care received by patients in these non-designated areas must include clinical interventions, monitoring and continuous supervision normally associated with a critical care area.
5.5.4	Adult critical care reference cost submissions must assign costs to individual HRGs.
5.5.5	All providers in England, Wales and Northern Ireland with adult critical care services must be members of a Critical Care Operational Delivery Network.
Recommendations	
5.5.1	Collection of all 34 fields in CCMDS is recommended. This should be done by dedicated trained personnel.
5.5.2	There should be clinical oversight of the CCMDS data entry/data submission to ensure accuracy of data.
5.5.3	Preparation of reference costs should include experienced clinician involvement.
5.5.4	Agreement should be in place to support early notification to a patient's CCG for longer-stay patients who are likely to have complex home needs, such as home ventilation to aid discharge planning including the identification of a funding package.
5.5.5	A lead commissioner should be identified with a commissioning forum for each critical care service.

CHAPTER 6.1: FIRE	
Standards	
6.1.1	All units must have well marked fire call points, fire extinguishers and oxygen shut-off valves.
6.1.2	Each unit must have a specific fire evacuation policy in place which takes account of: d. the layout of the building, including any need to negotiate stairs during an evacuation e. the provision of ventilatory support, intravenous therapies and invasive monitoring for patients during such an evacuation f. the fact that critical care staff may themselves be affected by a fire and therefore be unfit to continue working Action cards summarising the evacuation procedure should be displayed within the unit, ideally next to fire call points, so that they can be referred to in an emergency.
6.1.3	Recommendations for the safe use of oxygen cylinders must be adhered to at all times and include: d. the safe use of oxygen cylinder bed brackets e. the safe storage of oxygen cylinders, including storing oxygen cylinders turned off at both the valve and the flowmeter f. following the recommended sequence of events when turning on an oxygen cylinder: • first connect the oxygen tubing and mask to the oxygen cylinder outlet • then turn on the oxygen cylinder and select the flow • finally attach the oxygen to the patient.
6.1.4	Units must comply with current Department of Health regulations regarding the fire-retardant nature of mattresses, bedding, flooring and curtains.
6.1.5	New units must be designed using Department of Health guidance and in conjunction with the Trust fire safety officer, with consideration given to the provision of:

	e. multiple exit routes f. ski pad, ski sheets or other evacuation aids for all bed spaces which are readily available g. adopting small bays rather than open areas h. splitting ICU departments into separate clinical and non-clinical areas.
6.1.6	Units must have a major incident plan in place which allows for the transfer in of multiple critical care patients from a neighbouring hospital's critical care unit should it need to carry out an emergency evacuation.
6.1.7	Any problem with oxygen cylinders and associated equipment must be reported immediately to both the medical gas supplier and the Medicines and Healthcare products Regulatory Authority (MHRA).
6.1.8	All staff must undergo regular training in fire prevention and fire procedures, to include training in-situ in the specific clinical areas in which they work. All staff must know: c. the location of fire call points within their own unit and how to operate them d. the location of fire extinguishers within their unit and which type to use in the event of a fire Medical and senior nursing staff must also know the location of the medical gas pipeline shut-off valves in their unit, how to operate them and the implications of doing so.
6.1.9	All intensive care staff must be given basic training regarding the safe use of oxygen cylinders.
6.1.10	Local unit evacuation policies must be drawn up, with consideration for: i. other locations within the hospital where critical care might be provided on a temporary basis j. provision of equipment and drugs k. evacuation case at each bed space l. triage of patients (the least unwell patients being evacuated first and the most unwell patients last) m. possible co-existing power and/or equipment battery failure n. use of transport ventilators and hand ventilation if needed o. temporary discontinuation of renal replacement therapy p. transfer of hospital notes especially if electronic patient monitoring is in use. In a major fire, it is possible that serial evacuations will be required with a staged move to the outside, and that the whole hospital may need to be evacuated.
Recommendations	
6.1.1	Evacuation policies should include liaison with the Bronze (Operational), Silver (Tactical) and Gold (Strategic) commanders in conjunction with the senior fire officer on scene. Timing of evacuation is crucial: if evacuation occurs too early, then patients may be harmed by a transfer; if evacuation occurs too late, then patients and staff may be harmed by fire and smoke.
6.1.2	Local fire evacuation policies should be tested regularly, ideally as part of a simulation scenario. Evacuation at night should also be practised.
6.1.3	Units should have a system whereby staff involved in a traumatic incident, such as a fire in the critical care unit, receive debriefing and are followed up for signs of a trauma stress reaction or Post Traumatic Stress Disorder (PTSD). The Trauma Resilience Management (TRiM) system is a screening tool used in the military and more recently used successfully in healthcare which could be considered.
6.1.4	Critical care networks should develop systems to support planning for, and management of, a major incident in one critical care unit within the network, so that other units can

	cooperate to accommodate all critically ill patients in this type of situation. A retrieval team approach, with staff from neighbouring units travelling to the affected unit to transfer patients, should be planned. Liaison with neighbouring units and local ambulance services at an early stage is advised.

CHAPTER 6.2: MAJOR INCIDENTS	
Standards	
6.2.1	All hospitals designated receiving hospitals with Level 3 critical care capability must be *prepared* to double their normal Level 3 ventilated capacity and to maintain this for up to 96 hours.
6.2.2	All nominated supporting hospitals with Level 3 critical care capability must be prepared to double their normal capacity for Level 3 beds for general use and to support the decant of patients from other receiving hospitals.
6.2.3	All hospitals with intensive care capacity must have in place plans to support the retrieval or transfer of patients; supporting hospitals must have to support patient transfers by providing suitably skilled transfer teams for each patient needing to be moved within Critical Care Operational Delivery Network areas and beyond.
6.2.4	All hospitals must have an evacuation and shelter plan that includes evacuation and shelter of highly dependent patients, including but not exclusively intensive care patients, should the intensive care areas become unusable for any reason.
6.2.5	All hospitals must have a **lock down** plan that includes all intensive care areas, preventing unauthorised access.
6.2.6	All hospitals must have a recovery plan to ensure a rapid return to normality once the incident is closed. This must include adequate rest and psychological support for staff.
6.2.7	Action cards must be available for use on activation of plan and must include information and communication routes that are to be used.
Recommendations	
6.2.1	Intensive care leads should work closely with the Healthcare Organisation Emergency Preparedness, Resilience and Response (EPRR) leads and clinical colleagues to create the intensive care response to a major incident, hospital evacuation or mass casualty plans.
6.2.2	Intensive care should have access to emergency planning and response training including strategic/crisis leadership.
6.2.3	Intensive care service staff should participate in the local and regional multidisciplinary exercises including 'table top' and 'live' exercises to further refine local and regional plans and communication routes between organisations and networks.
6.2.4	Intensive care leads should work with their EPRR team to facilitate exercises in the evacuation of very dependent patients from any part of their hospital. This should include practical use of ski sheets, and other patient handling aids, as well as rehearsing the decision making and forward planning required by shift leads to support a controlled, staged evacuation.
6.2.5	Intensive care staff should be prepared to take a central leadership role in any major incident and should be prepared to send teams 'forward' to the Emergency Department, as well as any preoperative hold areas and recovery.
6.2.6	The plan to double the number of intensive care beds should include an inventory of where equipment is to come from, where the beds should be located and who should staff them. This should be near the permanent critical care unit, where possible allowing the normal functioning of the hospital around it.
6.2.7	Advance consideration of staff workforce requirements, including mutual aid from colleagues in neighbouring hospitals should form part of the intensive care service planning.

6.2.8	Staff welfare should be actively supported during an incident and critical care staff access to informal, immediate debrief or later formal counselling.
6.2.9	Clinical standards should be maintained as long as possible, critical incident reporting encouraged and contemporaneous note kept to enable quality post-incident lessons to be investigated, communicated and learnt.

CHAPTER 6.3: HIGH CONSEQUENCE INFECTIOUS DISEASES: ISOLATION AND MANAGEMENT	
Standards	
6.3.1	Each critical care unit must ensure there are local contingency plans for the initial isolation and management of critically ill patients with suspected HCIDs. These plans must be regularly practiced and reviewed, including the use of table-top exercises and simulations.
6.3.2	Units must liaise with local Directors of Infection Prevention and Control to ensure the correct personal protective equipment (PPE) is procured and sufficient stocks are readily available for use by appropriately trained intensive care staff in the event it is required.
Recommendations	
6.3.1	A consultant in Intensive Care Medicine should have responsibility for intensive care aspects of local emergency planning and resilience preparations, incorporating plans for the appropriate isolation and management of suspected patients with HCID.
6.3.2	A clinical area where critically ill patients with suspected high consequence infectious diseases may be isolated, either within the unit or elsewhere, should be prospectively identified. Ideally plan to utilise negative pressure rooms with anterooms where available.
6.3.3	All clinical equipment used in the management of a patient with a HCID should be dedicated to that patient alone. Equipment should be single use where possible.
6.3.4	Training should be provided on a regular basis to ensure critical care staff are familiar with using and safely removing the PPE provided. This should incorporate annual fit testing of respiratory protective equipment (e.g. FFP3 masks).
6.3.5	Critical care staff providing care for a patient with a suspected or confirmed HCID should be dedicated to the care of that patient on a clinical shift and should not provide concurrent care for other patients, thus limiting the risk of cross-infection.
6.3.6	Contingency planning should incorporate plans for holding securely the large volume of clinical waste resulting from clinical care including discarded contaminated PPE. Once a HCID is confirmed, further advice on correct disposal of the waste will be provided.
6.3.7	Patients with a suspected viral haemorrhagic fever should be risk assessed in accordance with the Advisory Committee on Dangerous Pathogens Viral Haemorrhagic Fever (ACDP VHF) Risk Assessment algorithm and investigations to exclude malaria promptly undertaken, in keeping with local procedures.
6.3.8	Patients with suspected airborne HCIDs should be risk assessed according to national guidelines where they exist (disease-specific e.g. MERS guidance collections or generic airborne HCID guidelines, as appropriate).
6.3.9	Following recognition of a patient with a suspected HCID: 1. local infectious disease and/or microbiology and virology services should be

	notified and advice sought, including guidance on obtaining appropriate diagnostic clinical specimens. 2. local clinicians should liaise with the Imported Fever Service (note this service is available to clinicians across the UK) for further clinical advice and to facilitate access to specialist diagnostics as required. 3. all suspected cases should be reported immediately to local health protection authorities (e.g. the local Health Protection Team).
6.3.10	Critical care units accepting international medical transfers should perform a risk assessment prior to transfer if a patient is being transferred from a country with known HCID outbreaks or countries where there is a significant risk of specific HCIDs; refer to national guidance (disease-specific or generic HCID guidance).

CHAPTER 6.4: SURGE AND BUSINESS CONTINUITY PLANNING	
Standards	
6.4.1	Adult critical care units (in England) must submit twice-daily information on their bed capacity through NHS Pathways Directory of Services (DoS).
6.4.2	Each organisation with an adult critical care unit must have their own escalation plan and business continuity plan.
Recommendations	
6.4.1	Unit managers and senior clinical staff should develop plans and checklists for scenarios such as: e. Supply chain disruption (road/fuel crisis, extreme weather, industrial action or civil disturbance). f. Infrastructure failures (intermittent power cuts or 'brownouts', failure of water or heating). g. Interruption of normal staffing patterns (e.g. transport disruption, school closures). h. Checklists should include, for example, which drugs and consumables would run out first if supplies are disrupted.
6.4.2	Plans should also include options for: c. Unit evacuation, both internally and externally to other sites in the event of major infrastructure failure, or other events (e.g. fire) which threaten the ongoing operation of intensive care facilities d. Capability for accommodating intensive care patients evacuated from another site.
6.4.3	As lack of critical care capacity is frequently the bottleneck in other surge-events, managers and clinicians should have identified areas within their acute hospital sites to allow for expansion of critical care capacity. This may include use of operating theatres, recovery and augmented higher care areas, or upgrading Level 2 critical care areas to permit mechanical ventilation and Level 3 care.
6.4.4	If increased activity is anticipated, the increase in requirement for consumables should be quantified using the concept of 'days of supply' (i.e. what is needed to run one intensive care bed for a 24-hour period). This should include consideration of oxygen and air supplies.
6.4.5	Expansion may also require consideration of essential equipment and possible alternatives.

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